IsDB
البنك الإسلامي للتنمية
Islamic Development Bank

REBUILDING INCLUSIVE GLOBAL VALUE CHAINS AS PATHWAY TO GLOBAL ECONOMIC RECOVERY

THE GLOBAL VALUE CHAINS REPORT 2020

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This publication is led by the Global Value Chains (GVC) Division, Department of Strategy and Transformation (DoST). It covers a wide range of complex topics and incorporated content from multiple stakeholders including IsDB staffs, IsDB Member Countries, United Nations bodies, various agencies, universities and industry experts. The Report is written by staff from the Global Value Chains Division, as well as IsDB staff participating in the IsDB GVC-CoP Certification Program. We thank all the organizations whose knowledge of the industries and related subjects has informed this publication.

Contact

IsDB Global Value Chains
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The GVC Report 2020 is produced by the Global Value Chain Division, Department of Strategy and Transformation, as part of the program of the Global Value Chains Community of Practice.

For any questions and suggestions related to this report please contact:

Email: gvc@isdb.org

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Foreword

At the beginning of 2019, we established the Islamic Development Bank (IsDB)'s Global Value Chains (GVC) Section under the Department of Strategy and Transformation (DoST) to set forward the bank's new business model of "Making Markets Work for Development" under my Five-Year Program (P5P).

The newly established Community of Practice on the Global Value Chains (GVC CoP) aims to build the GVC capacity of the bank's staff, promote training and knowledge transfer within IsDB in this new area to position IsDB as a leading global knowledge institution.

The goal is to provide IsDB experts with the necessary skills and tools in GVCs to develop and promote industry champions of member countries under the new Member Country Partnership Strategy (MCPS) and IsDB business model.

It is also an endeavor to build expertise in GVCs to successfully implement the GVC-based MCPS so that IsDB can help member countries achieve their development goals.

I am proud that IsDB has become the leading international development organization in highlighting the importance of GVCs and investing in the development of necessary skill sets and expertise in promoting awareness in this niche area.

The COVID-19 pandemic has also demonstrated the critical role of GVCs in the global economy. As a result, many organizations started to invest in this area to develop necessary skills. I am delighted that our early engagement and efforts are already paying off through the GVC-CoP activities.

It gives me immense pleasure to share with you "The Global Value Chains Report 2020: Rebuilding Inclusive Global Value Chains as Pathway to Global Economic Recovery" as a direct result of IsDB's technical targeted contributions to GVCs.

The publication, exclusively written by IsDB staff, illustrates that IsDB is ready to support its 57 member countries reposition themselves in different sectors and help them achieve their socio-economic development goals.

No sooner had I assumed office as IsDB President than I established the P5P, which emphasizes strengthening the competitiveness of IsDB Member Countries (MCs) in strategic industries through public investments and private resource mobilization. The program puts forward IsDB's innovative approach that focuses on driving development, growth, and innovation and promoting MCs' competitive industries.

I hope this report will feed into our member countries' Development Strategies and National Development Plans.

I take this opportunity to extend my appreciation to the DoST Director, the GVC-CoP team, and everyone who has contributed to this informative publication.

Dr. Bandar Hajjar

President, Islamic Development Bank

Introduction

Dr. Mohammed Faiz Shaul Hamid,
Acting Manager of the Global Value Chains Division, Islamic Development Bank

One lesson that the COVID-19 pandemic has taught the global economy is the importance of fully functioning global value chains. Against any backdrop of trade tensions, the key survival of humanity lies within collaboration and the need to keep the engine of growth moving. Yet, we are still debating from face masks at the beginning of the pandemic to vaccines with high levels of distrust in spheres of societies and between governments. In the highly interconnected world we live in today, the debate on global value chains is between rebuilding resilience or continuing with a more efficient setup. On both ends, resilience and efficiency may just widen the disparity between societies and governments and there is a strong need and opportunity to rethink how can we rebuild more inclusive value chains as a pathway to global economic recovery.

The unprecedented global economic shocks brought by the COVID-19 pandemic shed a bright light on the importance of the complex global value chains as the bedrock of the global economy. Since the outbreak, the global economy was challenged by supply and demand shocks. At the beginning of the pandemic, global firms operating in multiple locations started to monitor the impact of the pandemic in some parts of their operations. Some firms anxiously closed operations in certain regions thinking that the effect of the pandemic will be contained in certain parts of the world, while governments were contemplating emergency lockdowns and ways to contain the virus. There was of course no ideal pathway or best practices in a situation where the global economy is highly interconnected in complex global value chains. The pandemic is the biggest test for the global economy that is supported by GVCs.

People from all walks of life realized how interconnected the global economy is when many countries were running short of face masks. In February and March 2020, nearly all countries exporting face masks stopped doing so. Face masks which are part of the non-woven textile industry were at that time a low margin product with global production spread in countries like China, India, and Turkey. As simple as the face mask, the shortage of it caused chaos as governments were grappling with the need to procure it resulting in turning some production facilities into a temporary face mask factory.

Although a low margin and low value-added product, a product as simple as the face mask undergoes a complex value chain setup. Even though some countries were able to quickly transform some production facilities to produce face masks, the main bottleneck in the value chain of non-woven fabric is the input of polypropylene. Face masks also go through some other processes that were disrupted such as sterilization and testing and packaging which are relatively labor-intensive in many developing countries. From face masks, quite similarly the personal protective equipment (PPEs) were also facing global shortages as health workers started to extensively deal with the growing COVID-19 cases. As more countries jumped in the bandwagon of export restrictions by April 2020, another angle of the global value chains came to light, beyond the product and processes, which are the firms. We rightly have the trade data between countries which gives us the impression of countries trading with each other but in reality, global firms are trading with each other and countries are facilitating the trade. In China, for example, factories of 3M and Honeywell which naturally should be able to produce face masks for the United States were unable to export masks in January and February 2020. A similar situation worsened in Europe when factories just kilometers apart separated by a border were not allowed to supply cross border.

Some of these unilateral moves by some countries started to backfire as investments were pulled out from some of these countries, with the realization that the input and processes of the entire value chain are also as important as the final product.

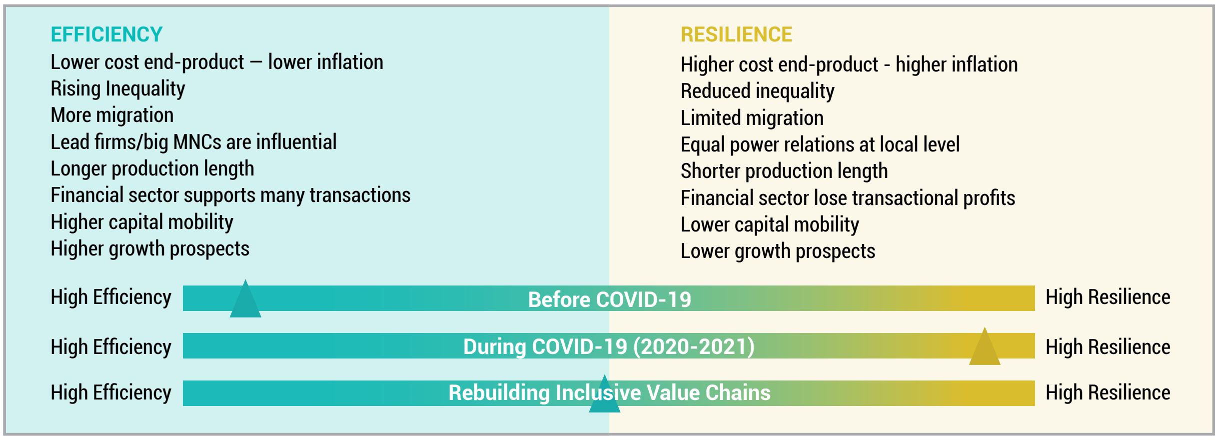
While healthcare workers were fighting the virus in their PPEs, the next value chain that came to light was the ventilators. Shortages of ventilators in Italy and Spain spread to a more global level when several U.S. states and many countries in Asia were unable to secure ventilators. The surge in demand for ventilators resulted in emergency responses by governments across the world with incentives and grants to manufacture ventilators. At this point, many auto manufacturers stepped in to also innovatively support and manufacture ventilators.

Once again, the missing link from a global value chain perspective is the entire spectrum of devices, parts, and components needed to deliver life-saving oxygen to patients. While the focus was given to ventilators, oxygen flowmeters and oxygen pressure regulators were running low. In normal circumstances, both these devices are exported from China to the world, but during the peak of ventilator use, some delays also occurred to design and innovatively work around these two devices. This just shows once again that the perspective of global value chains from a process and product perspective is essential to make the right decision.

As a result of the several shortages and challenges faced by the global economy due to global value chain disruptions in the examples above, it naturally posed the debate on the viability and preparedness of the global economy with the current setup of dispersed production network that has supported the growth and many industries in the past 50 years. This setup of the global value chain which is based on efficiency-seeking activities is opposed by a more resilient value chain that can support the emergency needs of countries. Initially, the discussions were surrounding the move from a global to regional value chain setup by building regional solidarity in production and boosting regional interdependency. However, this concept did not take off as countries were either focusing on self-reliance and moved into a survival mode when the global output declined tremendously with the second wave of lockdowns in many manufacturing-focused countries.

Recognizing the continuous challenges in the global value chains, the call to move away from the efficiently designed global value chains did not only come from the countries. The main actors in the global value chain which are multinational corporations echoed the calls by countries to rethink the just-in-time replenishment model that supports efficiency. Actors in the value chains have always been coping with hyper-competition at the national, regional, and global level and therefore, the adaptation and integration in the global value chains required the actors in the value chain to always increase efficiency. This also means that the actors in the value chain constantly try to achieve

Figure 0: Efficiency-Based Value Chain vs. Resilience-Based Value Chain – A Call for "Rebuilding Inclusive Global Value Chains"



Source: Author

a maximum outcome with minimal use of resources to survive the competition. As a result, we can observe that minimizing the resources especially from a financial point of view, allows firms and businesses to reallocate the savings or invest for future improvements.

The call to move away from efficiently setup value chains is to build resilience given the fragile output conditions in several parts of the world. As a result, hasty decisions are sometimes made in the name of rebuilding resilience that may end up with huge consequences in the global economy. Some of these decisions could also permanently change the global value chain setup and may risk posing economic scarring. The debates on resilience against efficiency have always resulted in extreme ends. Before COVID-19, there was no real alternative as firms in multiple industries set up the supply chains in the most efficient way possible. The aftershock of COVID-19 has resulted in firms and policymakers turning into an extreme position of building a more resilient value chain that sometimes can be moving towards autarky. The efficiency-based value chains are not perfect by themselves. In some extreme cases, it created higher inequality, massive migration and made the multinational firms even more powerful and influential in the industry. Nevertheless, there were policy measures to reduce these impacts, but many empirical studies have suggested that it has expanded growth in many ways. First, the savings from the higher efficiency is used to invest further, and secondly specializations and geographical network setup has made the production length longer with more transactions happening between different parties just to produce one product. The increase in production length also tremendously expanded the services industry and as a result, the financial and banking sector were also benefitting from this setup.

The move towards a completely resilient value chain on the other hand may have short term benefits such as access to certain materials or goods without depending on other countries, decrease migration, create local jobs, reduce inequality to a certain extent if good policies are in place while at the same time balance the power and influence of global multinationals to be more inclusive. As good as it sounds, there will be first some drawbacks that we need to consider. Initially, a more resilient value chain, in the most extreme case relies completely on local production. Local production will increase the price of end products as the entire local value chain actors will be new and some resources may need huge capital investment. This is even worse for countries with a smaller population that cannot absorb the scale required to reduce cost. As a result, inflation will rise until these effects completely go away. The rising working capital requirements to store and keep goods instead of moving them around in the just-in-time setup may also pose risks for smaller-sized firms to close shop. The extreme position of resilient value chains would be based on a local production that will end up with a shorter production length, monopolized by large local institutions with minimal competition. This will result in high initial capital investment to set up this new network of local value chains through various government stimulus and result in slower growth in the long term as the services industry supporting a more globalized setup may shrink while the financial and banking sector may not capture the volume of transactions as before.

Both efficiency-based value chain and resilience-based value chain at their extreme end will not benefit the struggling global economy. There is a need to rethink, with a more targeted policy approach behind the rhetoric of decoupling from the global value chains and find a more inclusive way of sustaining the efficiency-based value chain while ensuring resilience in place. This would require short and medium transitional policies that are selective and targeted for the outcome of prosperity in large. With multiple countries taking astronomical new debts as a pathway to global economic recovery, the resources must not fall into the trap of supporting either one of the extreme ends of the efficiency-based or resilience-based value chain, but rather focus on a people-based value chain that is inclusive, creates sustainable jobs and increases the value-add contribution to the economy in the medium to long term.

About the author:

Dr. Mohammed Faiz Shaul Hamid is the Acting Manager of the Global Value Chains Division at the Islamic Development Bank. He pioneered and leads country and industrial strategy at the Bank that is based on Global Value Chains (GVC) Member Country Partnership Strategy (MCPS). The GVC based MCPS designs, defines and originates projects and investments in IsDB member countries in the most targeted way using the industry lenses instead of conventional sectoral approach. He has led the Bank's GVC based MCPS in Gabon, Maldives and currently in Guinea, Morocco, Senegal, Indonesia, Turkey and Nigeria. Since COVID-19, the GVC-based MCPS has been turned into a more targeted strategy with the theme of "Rebuilding Inclusive Global Value Chains".

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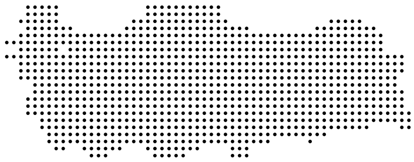
Abbreviations

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
ATC	Agreement on Textiles and Clothing
CAGR	Compound Annual Growth Rate
CMT	Cut-Make-Trim
CoP	Community of Practice
DVA	Domestic value added
DVX	Indirect value-add
EV	Electric Vehicle
FAO	Food and Agriculture Organization of the United Nations
FVA	Foreign value added
GATT	General Agreement on Tariffs and Trade
GVC	Global Value Chain
HS	Harmonized Commodity Description and Coding Systems
ILO	International Labor Organization
IsDB	Islamic Development Bank
IsDBI	Islamic Development Bank Institute
ITC	International Trade Centre
LBA	Local Buying Agent
LDC	Least Developed Country
MC	Member Country
MCPS	Member Country Partnership Strategy
MFA	Multi-Fibre Arrangement
MFA	Multifiber Arrangement
MRIO	Multi-Region Input-Output table
OBM	Original Brand Manufacturers
ODM	Original Design Manufacturers
OEM	Original Equipment Manufacturer
OICA	Organisation Internationale des Constructeurs d'Automobiles
PCI	Product Champion Index
RCA	Revealed Comparative Advantange
SEZ	Sepcial Economic Zone
SME	Small and Medium-sized Enterprises
UNCTAD	United Nations Conference on Trade and Development
USAID	United States Agency for International Development
WB	World Bank
WTO	World Trade Organization

Chapter 1

THE GLOBAL AGRI-FOOD VALUE CHAINS

1.1 TURKEY IN THE FRESH FRUIT AND VEGETABLE GLOBAL VALUE CHAIN



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Summary

a. Overview

Turkey is seeking to integrate more deeply into global agriculture Global Value Chains (GVC). Agriculture makes up 6% of GDP, it is a major contributor of employment with 19% of Turkish labor force employed in the sector. Agriculture is one of the priority areas in the 11th Development Plan, which entered into force in July 2019, with multiple goals including: food safety and security and to drive rural development and sector competitiveness. Improving agricultural performance offers a particularly important tool for addressing Turkey's socio-economic disparity among its 81 provinces.

Despite significant agricultural output levels, ranking 10th globally, production is geared for local consumption, a small share of the US$64 billions of production was exported, and Turkey became a net importer of essential cereals and pulses. Nonetheless, the sector accounts for 10% of total exports and Turkey ranks as a significant agricultural exporter of hazelnuts, apricots, figs, and fresh vegetables like tomatoes and cucumber. The main export destinations for fresh fruit and vegetables include, Iraq, Syria as well as countries of the European Union. This preliminary GVC analysis focuses primarily on this subsector.

b. Outcomes, Opportunities and Challenges

The key preliminary GVC analysis outcomes for the fruits & vegetables - agriculture industry include:

1. The industry lacks export diversification with a large share of fresh fruits and vegetables going to three countries: Syria. Iraq and Russia.
2. Turkey has a low agricultural productivity per worker compared to neighboring countries. The predominance of small-sized, subsistence and semi-subsistence farms hinders productivity growth.
3. Dominance of lower value "commodity" fruits and vegetables over higher value produce.

Key opportunities for Turkey include:

1. Favorable climate conditions, vast farmlands and a rich biodiversity position the country well for fresh produce production.
2. Access to a wide range of markets due to its strategic location.
3. Potential to become a top exporter of fresh fruit and vegetable.
4. Ideal farming structure to produce high value-added fruits and vegetable.

However, challenges to the sector are:

1. Major losses throughout the fresh fruit and vegetable value chain
2. Highly concentrated in domestic markets
3. Low-quality farming standards
4. Small and fragmented farms structures

c. Recommendations

Our recommendation for upgrading include:

1. Product Upgrading: Diversifying into higher-value products and decrease concentration on commodity products.
2. Market Diversification: Diversify away from countries with high exposure and relatively low value-added markets.
3. Functional Upgrading: Improve agri-food processing, specially frozen vegetable and fruit juice manufacturing.
4. Process upgrading: Increase the yields for fresh fruit and vegetable in the regions that are lagging and invest in the infrastructure to reduce losses.

1.1.1 Introduction

Turkey is an important agricultural country due to its size, favorable climate and soil conditions. According to FAO data, Turkey ranks 10th in terms of agricultural output with US$64 billions of annual food production value (see Table 1).

The agricultural sector has marked a 378% increase in exports from 2002 to 2018. It recorded agricultural export values of US$17.7 billions to 190 countries from 1800 products in 2018. In the same period, the composition of exports also diversified, across types of products as well as value chain stage. For

Table 1: Top 10 Countries in Agricultural Production for Food Uses

COUNTRIES & VALUE OF AGRICULTURE PRODUCTION FOR FOOD USE

China	US$1,181 billions
Venezuela	US$675 billions
India	US$340 billions
U.S.	US$320 billions
Brazil	US$153 billions
Indonesia	US$134 billions
Japan	US$86 billions
Russia	US$70 billions
France	US$65 billions
Turkey	US$64 billions

Source: FAO, 2016

example, exports of processed products such as bakery products and products of the milling industry increased.[1]

The agriculture value chain is defined by FAO as "the set of actors and activities that bring a basic agricultural product from production in the field to final consumption, where at each stage value is added to the product. A value chain can be a vertical link or network between various independent business organizations and can involve processing, packaging, storage, transport and distribution."[2] Within Global Value Chains (GVC), inputs and raw materials can be derived domestically or imported, while exports are either intermediates plugging into production systems in another country, where the good is further processed, or delivered to final demand in a foreign market.

The agriculture sector's complex GVC brings together multiple actors; it spans input companies, farmers, traders, food companies and retailers, all of whom must ultimately satisfy the varying demands of the consumer in a sustainable manner. The sector encompasses huge diversity and variety at each stage, from R&D-based input companies to generic manufacturers, subsistence farmers to high tech, biotech boutiques and Small and Medium-Sized Enterprises (SMEs) to multinational corporations.

The agriculture supply chain is generally depicted as composed by three main levels: agricultural production, industrial processing and wholesale or retail distribution. At each level of the supply chain, firms as well as other organizational forms perform specific activities supplying goods or services. At the same level, there may be one or more firms performing the same or complementary activities, adding specific value at their stage of activity.[3] Along the food supply chain, firms perform their activities together with and in compliance to governmental agencies and NGOs regulatory regimes and certifications. Agricultural commodities generally undergo a processing stage before being distributed. However, in some cases they are sold directly to consumers (direct chain) or through the sole mediation of the wholesale industry (short supply chain).[4]

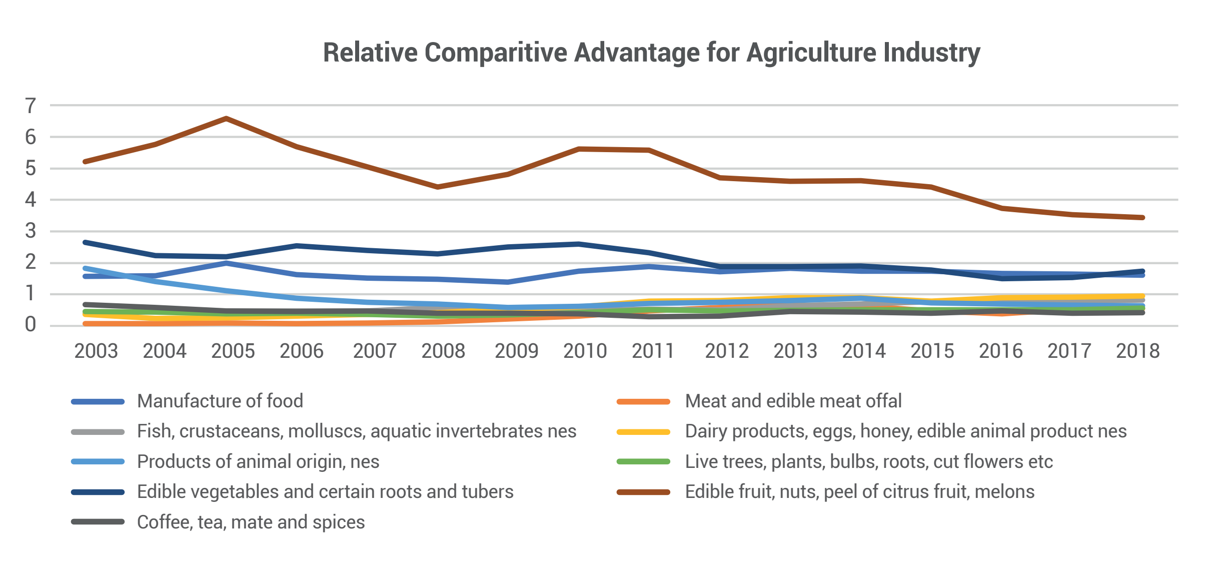
1.1.2. Quantitative Analysis of Agriculture Value Chain

To identify potential sectors within Agriculture in Turkey, we utilize IsDB's GVC selection tool.[5] The tool provides a systematic approach to assess a country's competitiveness and global value chains' trade potential. Secondly, it provides a framework to analyze value chains in order to achieve industrial deepening and upgrading.

a. Natural Potential

The relative comparative advantage (RCA) of the agriculture industry has been in a state of decline. Manufacturing of food (cluster of HS10-21 and 23), edible fruit and nuts (HS07) and edible vegetables (HS08) are the three categories that have an average RCA above 1. As presented in figure 2 below, the RCA for edible fruit consistently increased until 2005, followed by a sharp decline until 2008, between 2012 to 2018, there has been a steady decline. Manufacturing of food and edible fruits has been stable throughout the years.

Figure 1: RCA for the Agriculture and Food Industry in Turkey



Source: Authors using UN Comtrade data

1. Agrofood - Invest in Turkey. (2019). Retrieved 25 December 2019, from https://www.invest.gov.tr/en/sectors/pages/agrofood.aspx
2. Agricultural Value Chain Development: Threat or Opportunity For Women's Employment? (2010) Retrieved 25 December 2019, from http://www.fao.org/3/i2008e/i2008e04.pdf.
3. Global Food Value Chain and Competition Law BRICS Draft Report, CLES Paper Series, 2017.
4. Global Food Value Chain and Competition Law BRICS Draft Report, CLES Paper Series, 2017.
5. The methodology can be accessed at https://strategy.isdb.org/global-value-chains

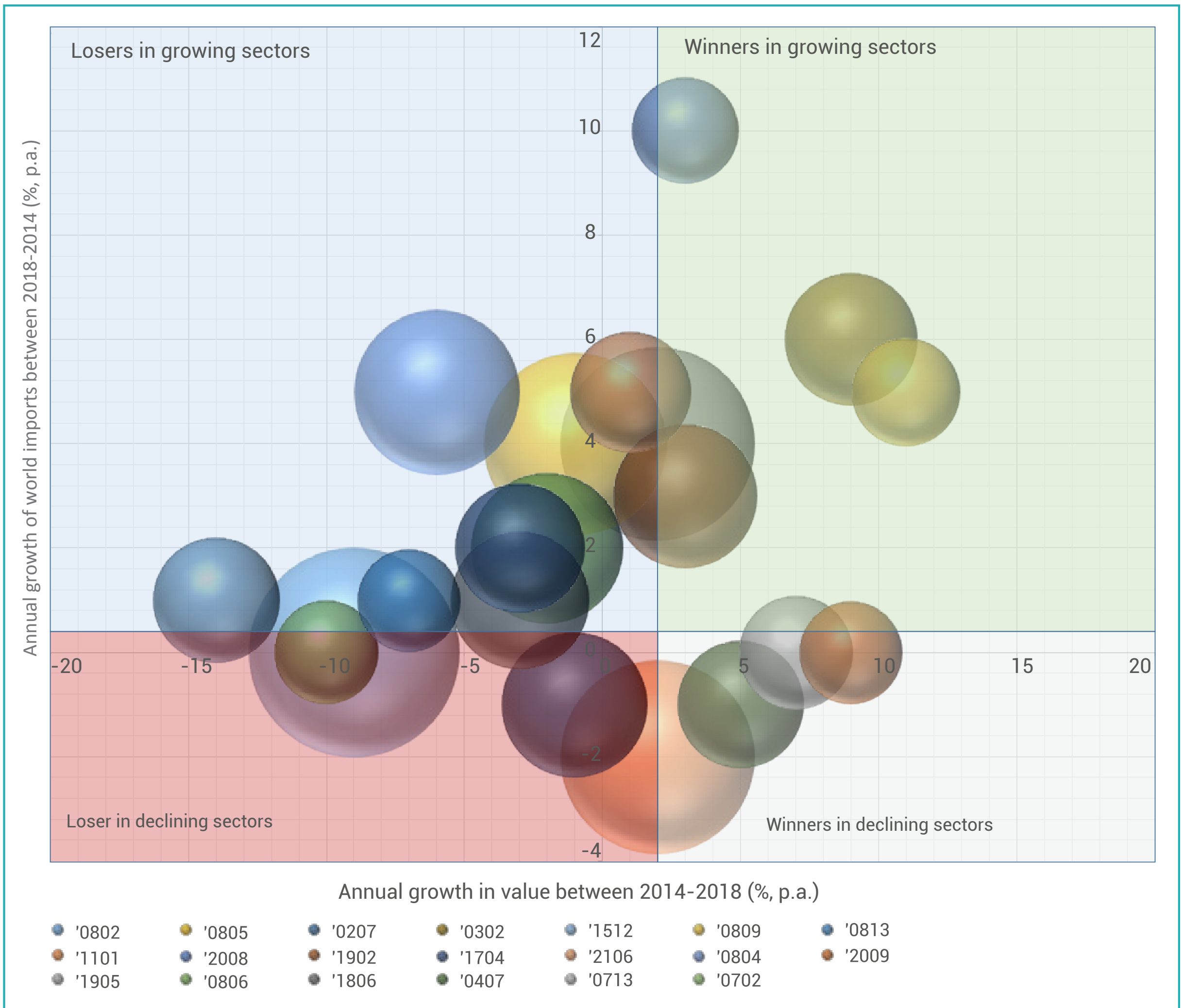
b. Dynamic Potential: Product Champion Index

By breaking down the exports data at HS4 level for the agriculture industry, the Product Champion Index (PCI) was calculated and ranked according to the six indicators. The PCI identifies at more disaggregated level, the highest potential products that a country can produce to plug into the GVC. This step ends up with an index that ranks several products. The results are presented for PCI Static Supply, PCI Dynamic Demand and PCI Market Access. These indices reflect the potential product champions in the industry that could guide policymakers to integrate these products in the GVC.

As presented in figure 3, Turkey's agriculture industry exports are very diverse at the HS 4 level ranging from products performing well in winning sectors, whereby, the country exports have shown growth trajectory in tandem with global growth in demand for these products. Some products are performing poorly (losing sector), whereby, the country growth of exports has not been able to meet global growth in demand. Looking at the bubble graph, there are five products in the top right quadrant (winning sector in a growing market):

- HS0302, fresh or chilled fish;
- HS0809, fresh apricot, cherries, peaches, nectarines, plums and sloes;
- HS1915, bread, pastry, cakes, biscuits and other bakers' wares, whether or not containing cocoa; communion...
- HS1902, pasta, whether or not cooked or stuffed with meat or other substances or otherwise prepared,...
- HS0804, dates, figs, pineapples, avocados, guavas, mangoes and mangosteens, fresh or dried.

Figure 2: Performance of Selected Agriculture Exports *(Source: Authors using UN Comtrade data)*



Using IsDB's methodology to capture the Product Champion Index (PCI), shown in figure 4, the top 10 HS4 product for different types of PCI index is consistent. There are two products which are always in the top 3 in all the list; one is HS0302, fresh or chilled fish; and HS0809, fresh apricot, cherries, peaches, nectarines, plums and sloes.

Table 2: Product Champion Index (PCI) for Static Supply, Dynamic Demand and Market Access

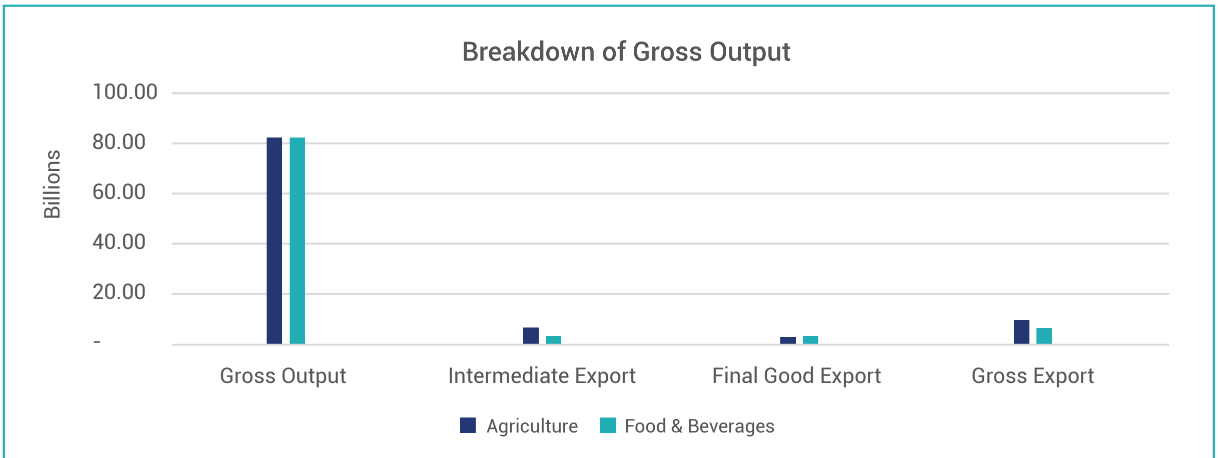
PRODUCT	PCI STATIC	PRODUCT	PCI DYNAMIC	PRODUCT	PCI MARKET
Bread, pastry, cakes, biscuits and other bakers'	0.296139866	Fish, fresh or chilled (excluding fish fillets and other	0.381966858	Apricots, cherries, peaches incl. nectarines, plums	0.083973501
Fish, fresh or chilled (excluding fish fillets and	0.284889383	Apricots, cherries, peaches incl. nectarines, plums	0.379343348	Fish, fresh or chilled (excluding fish fillets and	0.08176414
Apricots, cherries, peaches incl. nectarines, plums and sloes, fresh	0.261583228	Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens, fresh or dried	0.316530611	Bread, pastry, cakes, biscuits and other bakers' wares, whether or not containing cocoa; communion ...	0.027511113
Citrus fruit, fresh or dried	0.237550736	Bread, pastry, cakes, biscuits and other bakers'wares, whether or not containing cocoa; communion...	0.270907258	Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens, fresh or dried	-0.000507208
Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens, fresh or dried	0.2195028	Citrus fruit, fresh or dried	0.195395611	Citrus fruit, fresh or dried	-0.001731649
Wheat or meslin flour	0.166095281	Food preparations, n.e.s.	0.174790932	Dried leguminous vegetables, shelled, whether or not skinned or split	-0.018023557
Food preparations, n.e.s.	0.156611703	Dried leguminous vegetables, shelled, whether or not skinned or split	0.163519444	Food preparations, n.e.s.	-0.049388618
Fruits, nuts and other edible parts of plants, prepared or preserved, whether or not containing...	0.132383859	Pasta, whether or not cooked or stuffed with meat or other substances or otherwise prepared, ...	0.141430731	Fruits, nuts and other edible parts of plants, prepared or preserved, whether or not containing ...	-0.123158491
Pasta, whether or not cooked or stuffed with meat or other substances or otherwise prepared, ...	0.131323586	Fruit juices, incl. grape must, and vegetable juices, unfermented, not containing added spirit, ...	0.141013102	Birds' eggs, in shell, fresh, preserved or cooked	-0.12586738
Dried leguminous vegetables, shelled, whether or not skinned or split	0.130569155	Birds' eggs, in shell, fresh, preserved or cooked	0.096594609	Wheat or meslin flour	-0.152687175

Source: Authors using UN Comtrade data

c. Surplus and Spillover Potential

Surplus and spillover potential aims to analyze the value-added in industries by considering the interlinkages of industries. Figure 5 below depicts the breakdown of output for domestic and international uses. Only 12% of the gross output of agriculture industry was exported. Of the exported products, 30% were used as final, and 70% were intermediate goods. While the food and beverage industry, gross export was only 8% of the gross output of which 52% was used as a final good.

Figure 3 Breakdown of Output and Export of Agriculture Industry



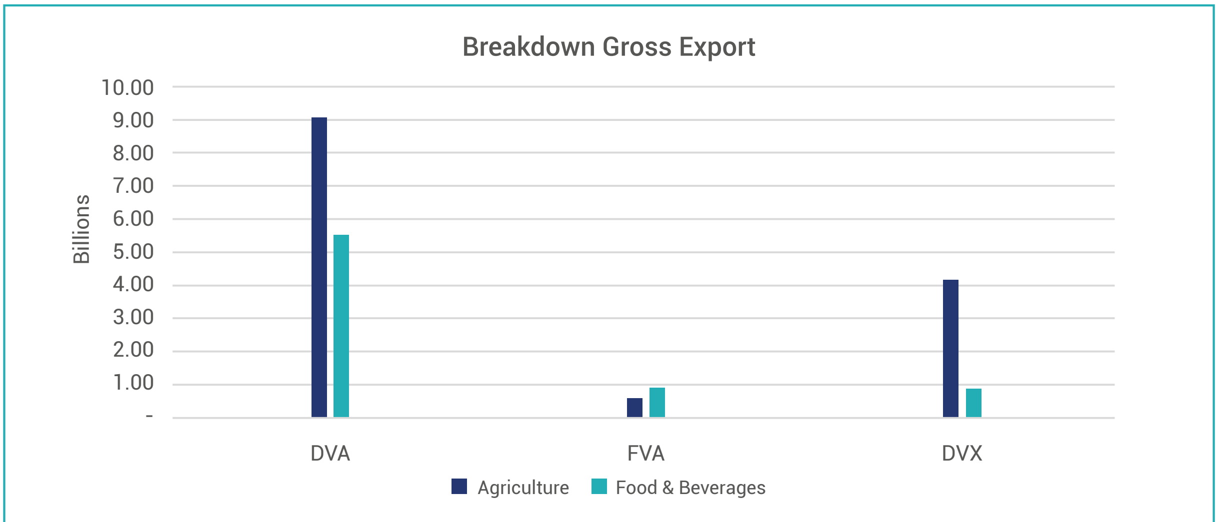
Source: Authors using EORA input output table

The extent at which domestic (or foreign) inputs are used can be found by checking the decomposition of exports into its domestic and foreign sources. Domestic value added (DVA) indicates the share of domestic supplier industries in total exports, whereas foreign value added (FVA) indicates the share of foreign supplier firms (imports) in total exports.

The domestic value added in the agriculture industry in Turkey is around US$9 billions. Nearly 94% of the agriculture industry is based on domestic value-added. The remaining 4% is foreign value-added. The share of domestic value-added in a third countries export, indirect value-add (DVX) is around US$4.2 billions. About 43% of agriculture exports are exported to third countries.

The domestic value added in the food and beverage industry in Turkey is around US$5.5 billions. 86% of industry exports are based on domestic value-added, and the rest is made up of foreign value-added. The indirect value-added is around US$900 million, 13% of agriculture exports are exported to third countries.

Figure 4: Domestic Value Added (DVA) Foreign Value Added (FVA) and, Indirect Value-Add (DVX)



Source: Authors using EORA input output table

The current engagement of Turkey in GVCs can be quantified and evaluated by two indexes proposed by Koopman et al., (2014) and IsDB (2019): i) The GVC position index identifies the role of a country as upstream or downstream position, and ii) The GVC participation index that summarizes the importance of the global supply chain for the country for which it is calculated (Koopman et al., 2011). It measures the participation degree to GVCs by the sum of the shares of foreign value-added in exports and domestic value-added in third countries exports in total export. The GVC position index uses the difference between these shares in logarithmic form.

High values of GVC participation index signal high integration into GVCs. IsDB calculated Turkey's GVC participation index as 49% and 28%. In other words, 49% and 28% of the agriculture and food and beverage exports is related to either foreign value-added or indirect value add. Both have the lowest GVC participation compare to the other industries.

Two types of upstreamness can be distinguished (Koopman et al., 2014): The first, natural resource exporters whose goods are used by other countries to produce intermediate goods exports, and the second, intermediate goods exporters to be used by other countries in their production. Those countries with high upstreamness, other than natural resource exporters, tend to be generally specialized in skill- and design- intensive goods. Koopman et al., (2014) remarks that advanced countries export relatively more upstream components and a part of this value-added embedded in these export activities returns to advanced countries in imports from other countries. Downstreamness generally defines a user position in a GVC. Positive values of GVC position index define upstream positions, whereas negative values define downstream positions.

The GVC position of Turkey's agriculture industry was calculated as 0.29, and the food and beverage were calculated as -0.005. This implies the agriculture industry is in the upstream and the food and beverage industry at the downstream of production.

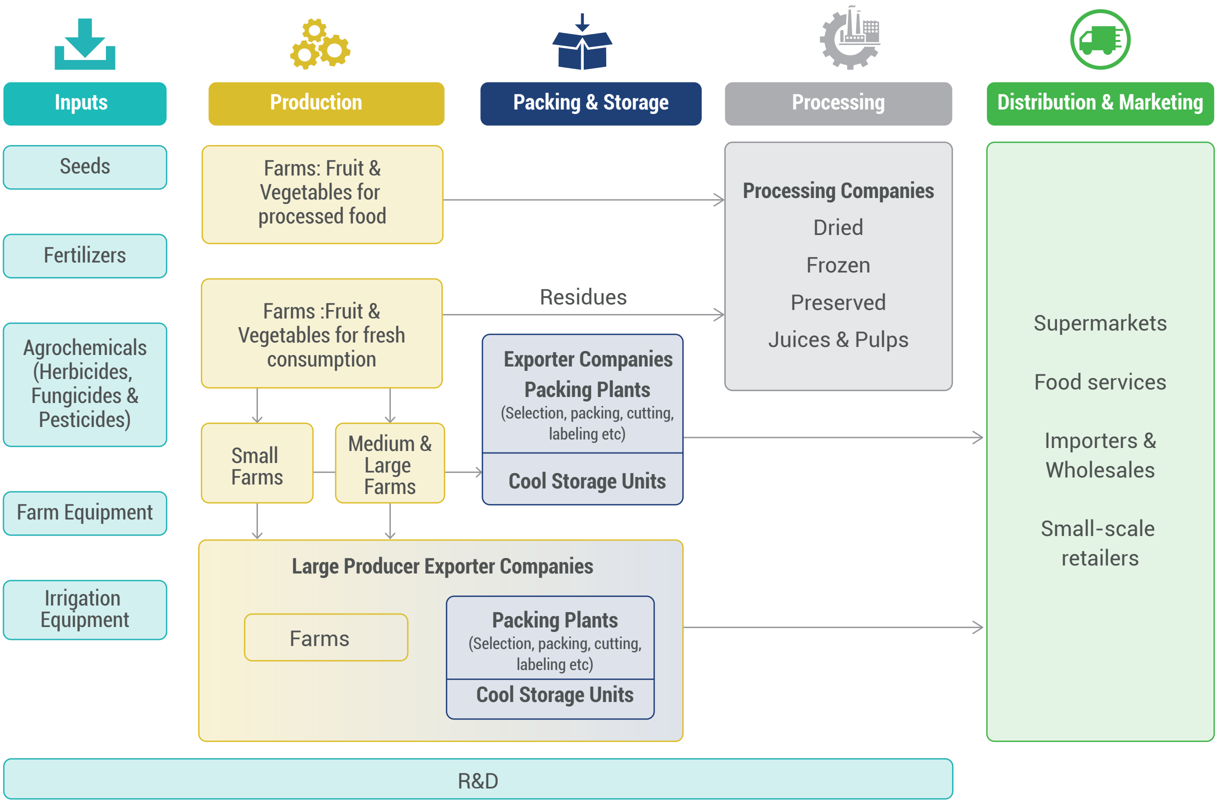
1.1. 3. The Global Fruits and Vegetables Industry

a. Overview

The fruit and vegetables GVC is comprised of five major segments; input provision, production (farming), packing & storage, processing and distribution and marketing. R&D activities are carried out to support each of these different stages, with the highest value R&D considered to be in the production of inputs.

Produce may be traded fresh/chilled, in bulk or packaged. These products may be repackaged for fresh consumption by importing countries or oriented to processing plants. Value distribution in the chain is driven by the perishable and seasonal nature of the specific products. (1) Fresh produce generates the highest profit margins early in the end-market season, with margins declining as available volumes increase. (2) Processing consists of drying, freezing, preserving or juicing fresh produce. This stage allows producers to orient peak-season and/or lower quality produce towards an alternative end-product, which are less subject to seasonality/perishability challenges. These products can be sold year-round. Processing generally requires sufficient capacity in the production stage of the chain to ensure optimal utilization of capital equipment. (3) Geographic end-markets vary in quality requirements and potential value opportunities for both fresh and processed produce. Potential shipping distance to end-market is determined by product shelf-life.

Figure 5 Fruit & Vegetable Global Value Chain *(Source: Fernandez-Stark et al., 2011)*



b. Global Supply and Demand in the Fruit and Vegetable GVC[6]

The global fruit and vegetable trade has grown considerably over the past two decades. Since 2000, volume[7] has doubled, while value has quadrupled; increased returns have encouraged further growth of the sector. Growth has been driven primarily by the demand for off-season fresh produce by developed countries, which accounted for 71% of imports in 2017 (UN Comtrade, 2018). The expansion of trade has been helped by innovations in packaging and shipping techniques that have increased shelf-life and ensured sanitary and phytosanitary standards (SPS) compliance into key markets.

Figure 6; Global Trade in Fruits, Nuts & Vegetables by Value & Weight, 2000-17

Source: UN Comtrade, 2018 (HS-2002, 07 – Vegetables, & 08 Fruits & Nuts. Includes some, but not all processed fruits and vegetables as a result of use of aggregate data. H2-20 not included). Downloaded 2019/12/10.

Global fruit and vegetable trade is comprised of approximately 2/3 fruits and 1/3 vegetables. This share has remained steady over the past decade.

Fruit: Fruit can be divided along a spectrum of high volume, low-value fruit (e.g. banana, citrus, apples, pears, grapes) to low volume, high-value fruit (e.g. avocados, cherries, fruits, berries). High volume fruit collectively perform well in long-distance shipping, allowing them to be relatively cheaply transported around the world. Year-round supply, widespread production areas, consolidated supply chains and general commoditization mean that these fruits are highly competitive with low margins and require economies of scale to turn a profit. High-value fruit are generally more delicate and labor intensive; they require specific production conditions and post-harvest handling to ensure they arrive in optimal condition. Long-distance shipping of these products has increased over the past five to ten years as packing and shipping technologies have improved (Bamber & Fernandez-Stark, 2019). Fruit is primarily exported fresh, with only 32% of traded value in the industry derived from processed products. Processed fruit is dominated by fruit juice and canned/preserved fruit (UN Comtrade, 2019).

6. This section is based on analysis of UN Comtrade international trade statistics, using the primary HS2002 categories 07, 08 and 20. Data downloaded March 15, 2019 unless otherwise specified.
7. References to volume in this report should be considered as Weight if not otherwise specified, as per global trade statistics definitions.

Table 3. Trade in Fresh Fruits, 2017

	Value (US$ million)		Volume (KT)	
Fresh Fruits	**2017**	**CAGR 2012-2017**	**2017**	**CAGR 2012-2017**
Citrus, fresh/dried	13,521	2%	14,861	1%
Bananas, incl. plantains, fresh/dried	10,891	2%	18,804	0%
Grapes, fresh	8,143	3%	4449	3%
Apples, fresh	7,544	1%	8199	0%
Avocados, fresh/dried	5,816	25%	1933	13%
Berries, All Excl. Strawberries & Cherries	4,080	13%	704	10%
Kiwifruit, fresh	2,700	6%	1493	1%
Pears & quinces, fresh	2,635	0%	2808	1%
Guavas, mangoes & mangosteens, fresh/dried	2,588	10%	1859	1%
Strawberries, fresh******	2,570	2%	935	2%
Cherries, fresh	2,197	6%	533	5%
Peaches, incl. nectarines, fresh	2,167	-1%	2378	5%
Pineapples, fresh/dried	1,974	3%	3609	2%
Watermelons, fresh	1,637	8%	4771	15%
Dates, fresh/dried	1,136	6%	733	-2%
Plums & sloes, fresh	826	1%	706	2%
Durians, fresh	618	12%	229	-18%
Figs, fresh/dried	490	8%	136	5%
Apricots, fresh	429	1%	372	4%

Source: Bamber and Fernandez-Stark, 2019 based on UN Comtrade, 2019. Downloaded 2019/03/12. Exports.

Dynamics in vegetable trade differ slightly. The largest volume, mature vegetables (e.g. potatoes, tomatoes) growing at a faster rate than mature fruits. Nonetheless, trade in mid- and low-volume vegetables (e.g. peas, cabbage, cucumbers is growing faster than large volume products.) Processed produce accounts for a higher share of traded value (54%) than fresh vegetables. Frozen and prepared, but uncooked vegetables account for the majority of processed vegetables.

Table 4. Trade in Fresh Vegetables, 2017

	Value (US$ million)		Volume (KT)	
Fresh Vegetables	**2017**	**CAGR 2012-2017**	**2017**	**CAGR 2012-2017**
Tomatoes, fresh/chilled	8,927	1%	7,642	1%
Capsicum/Pimenta, fresh/chilled	5,034	5%	3,506	5%
Potatoes (excl. seed) fresh/chilled	3,345	2%	11,126	2%
Onions & shallots, fresh/chilled	3,168	3%	7,944	3%
Garlic, fresh/chilled	3,128	4%	2,150	4%
Cucumbers & gherkins, fresh/chilled	2,452	5%	2,890	5%
Lettuce (excl. cabbage) fresh/chilled*****	1,386	2%	1,014	2%
Cauliflowers & broccoli, fresh/chilled	1,356	3%	1,342	3%
Carrots & turnips, fresh/chilled	1,249	3%	2,824	3%
Mushrooms, fresh/chilled	1,015	2%	464	2%
Cabbage lettuce, fresh/chilled	977	10%	1,309	10%
Seed potatoes, fresh/chilled	908	3%	1,740	3%
Beans, fresh/chilled	813	3%	559	3%
Peas, fresh/chilled	397	11%	480	11%

Source: Bamber and Fernandez-Stark, 2019 based on UN Comtrade, 2019. Downloaded 2019/03/12. Exports.

The United States leads the global import markets for both fruits and vegetables with 17% and 18% respectively (Table 4, Table 5), followed by Germany (Fruit: 8%, Vegetables: 12%). China has become an increasing important buyer of fruits, now accounting for 6% of the global market. The United Kingdom remains a major importer of both fruits and vegetables with 6% and 8% of global markets respectively.

Table 5. Leading Importers, Fresh Fruit, 2017

Importers	Value (US$ million)	Share (%)
World	82,156	
U.S.	13,840	17%
Germany	6,745	8%
China	5,116	6%
Netherlands	4,854	6%
United Kingdom	4,838	6%
Russian Federation	4,237	5%
France	4,138	5%
Canada	3,531	4%
Belgium	3,005	4%
China, Hong Kong SAR	2,609	3%
Japan	2,116	3%
Others	7,127	33%

Source: UN Comtrade, 2019. H2. Downloaded 2019/03/12. Importers.

Table 6. Leading Importers, Fresh Vegetables, 2017

Importers	Value (US$ million)	Share (%)
World	32,440	100%
U.S.	5,815	18%
Germany	3,811	12%
United Kingdom	2,484	8%
Canada	2,242	7%
France	1,857	6%
Netherlands	1,834	6%
Belgium	1,362	4%
Russian Federation	987	3%
Italy	779	2%
Japan	772	2%
Others	10,498	32%

Source: UN Comtrade, 2019. H2. Downloaded 201903/12. Importers. Note: Lebanon excluded from data due to outlier data point.

World exports of fruits and vegetables are led by Spain, US, Mexico and China. Spain and Mexico are very strong intra-regional exporters, with the bulk of their exports (+80%) destined to Europe and the U.S. respectively. Chile, Ecuador, South Africa and Peru lead extra-regional exports and are primarily focused on fruits.

Table 7. Leading Exporters, Fresh Fruit, 2017

	Value (US$ million)	Share (%)
World	75,648	100%
Spain	8,055	11%
U.S.	5,930	8%
Mexico	5,567	7%
Netherlands	4,963	7%
China	4,358	6%
Chile	4,305	6%
Italy	3,437	5%
Ecuador	3,151	4%
South Africa	2,879	4%
Belgium	2,422	3%
Viet Nam	2,411	3%
Peru	2,195	3%
Others	25,977	34%

Source: UN Comtrade, 2019. H2. Downloaded 2019/03/12. Exporters. Note: Netherlands and Belgium serve roles as distributors within Europe, with high levels of re-exports.

Table 8. Leading Exporters, Fresh Vegetables, 2017

	Value (US$ million)	Share (%)
World	32,108	100%
Netherlands	4,825	15%
Spain	4,453	14%
Mexico	3,916	12%
China	2,707	8%
U.S.	2,679	8%
France	1,401	4%
Italy	1,317	4%
Canada	1,240	4%
Belgium	842	3%
Germany	772	2%
India	643	2%
Egypt	570	2%
Others	6,744	21%

Source: UN Comtrade, 2019. H2. Downloaded 201903/12. Exporters. Note: Netherlands and Belgium serve roles as distributors within Europe, with high levels of re-exports.

Table 9. Exporters, Processed Fruits, 2017

	Value (US$ million) 2017	Share
World	35,918	100%
China	3,987	11%
U.S.	2,793	8%
Netherlands	2,649	7%
Brazil	2,241	6%
Germany	1,936	5%
Thailand	2,003	6%
Spain	1,458	4%
Poland	1,226	3%
Mexico	1,449	4%
Belgium	1,500	4%
Italy	1,035	3%
Turkey	1,046	3%

UN Comtrade, 2019. H2. Downloaded 2019/12/10. Exporters. Note: Netherlands and Belgium serve roles as distributors within Europe, with high levels of re-exports.

c. Lead Firms and Governance Structures in the Fruit and Vegetable GVC

Large supermarket chains[8] are the leading actors in the key export markets, with controlling market shares of up to 80% across the EU and in the U.S. (Reardon et al., 2007), and a growing share of the market in Asia. These buyers seek enhanced cost competitiveness, consistency and product differentiation from their global supply chains. During the past 20 years, they have continuously globalized and consolidated, gaining more power over the suppliers; in 2018, for example, UK giant Tesco entered into a strategic partnership with French leader, Carrefour, for a collaborative procurement program (Deloitte, 2019).

Large supermarket chains are the leading actors in the key export markets, with controlling market shares of up to 80% across the EU and in the US

8. Including both supermarkets and hypermarkets.

Table 10. Leading Global Retailers in Fast-Moving Consumer Products, 2017

Company	Origin	Retail Revenue FY 2017 (US$ billions)	Number of Countries	Retail CAGR FY12-17
Walmart	US	500	29	1.3%
Costco	US	129	12	5.4%
The Kroger Co.	US	118	1	4.2%
Amazon	US	118	14	18%
Schwarz	Germany	112	30	7.5%
Aldi	Germany	98	18	7.2%
Tesco	UK	74	8	-2.4%
Ahold Delhaze	Netherlands	72	10	13.8%
Target	US	72	1	0.0%
Aeon	Japan	70	11	8.7%

Source: Deloitte. (2019). Global Powers of Retail 2019. https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Consumer-Business/cons-global-powers-retailing-2019.pdf

Today, these lead firms exert significant influence over the entire value chain and dictate how fresh produce is cultivated, harvested, transported, processed and stored (See Table 11).

Table 11. Prominent Standards in the Fruit & Vegetables Industry

	Public		Private	
	Mandatory	**Voluntary**	**Individual**	**Collective**
National	• National legislation (pesticide use, labor regulations, sanitary inspections etc.) • USDA Standards	• HACCP • USDA National organic program	• Nature's Choice (Tesco) • Field-to-Fork (M&S) • Terre et Saveur (Casino) • Conad Percorso Qualità (Italy) • Albert Heijn BV: AH Excellent (Netherlands)	• British Retail Consortium (UK) • Assured Foods Standards (UK)
Regional	• European Union Regulations		• Filieres Qualite (Carrefour)	• GlobalGAP[9] • Dutch HACCP • Qualitat Sicherhiet (QS – Belgium, Holland, Austria) • International Food Standard (German, French, Italian)
International	• World Trade Organization SPS Agreement	• ISO 9000 • ISO 22000	• SQF 1000/2000/3000 (U.S.)	• GlobalGap • Global Food Safety Initiative • SA 8000 • IFOAM Standard

Sources: Duke GVC Center.

9. GlobalGap is one of the most widely adopted standards. This standard was first developed in Europe in 1997 by an association of European fresh produce importers and retailers, and principally concerns pesticides and chemical use as well as the environmental impact of farming systems. U.S. retailers began to adopt this standard for fresh produce in 2008 (GlobalGAP, 2008).

d. Upgrading in the Fruit and Vegetable GVC

Table 12. Key Upgrading Trajectories in the Fruit and Vegetables Global Value Chain

	Description
Production (Entry in the value chain)	• Entry point for the fruit and vegetable value chain. • Opportunity for low-income countries to export higher value added agro-products.
Packing & Cold Storage (Functional Upgrading)	• Countries looking to increase the value of their exports and to improve supply for their clients will improve their packing and cold storage systems. • This can include sophisticated packing for fresh fruit and vegetables, such as ready-to-eat products, that are pre-washed, cut, and bagged.
Processed Fruit & Vegetables (Functional Upgrading)	• To enter in this segment, countries have to master the production stage. • Countries need new infrastructure and a workforce prepared to engage in this activity.
Product Upgrading	• Diversification or shift into higher value products. • Within the FFV, this includes moving from the production of more commoditized produce – such as citrus and/or deciduous fruits – into smaller niche segments, such as berries, cherries, figs or avocados.
Product Upgrading	• Improve the product characteristics. This can happen in all the stages of the value chain— production, packing and storage, and processing. • Some of the standards that have been adopted by the industry, such as GAP standards, focus on product upgrading, as well as ensuring that the sanitary and phytosanitary conditions of the product are met.
Process Upgrading	• Introduction of new technologies in the production system or the restructuring of the existing system to generate services more efficiently. • Companies implement more efficient systems in the search to improve productivity and remain competitive.
Market Diversification	• Entering into new geographic markets to supply FFV. This requires securing market access through SPS compliance amongst other things.

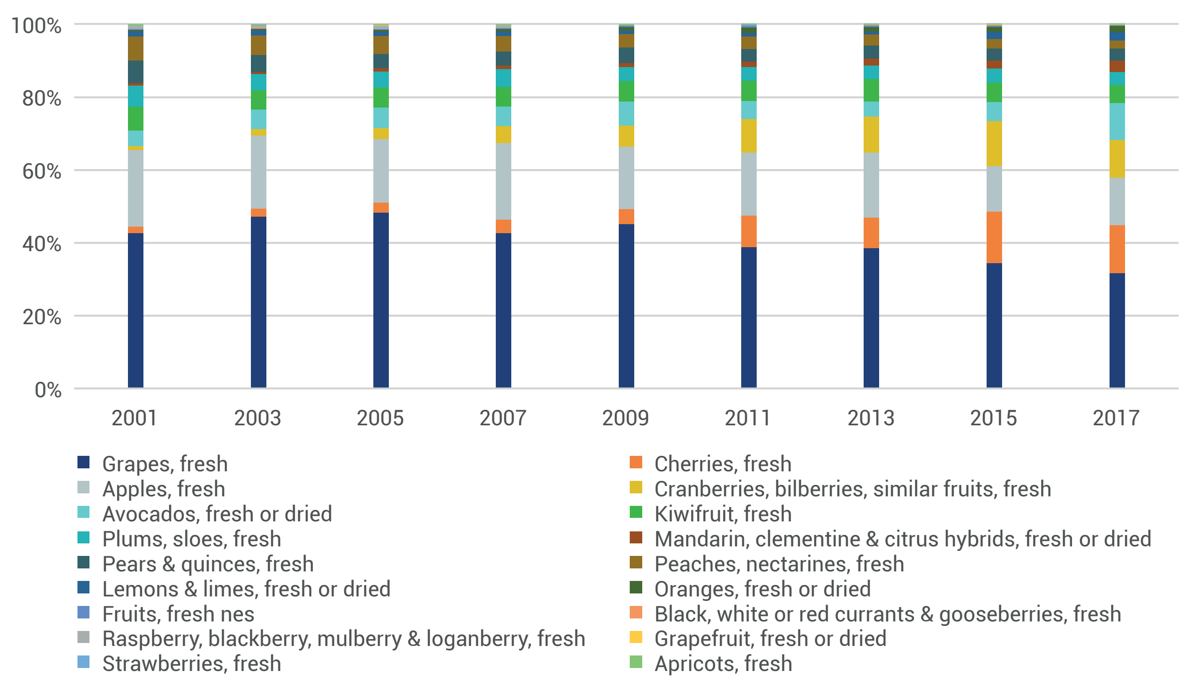
Source: Duke GVC Center.

e. Lessons for Upgrading from Other Countries in the Fruit & Vegetable GVC

The upgrading trajectories of other large players in the fruit and vegetable industry can be informative for Turkey as the country develops its strategy for GVC integration. These include Chile and Mexico. Major upgrading paths have included (1) process upgrading, that is, improving production processes to boost both productivity and improve the quality of the fresh product to improve shelf-life. This allows more fruit to reach its market in better condition. (2) Product upgrading, that is, expanding beyond low value fruits to enter into a diverse range of products. This upgrading trajectory has allowed producers to reduce seasonal production impacts, allowing them to retain a permanent workforce and optimal use of fixed assets. (3) Market upgrading: This has been stronger for Chile than Mexico, which continues to concentrate primarily on the U.S. market. (4) Functional upgrading into processed fruits and into R&D has taken place in both countries but remains secondary to product and market upgrading in terms of value contributions.

Chile: While Chile ranks 6th amongst global fruit exporters, it is the leading extra-regional exporter (by value). Product Upgrading: Between 2001 and 2017, Chilean fresh fruit exports diversified significantly (Figure 8), reducing its dependence on commodity products, including apples (2001: 21%, 2017:13%), grapes (2001: 43%, 2017:32%) and pears (2001:6%, 2017: 3%), and increasing its exports of higher value fruits. By 2017, high value cherries accounted for 13% of export value (compared to just 2% in 2001), avocados 10% (compared to 4% in 2001) and berries 10% (compared to 1%).

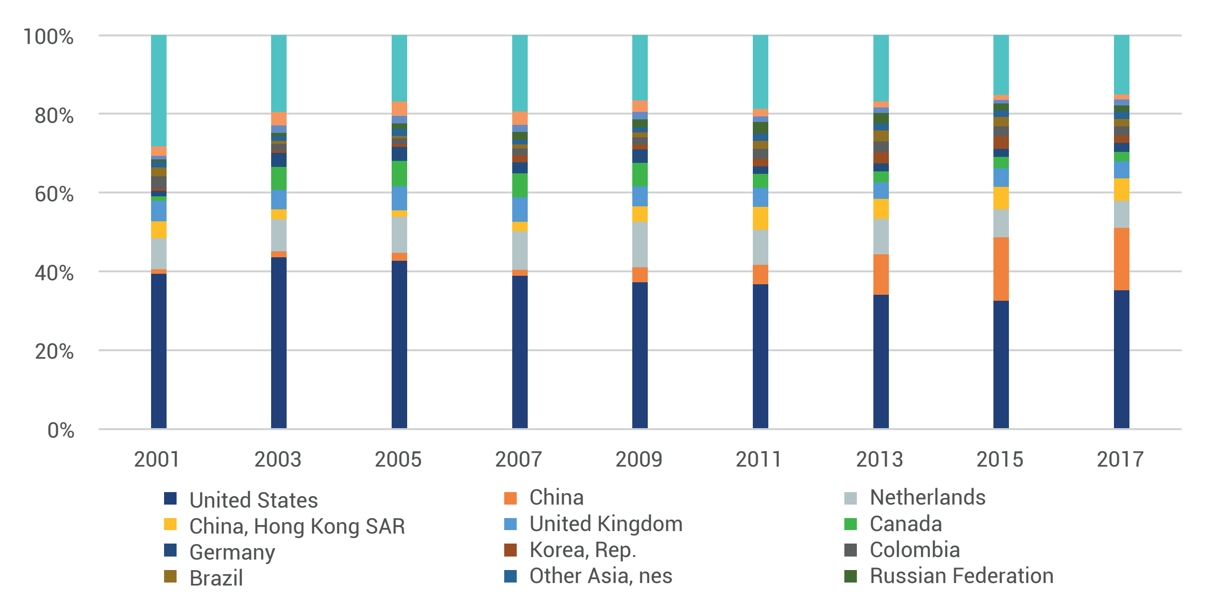
Figure 7. Chilean Fresh Fruit Export Composition, 2001-2017



Source: UN Comtrade, 2019.

Market Upgrading: Chilean exporters have diversified their markets (Figure 8), slightly reducing dependence on the U.S. market and gained access to new markets, particularly in Asia following new sources of demand. At the same time, exporters have retained their position in high value U.S. and EU markets.

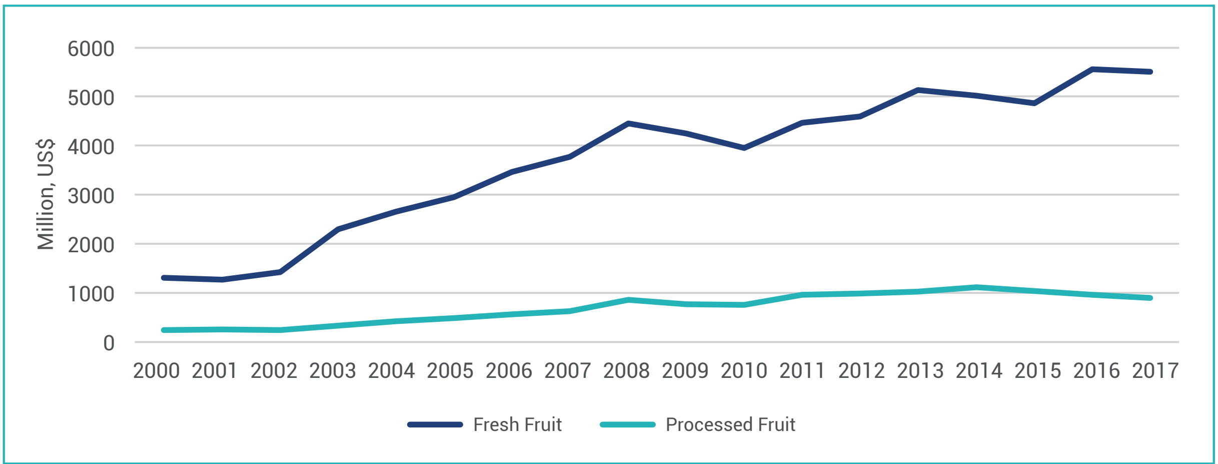
Figure 8. Chilean Fresh Fruit Export Destinations, 2001-2017



Source: UN Comtrade, 2019.

Functional upgrading: Chilean exports have focused on fresh exports, although firms have begun exporting more processed produce over the past fifteen years (Figure 10). Frozen and dried fruit account for higher shares of value (5% each) compared to fruit juice (3%). In addition to moving up the value chain into processing, the country has upgraded into both upstream and downstream services activities, including R&D in new genetic materials as well as engineering and consulting services for standards compliance at both the public and private levels.

Figure 9. Chilean Fruit Exports by Value Chain Stage

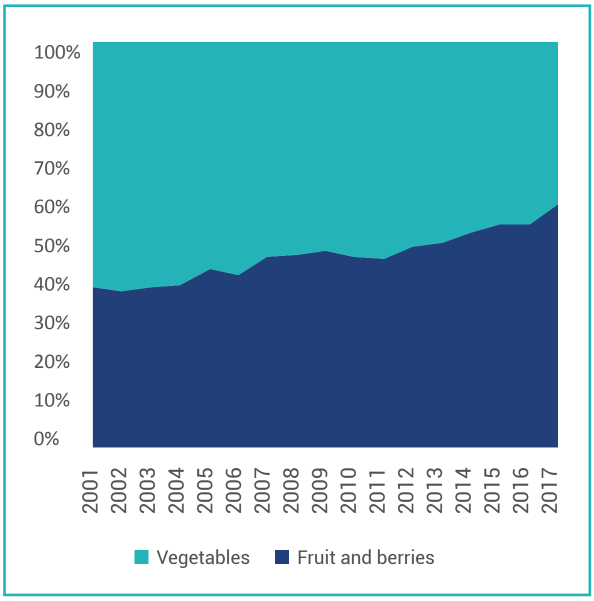


Source: UN Comtrade, 2019. Note: Processed Fruit includes HS96, 2009, 2008, 0806, 0812, 0813

These upgrading strategies have been supported by significant process upgrading, in both the production and packing and cold storage operations. Major process upgrades include widespread adoption of precision agriculture techniques such as drip irrigation, netting for orchard protection and harvest and post-harvest training. In addition, digitized real-time tracking of fruit from the orchard to the supermarket has helped optimize fruit condition on arrival. These methods have helped to increase the quantity, quality and shelf-life of output. The 2018/19 season resulted in historic volumes of exports.

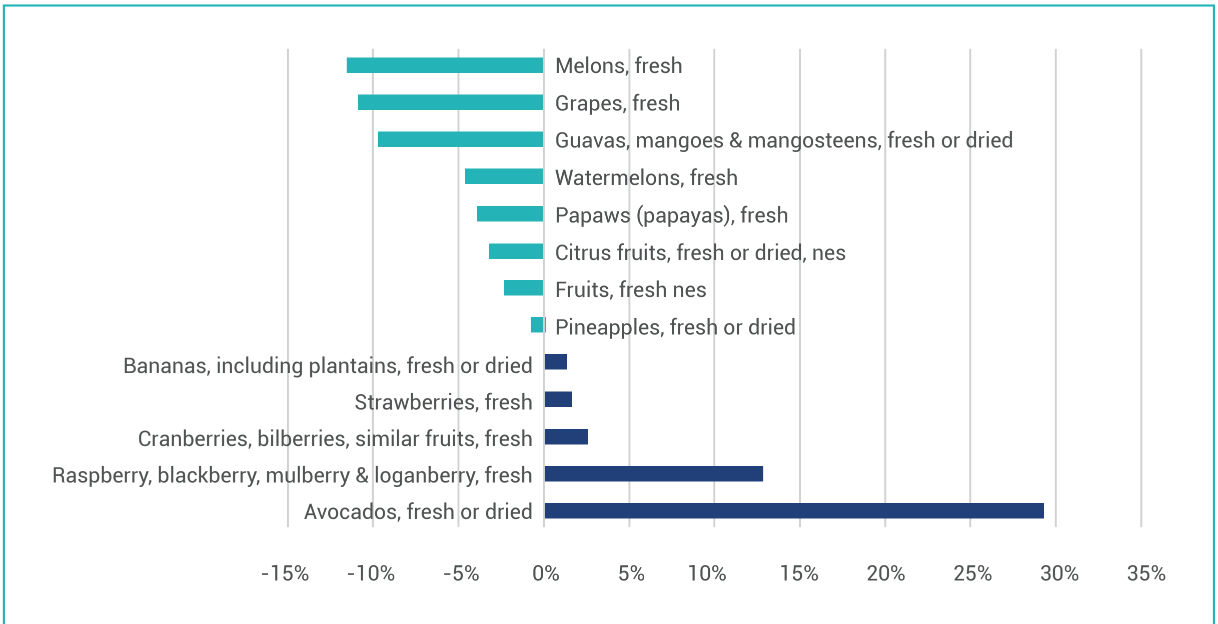
Mexico: Mexico is the 3rd largest exporter of fruit and the 2nd largest vegetable exporter globally. Fruit and vegetable exports have increased from US$5.5 billions in 2007 to US$13 billions in 2017 (UN Comtrade, 2019). Product upgrading: Mexico has steadily decreased the share of vegetables in exports, moving towards a greater concentration in higher value fruits. Fruits accounted for approximately 60% of value by 2017.

Figure 10. Export Composition by Value, Fruits & Vegetables, Mexico 2001-2017 *(Source: UN Comtrade, 2019.)*



Within fruits, Mexico increased the share of export revenue derived from higher value fruits (Figure 10), including avocados (+29%) and berries (raspberries +13%, cranberries +3%, strawberries +2%), and decreased its share of more traditional products including melons (-12%), citrus (- 3%) and pineapple (-1%).

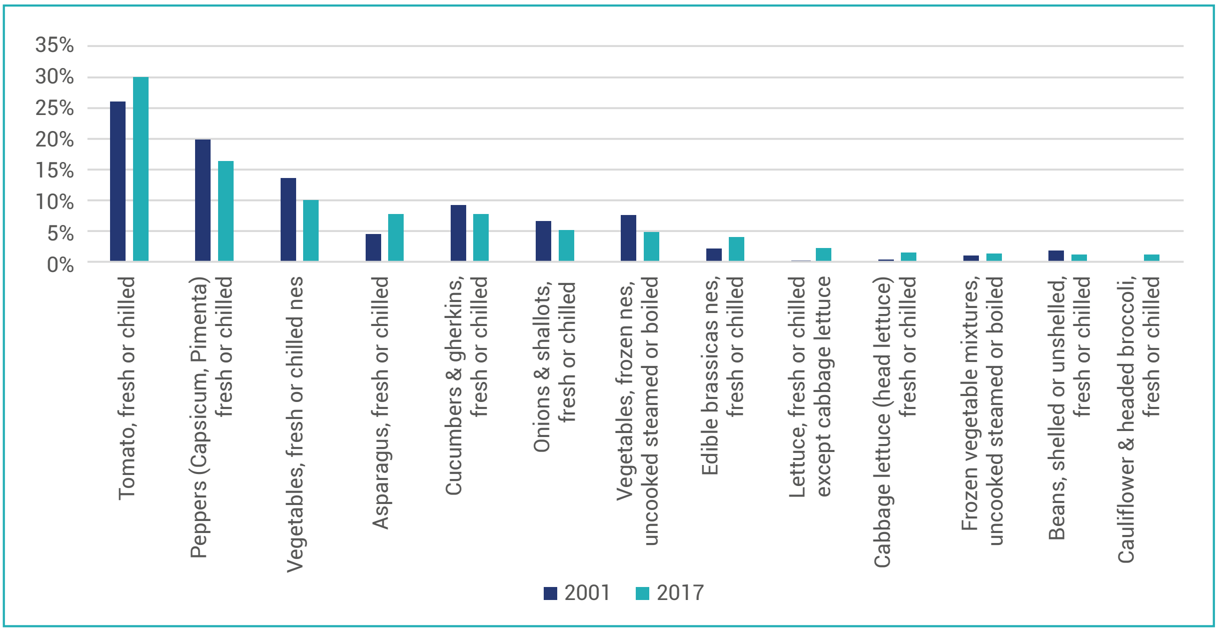
Figure 11 Change in Share of Exports, Fresh Fruit 2001/17



Source: UN Comtrade, 2019. Note: Fruits with no or <1% change excluded for illustrative purposes.

Exports of vegetables are concentrated in very few products, with tomatoes (32%) and peppers (18%) accounting for half of exports. Processed vegetable exports have tripled in value since 2001 but remain marginal (7%) of total vegetable exports. Frozen vegetables account for the largest share of these.

Figure 12. Export Share of Vegetables, Mexico 2001-2017

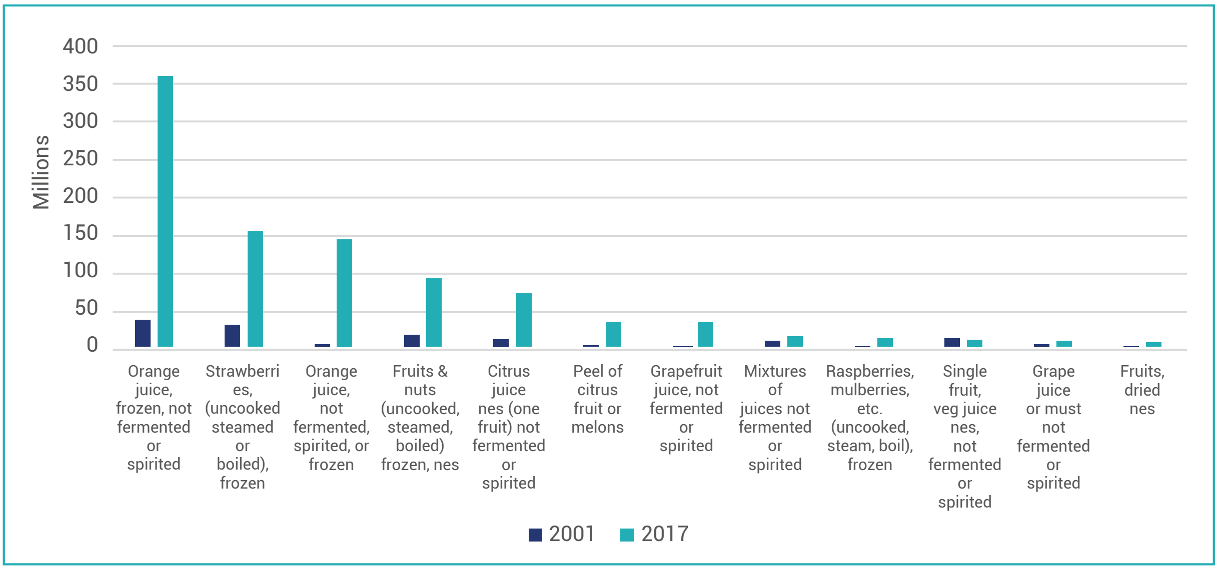


Source: UN Comtrade, 2019. Products with less than 1% of exports are excluded for illustrative purposes.

Market upgrading: Due to the size, value and proximity of the North America market, Mexico's export destinations remain focused on the U.S. market (2001: 87%, 2017:84%), although Mexico has diversified slightly, increasing the share of its output destined to Canada (2001:4%, 2017:8%). A marginally lower share of fruits is destined to North America compared to vegetables (88% vs 92%). Mexico actively promotes its competitive advantage in terms of proximity to the high value U.S. and Canadian markets, which allows it to provide high-quality fresh fruit locally.

Functional Upgrading: As with vegetables, while Mexico increased its processed fruits, although these remain a small share of total fruit exports (11%). In particular, Mexico has significantly increased exports of fresh and frozen orange juice, and frozen strawberries.

Figure 13. Mexican Exports of Processed Fruits, 2001 & 2017



Source: UN Comtrade, 2019.

Key Takeaways for Turkey:

- Significant export value can be harnessed by increasing output and diversifying into high value products, particularly fruits.
- Proximity in the case of Mexico and sophisticated technologies (improved processes for quality) in the case of Chile have enabled each country to leverage their potential to supply major markets with high quality fruit.
- Functional upgrading into processing has been a lower priority for producers, accounting for increasing export value, but still a small share of total product exports.

1.1.4. Turkey and the Agriculture Global Value Chain

While agriculture comprises a small share of Turkey's economy, at 6% of GDP, it is a major contributor of employment with 19% of Turkish labor force employed in the sector. A focus on Agriculture is particularly important for addressing Turkey's socio-economic disparity among its 81 provinces.

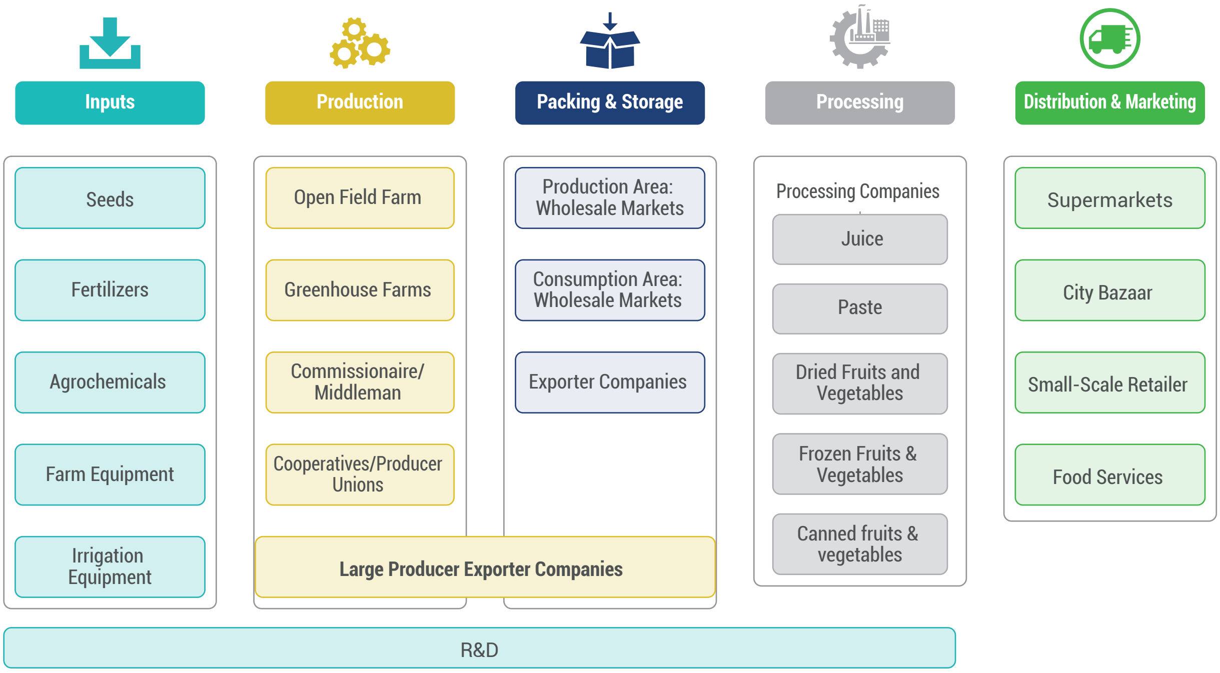
Low productivity in agriculture in Turkey compared to other economic sectors has resulted in lagging growth in provinces that are agricultural powerhouses. Most importantly, for rural women, agriculture is practically the only form of employment.[10]

There are more than 5.3 million farmers in Turkey, with a large number working as small-holder farmers. One key characteristic of Turkish agriculture is the relatively small farm sizes at 6 ha per farm.[11] This is indicative of the small-holder nature of the median Turkish farmer.

Our focus on fruit and vegetable (FV) sector is driven by socio-economic considerations. The overwhelmingly largest share of employment in the agriculture sector is in the FV sector, due to its labor-intensive processes.[12] Secondly, the FV value-chain has employment creation prospects in the distribution, marketing and retail segments. Lastly, the sector has strong potential for growth, as research indicates that the sector is underperforming its true potential with a focus on low-value commodity type products like tomatoes and apples. Reduction of reliance on rain-fed agriculture, increase in productivity, a focus on quality, and improvement in market access mechanisms can unlock significant potential in the FV value chain.

a. Mapping Turkey's Participation in the Fruit and Vegetable GVC

Figure 14: Schematic of Fresh Fruit and Vegetable Value Chain, *(Source: Author)*



10. National Gender Profile of Agriculture and Rural Livelihoods - Turkey Retrieved 25 December 2019, from http://www.fao.org/3/a-i6192e.pdf
11. Agrofood - Invest in Turkey. (2019). Retrieved 25 December 2019, from https://www.invest.gov.tr/en/sectors/pages/agrofood.aspx
12. Vural H. Marketing structure of fresh fruit and vegetable in Turkey. Horticult Int J. 2018;2(5):277-279 Retrieved 25 December 2019, http://medcraveonline.com/HIJ/HIJ-02-00064.pdf

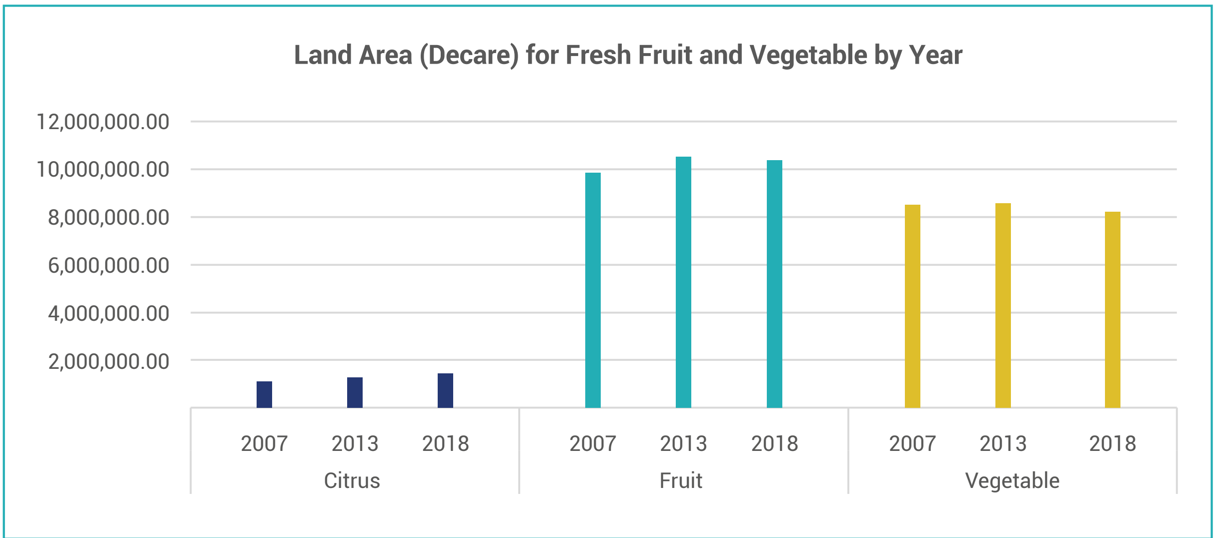
Inputs

The most important input for the Turkish fresh fruit and vegetable are seeds, fertilizers, agro-chemicals and fuel. The majority of the inputs are imported and sold through contracted dealer, chemical stores or cooperatives. Local production of fertilizer and seed cannot meet the local demand; hence majority of these inputs is imported. Even though Turkey produces fertilizer, the lack of raw materials (primarily phosphate) in the country, make it dependent on foreign supply, which is the same for pesticide and other chemicals.

Production

Fresh fruit and vegetables are grown in approximately 20 million decares of land; 9% of total agriculture land (TURKSTAT). As shown in figure 4, citrus land area has increased by 30% from 2007 to 2018. Whereas, vegetables land area has decreased by 3% in the same period.

Figure 15: Area under Production for Fruit and Vegetables



Source: TURKSAT

Fresh fruits and vegetable production is mostly operated by small & medium scale farmers with and average size of 0.99 ha for fruits and 0.98 ha for vegetable (TUKAS). In the production stage, there is only a hand full of large investors, the rest prefer to use either contract farming or buy from the wholesale market.

The production process can be split into two major groups; open field and greenhouse farming. Open field farming is widespread across the country due to favorable climate conditions. However, greenhouse production is clustered around the coastal region with warm climates, like Antalya, Mersin, and Adana, as it requires less energy to maintain internal temperatures. The harvest periods are extended by 9-10 months in greenhouse production. The harvest areas for greenhouse production are 95% vegetable, 4% fruit, and 1% ornamental plants. Industrial greenhouse producers concentrate on the export market (Agency, 2015).

Producers have four primary ways to sell their goods; through commissionaires, cooperative, direct to the wholesale market, direct to retail/manufactures. Going through the commissionaires mean the producer gives the right to the commissionaires to sell to the merchant in the wholesale market. Even though this adds an extra layer in the value chain, the small producer prefers to go through this route as it minimizes their logistic cost (BİRCAN). Producers can also sell their produce directly to the retailer; however, more and more retailers prefer to work with larger producers, edging the small producer out of the market (GÖKKÜR). Cooperative is another solution for small farmers to sell their produce without going through the wholesale market.

Packing & Cold Storage

This stage is a very critical part of the transportation of fresh fruit and vegetable as it maintains the quality of the produce and allows the producer to sell to higher value-added customers further afield. This stage is the weakest link in the value chain in Turkey as only the exporter/distributer/large buyer have both the packing and the storage units to handle fresh fruit and vegetable adequately. The lack of cold storage, inadequate packing, and distribution account up to 40% losses in the fresh fruit and vegetable value chain (TANYAŞ).

Processing

The processing observed in Turkey can be split into five parts; fruit juice production, paste products, dried, frozen, and canned fresh fruit and vegetables. The fruit juice sub-sector uses the lower quality products which cannot be consumed by the end market, and the main fruit inputs are apples, peach, pomegranate, orange, and cherries. Apple is the most used fruit for juice production with 47.8%, followed by peach 10.9%, pomegranate 10.4 %, orange 9,3 %, and cherries 6,3 % (Ministry of Economy (Turkey)). The leading firms in this space only produce fruit juice, source from wholesale markets and it is uncommon to see contract farming in this sector. Due to the scattered and small size of farmland in Turkey, it is difficult for juice producers to source the required type and volume of fruits (MEYED).

The paste industry for the fruit and vegetable industry is mainly made up of tomatoes and peppers. Unlike the juice industry, these products require a certain standard from their raw materials, hence, it is common to see contract farming in this part of the industry (Gunes).

For the dried fruit and vegetable industry, Turkey is a significant player in the global market. This industry is made up of two types of investors; industrial players who use modern techniques and traditional players still using traditional methods (e.g., Sun-drying, small-scale drying) to dry the fruit and vegetables. The main exported dried products are grape, apricot, fig, and tomatoes (Kartal).

Frozen fruit and vegetable production is mainly focused on exports due to the low demand in the domestic market. There are no large firms in this space, and it is underdeveloped compared to the rest of the processing functions in the fruit and vegetable space, however large fresh fruit and vegetable companies are starting to invest in this area to fill the gap in the value chain.

The main canned fruit and vegetable products are jams, pickled, and canned fruit and vegetables. The main products processed in this industry are beans, peas, okra, carrots, cucumbers, and potatoes for vegetables and sour/sweet cherries, apricots, and berries for fruits.

Distribution & Marketing

After the grading of the products based on the quality, it is sold from the wholesale market of the producing region to the large cities retailers and distributors (BİRCAN). 48% of fresh fruit and vegetables are bought the traditional way, from small scale retailers and city bazaars (PWC). The majority of companies that export are private Turkish firms and there appear to be very few foreign firms exporting fresh fruits and vegetables from Turkey.

b. Key Firms

In the GVC analysis, the top firms at different stages in the value chain can shed light on power dynamics within the chain and the expected strategy the market will follow. Hence, for this analysis, we use the top 1000 companies listed in the ISO 1000 to study the firms that are involved in the fresh fruit and vegetable value chain. The strategies indicate an increase in coordination throughout the chain, either through contract farming or vertical integration by processors/traders into production.

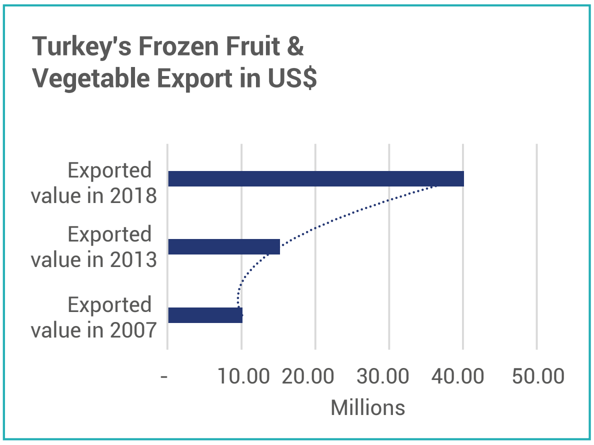
As mentioned earlier, most of the large players are in the processing stage of the value chain, particularly firms producing tomato products such as ketchup and paste. In Turkey, the firms involved in producing tomato products have similar product lines including pickled vegetable, mayonnaise, jam, and canned vegetables. This can be seen with both Yonca gida and Tat gida, the top companies in the ISO 1000 list under fruit and vegetable processing. These firms are not involved in the production process, however, their strategy - like most paste producers – is to engage in contract farming to control the quality of their inputs.

Juice processors like Dime and Aroma are the second category of large players after the tomato product producers in the fresh fruit and vegetable value chain. Due to the nature of the business, these firms only use the lower quality fruits; they do not invest in the production stage of the value chain and their typical upgrading strategy is product-oriented; that is, as they invest in different products derivatives (different type of juice and soft drinks).

The third category of large players are the traders (i.e. exporters only) of fresh food and vegetables, the strategy of these firms changes as they grow their business, but all the top firms have invested vertically along the value chain to have greater control over their supply chain. A typical path for a trading company starts with investing in a storage and packing unit then progressing into investing in logistics both locally and abroad. The investments in logistics help boost sales, which in turn, pushes the firms to invest in the production stage of the value chain, to ensure their supply. The latest trend has been to invest in freezing units to extend the shelf life of their perishable produce and advance to higher value-added products.

For example, Ucak Kardesler, one of the leading exporters of fresh fruit and vegetable in Turkey, started first investing in logistics space in Poland, Romania and Russia. Following this, they invested in 500-thousand-meter square of greenhouse production and, by 2017, they had invested in a freezing unit. Looking at figure 16, we see a jump of 165% in Turkey's exports of frozen vegetables since 2013, implying multiple firms have exploited this since 2013.

Figure 16 Frozen Fruit and Vegetable Exports from Turkey (US$), *(Source: UN COMTRADE)*



The current leading firm (list in the ISO 1000) that produces fresh fruit and vegetable is Çekok Gıda. They followed a similar pattern to Ucak Kardesle, although they have also invested in open farming and started producing higher value niche kiwi products. In addition, they have invested US$4.2 million (TRY 25 million) on automating the picking of fruit as they anticipate they will not have enough labor to pick the produce up in the future.

Table 13 Top Firms in the Fresh Fruit and Vegetable Value Chain from ISO 1,000 List

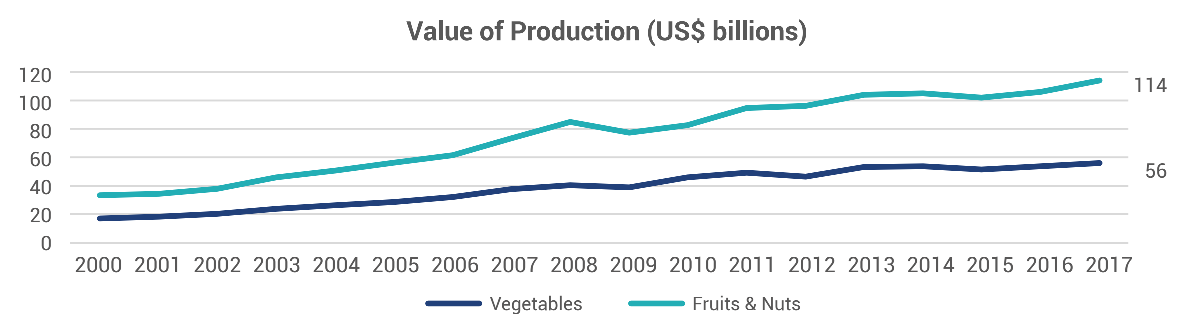
Firm	Net Sales (TRY)	Export (US$)	Produce Items
Yonca Gıda Sanayi İşletmeleri İç ve Dış Ticaret A.Ş.	714,541,273	87,883,000	Tomato products (ketchup, spread and sauce), oil products, canned fruits, pickled vegetables.
Tat Gıda Sanayi A.Ş.	1,207,344,910	27,401,000	Tomato products, pickled vegetable, mayonnaise, jam, and canned vegetable
Tamek Gıda ve Konsantre San. ve Tic. A.Ş.	456,904,155	16,453,000	Tomato products, pickled vegetable, mayonnaise, jam, and canned vegetable, fruit Juice
Çekok Gıda San. ve Tic. A.Ş.	906,360,814		35 types of FFV also import exotic fruits
Tukaş Gıda San. ve Tic. A.Ş.	371,529,768	15,124,000	Tomato products, pickled vegetable, mayonnaise, jam, and canned vegetable
Dimes Gıda San. ve Tic. A.Ş.	344,008,733		Fruit Juice
Aroma Bursa Meyve Suları ve Gıda Sanayii A.Ş.	265,260,510	5,797,000	Fruit Juice and soft drink
Oğuz Gıda San. ve Tic. A.Ş.	257,743,073		Fruit Juice
Burcu Gıda Konservecilik ve Salça Sanayi A.Ş.	249,432,458		Ketchup, other tomato product, canned and pickled goods
Penguen Gıda Sanayi A.Ş.	185,318,029	16,330,000	Tomato products (not including ketchup), pickled vegetable, jam, and canned vegetable
Ucak kardesler*	Top exporter of fresh fruit and vegetable		35 types of FFV

*Source: ISO, 2019; *Not in the ISO 1000 list, example of a top export for fresh fruit and vegetables*

1.1.5. Current Participation of Turkey in the Fruit and Vegetable GVC

Analysis of the production and export trends of the fruit and vegetable sector in Turkey reveals some important dynamics. First, while vegetables production makes up bulk of the production by volume, it is almost less than half the value of fruit production. Secondly, the vast volume of exported fruits is concentrated on low-value products. The top three exports in fruits and vegetables are commodity products that command low value in export markets.

Figure 17: Export Performance of Turkey's Fruits and Vegetables Sector



Source:UN Comtrade)

The table below shows the volume (KG) and value (US$) of Turkey's main FV export. Highlights include a concentration in low-value commodity products. Lemons, mandarins, tomatoes and oranges together – at an average unit price of US$0.54/kg –comprise 54% and 49% of export volume and value. This means that just four products account for half of the country's FV exports. Output. Secondly there is low production of high value commodity products, despite their relative value contribution. For example, cherries make up just 2% of total production, but 7% of value.

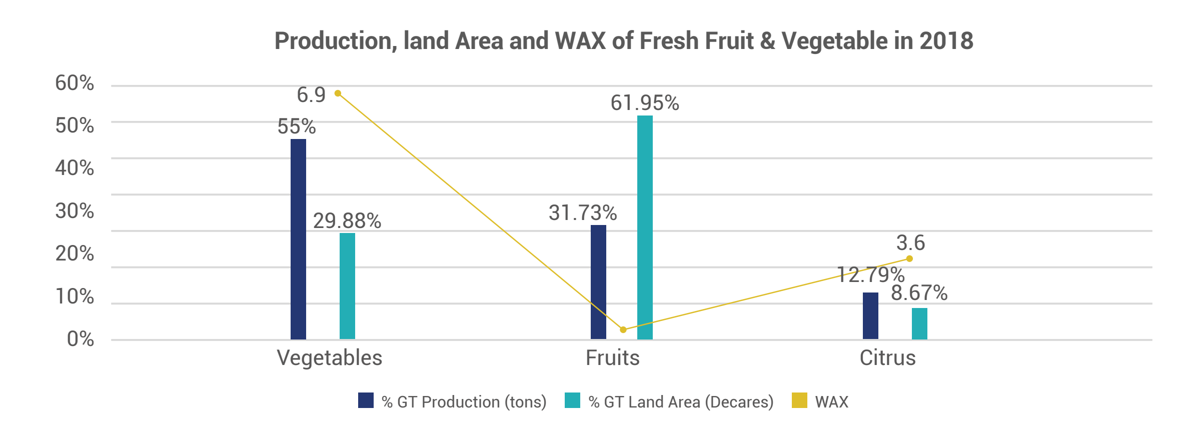
Table 14 Exported FFV in 2018 from Turkey by Value of Exports

#	Products	2018				
		Amount (KG)	Value (US$)	Unit Value	Amount (KG) (% of total FFV production)	Value (US$) (% of total FFV value)
1	Lemon	634,897,986	332,840,267	0.52	15%	15%
2	Mandarin	744,418,790	311,921,846	0.42	17%	14%
3	Tomato	538,585,972	291,903,059	0.54	12%	13%
4	Cherry, Sour Cherry	76,138,270	161,686,260	2.12	2%	7%
5	Orange	448,059,479	160,613,612	0.36	10%	7%
6	Grape	182,163,177	121,856,678	0.67	4%	5%
7	Pepper	128,753,389	118,662,315	0.92	3%	5%
8	Pomegranate	207,622,755	114,752,607	0.55	5%	5%
9	Apple	245,306,630	95,475,499	0.39	6%	4%
11	Peach	128,587,524	87,537,639	0.68	3%	4%
12	Chestnut	12,963,625	43,247,430	3.34	0%	2%
13	Cucumber	66,922,818	41,348,797	0.62	2%	2%
14	Apricot	71,406,911	41,120,641	0.58	2%	2%
15	Pumpkin	67,714,499	40,418,846	0.60	2%	2%
16	Fig	17,032,431	38,896,600	2.28	0%	2%
17	Potato	258,169,993	26,387,573	0.10	6%	1%
18	Strawberry	20,112,839	23,973,257	1.19	0%	1%
19	Plum	69,810,482	22,326,765	0.32	2%	1%

Source: Turkey Fresh Fruit and Vegetable Sector Council

Figure 18 below highlights a key trend in relative yields and land use. In 2017, vegetable uses 29.38% of total area under fresh fruit and vegetable cultivation but produces 55.48% of total production. On the other hand, fruit covers 61.96 % of land under FV cultivation while only producing 31.73 % of volume but has twice the value of vegetable production. Fruits are farmed on open fields and yield less product per area compared to the vegetable sector.

Figure 18: Production of FFV in Turkey (2018) - WAX= Weighted Average Yield by Production



Source: Authors using TurkStat

This is indicative of prevalence in intensive, high-productivity, farming techniques like greenhouse farming in the vegetable sector. Indeed, data analysis reveals that of the farms under green-houses, 94% are focused on vegetable, 5% on fruits and 1% on ornamental plants.[13]

The table below highlights the share of top export markets for Turkey's vegetable sector. The sector displays a large concentration of exports to low-value markets. As the table highlights, the largest value of exported vegetables is to Romania and Russia. While this may represent traditionally accessible markets, the worrying feature is that these markets do not provide premium returns compared to higher value markets in the EU (Germany, France, etc). Secondly, a large volume of trade is with Syria and Iraq where the average per-unit value of vegetables sold is 0.15 and 0.13 US$/unit but together these two countries account for a third of Turkey's exported vegetables.

Table 15. Export Destination of Vegetables, 2018

#	Country	2017	2018				
		Unit Value	Amount (Kg)	Value (US$)	Unit Value	Amount (% Of Total Production)	Value (US$) (% Of Total Value)
1	Romania	1.04	95,103,692.00	85,699,958.00	0.90	7%	14%
2	Russia	0.39	102,219,465.00	72,302,579.00	0.71	8%	12%
3	Germany	1.22	46,874,900.00	52,198,144.00	1.11	4%	9%
4	Bulgaria	0.53	74,065,594.00	39,903,630.00	0.54	6%	7%
5	Ukraine	0.51	73,195,110.00	37,943,100.00	0.52	6%	6%
6	Iraq	0.17	289,965,730.00	37,777,664.00	0.13	22%	6%
7	Belarus	0.55	54,326,863.00	30,149,965.00	0.55	4%	5%
8	Israel	0.71	50,140,007.00	29,595,117.00	0.59	4%	5%
9	Saudi Arabia	0.32	86,123,891.00	26,179,207.00	0.30	7%	4%
10	Georgia	0.29	92,109,471.00	25,654,346.00	0.28	7%	4%
11	Syria	0.15	128,656,730.00	18,712,630.00	0.15	10%	3%
12	Poland	0.94	19,975,873.00	18,362,967.00	0.92	2%	3%
13	Netherlands	1.10	15,937,991.00	16,499,492.00	1.04	1%	3%
14	Moldavia	0.65	14,839,591.00	11,257,368.00	0.76	1%	2%
15	Austria	1.13	8,497,806.00	8,538,756.00	1.00	1%	1%
16	United Kingdom	1.21	5,577,228.00	6,647,010.00	1.19	0%	1%
17	Bosnia Herzegovina	0.49	12,728,907.00	6,065,471.00	0.48	1%	1%
18	Azerbaijan	0.24	31,839,152.00	5,725,840.00	0.18	2%	1%
19	France	1.49	3,291,428.00	5,226,743.00	1.59	0%	1%
20	UAE	0.26	12,121,240.00	4,412,212.00	0.36	1%	1%
	Total	**0.44**	**1,308,233,119.00**	**593,286,615.00**	**0.45**		

Source: Turkey Fresh Fruit and Vegetable Sector Council

13. Agrofood - Invest in Turkey. (2019). Retrieved 25 December 2019, from https://www.invest.gov.tr/en/sectors/pages/agrofood.aspx

A snapshot of the fruit exports to top market destinations reveals an even starker disparity with 39% of fruit export value destined to Russia, at an average unit value of US$0.84. Note that Iraq buys 31% of Turkey's fruit exports but contributes to 9% of value.

Table 16. Export Destination of Fruits, 2018

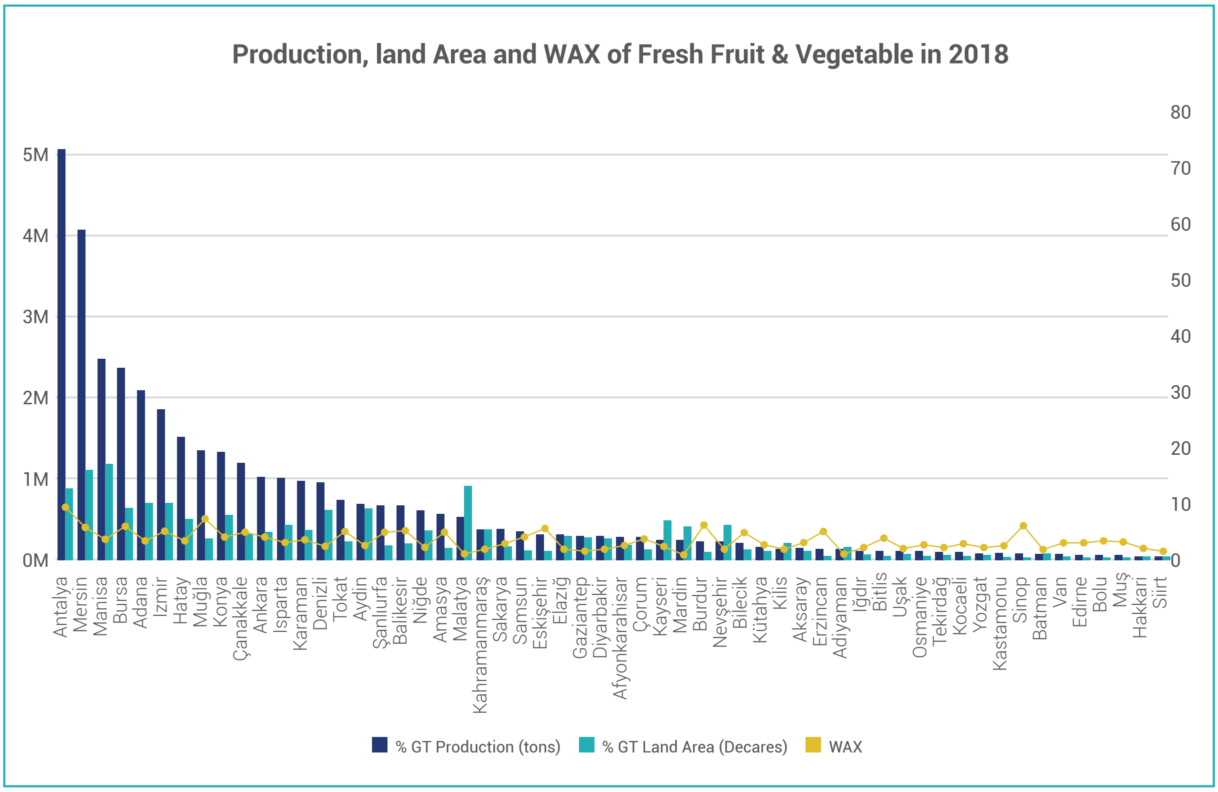
#	Country	2018				
		Amount (Kg)	Value (US$)	Unit Value	Amount (Of Total Production)	Value (US$ % Of Total Value)
1	Russia	342,478,786.00	287,606,869.00	0.84	32%	38%
2	Germany	71,645,462.00	140,973,764.00	1.97	7%	19%
3	Iraq	325,649,429.00	65,200,850.00	0.20	31%	9%
4	Italy	13,949,418.00	39,629,346.00	2.84	1%	5%
5	Romania	25,027,945.00	23,760,586.00	0.95	2%	3%
6	Saudi Arabia	51,732,412.00	23,179,463.00	0.45	5%	3%
7	United Kingdom	12,269,427.00	19,806,238.00	1.61	1%	3%
8	Netherlands	12,208,200.00	19,311,679.00	1.58	1%	3%

Source: Turkey Fresh Fruit and Vegetable Sector Council

Productivity by Region

Turkey's productivity in the FV GVC varies notably by region as illustrated by Figure 15. We have focused our report on Izmir, Antalya, Hatay and Mersin. Our preliminary analysis focused on high producing regions and compared trends in productivity across regions and over time to identify opportunities for improving quality as well as moving to higher-value products and markets.

Figure 19: Production by Subnational Region - WAX= Weighted Average Yield by Production



Source: Authors using TurkStat

As per the breakdown by the top five regions below (Tables 17, 18 and 19), they are the clear performers in the fresh fruit and agriculture sector in Turkey. With reference to tables below, Antalya and Mersin are the main producers of fresh fruit and vegetables. Amongst the top producing regions, Antalya has the largest yields. This indicates potential for process upgrading for the rest of the country.

Table 17: Citrus Production (Volume and Value in the Top 5 Regions in Turkey)

#	Region	Amount (Kg)	Value (US$)	Amount (% Of Production)	Value (US$) (% Of Value)
1	Mersin	755,627,085	349,361,309	37%	39%
2	Hatay	507,376,232	225,755,560	25%	25%
3	Adana	219,206,263	98,626,611	11%	11%
4	Trabzon	160,039,317	79,872,997	8%	9%
5	Izmir	61,362,884	32,883,632	3%	4%

Source: Turkey Fresh Fruit and Vegetable Sector Council

Table 18: Vegetable Production (Volume and Value in the Top 5 Regions in Turkey)

#	Region	Amount (Kg)	Value (US$)	Amount (% Of Production)	Value (US$) (% Of Value)
1	Antalya	297,163,920	230,171,681	23%	23%
2	Hatay	258,752,394	103,751,428	20%	20%
3	Mersin	142,737,833	66,754,552	11%	11%
4	Trabzon	53,319,779	32,772,755	4%	4%
5	Izmir	40,812,562	28,922,402	3%	3%

Source: Turkey Fresh Fruit and Vegetable Sector Council

Table 19 Fruit Production (Volume and Value in the Top 5 Regions in Turkey)

#	Region	Amount (Kg)	Value (US$)	Amount (% Of Production)	Value (US$) (% Of Value)
1	Antalya	148,145,419	141,451,487	13%	17%
2	Mersin	229,530,581	129,417,793	19%	16%
3	Hatay	205,773,145	122,845,773	17%	15%
4	Izmir	73,007,333	90,490,917	6%	11%
5	Trabzon	83,493,625	66,366,598	7%	8%

Source: Turkey Fresh Fruit and Vegetable Sector Council

Figure 20 Yield over time for Selected Subnational Regions, *(Source: Authors using TurkStat)*

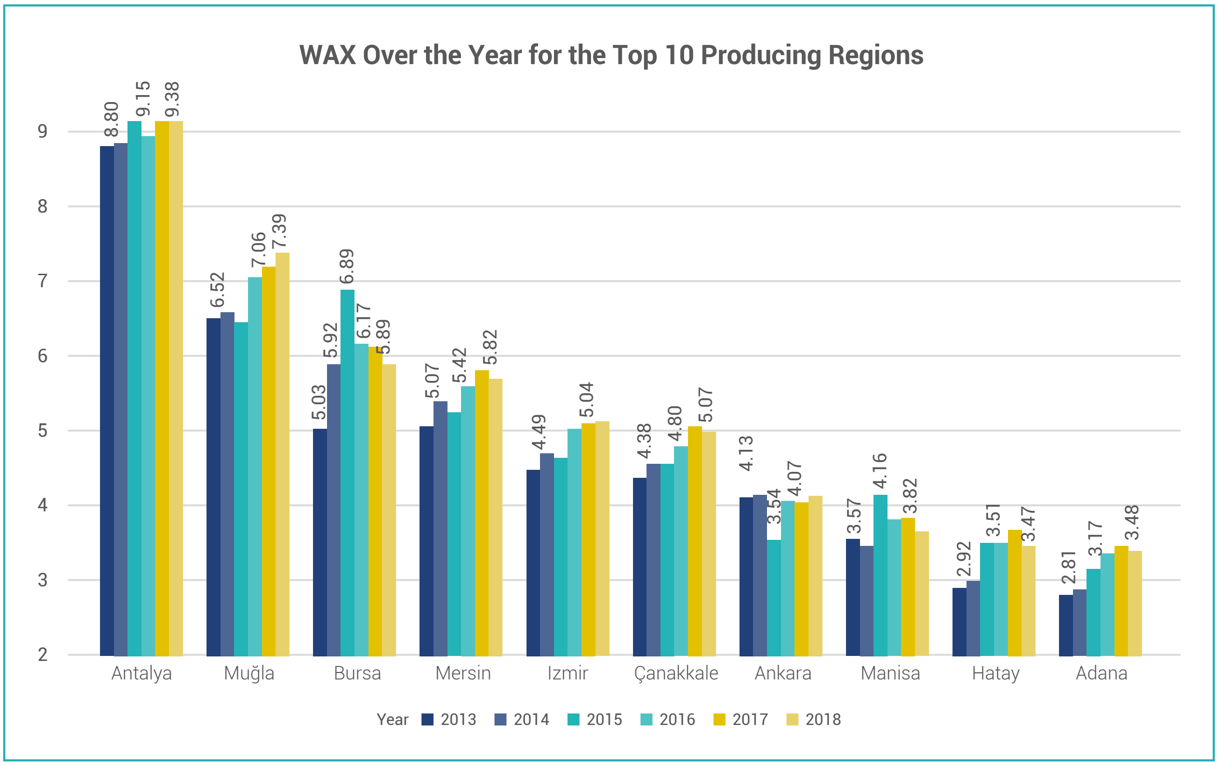


Figure 20 above, highlights change in productivity over the last 6 years. There is a general trend in increase of productivity for the top 6 producing regions. It would be beneficial to learn more about the Antalya region as a case study for the region.

Taking citrus fruit as an example, there are yields of 4.02 tons/ decare in the Antalya area, while yields in Adana, the number one producer of citrus fruit, are considerably lower at 3.11 tons/ decare. The variation in yields can also be seen at a product level, taking an example of lemons, Turkey's number one exports (US$333 million) for fresh fruit and vegetables, where Adana, second largest producer of lemons can have a yield of 2.02 tons /decare and Mugla the third largest producer can have yields of 4 tons/ decare.

Figure 21 Production, land area and WAX for the top 7 producers of citrus, *(Source: Authors using TurkStat)*

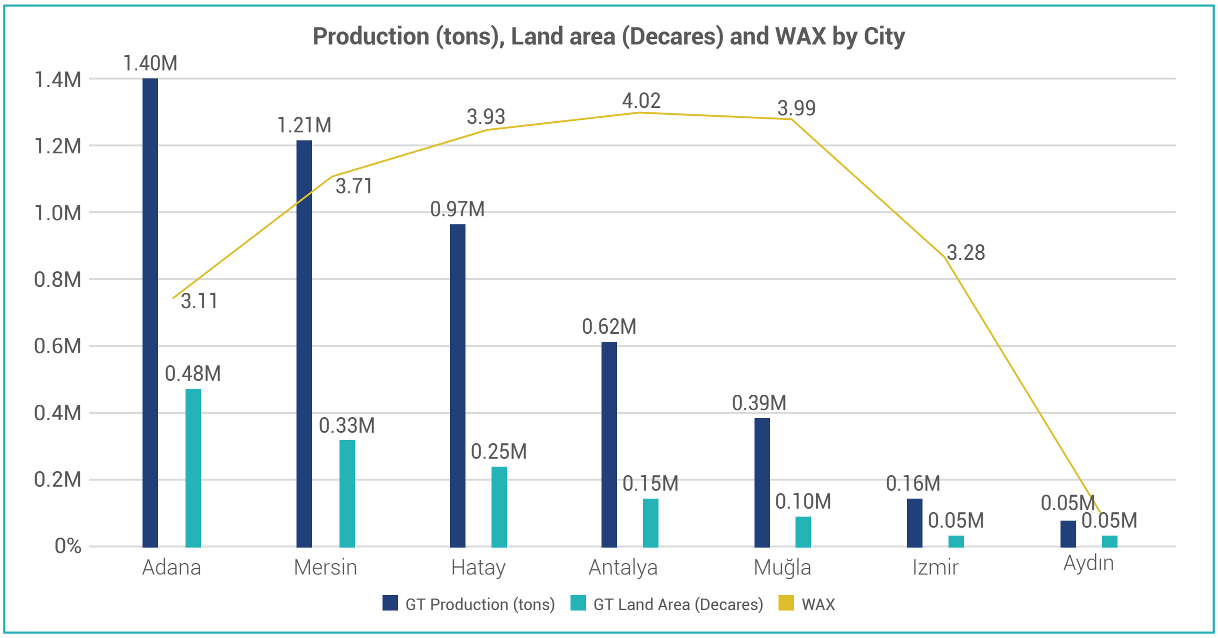


Figure 22 Production, Land Area and WAX for the Top 5 Producers of Lemon *(Source: Authors using TurkStat)*

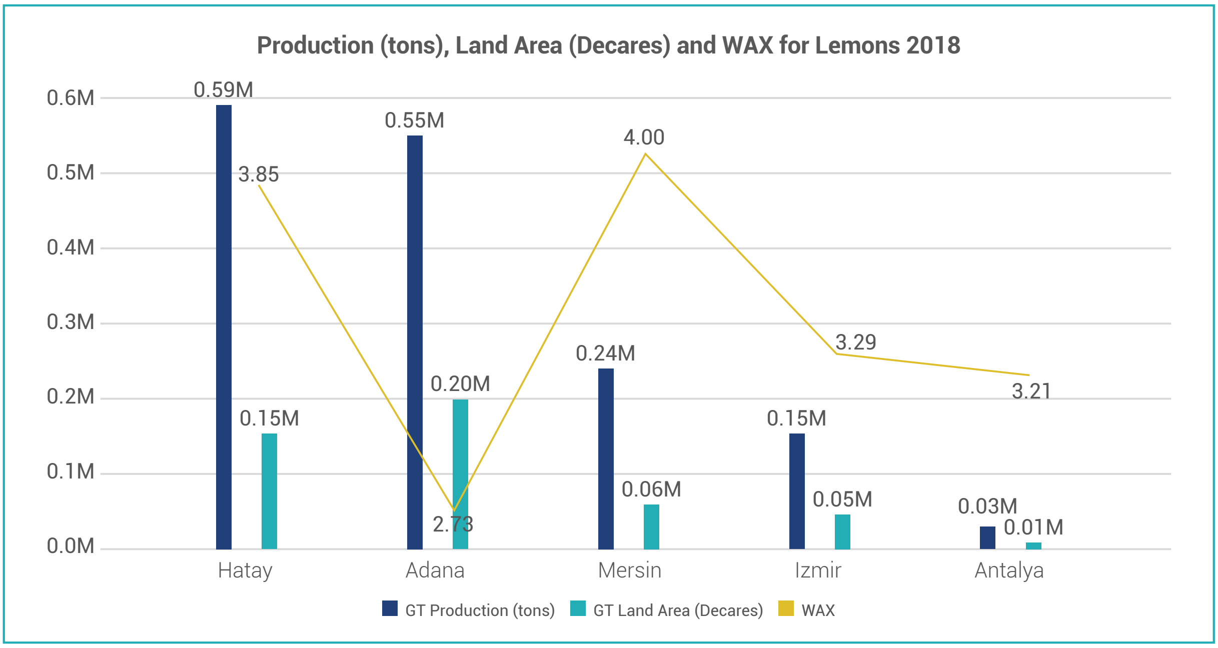
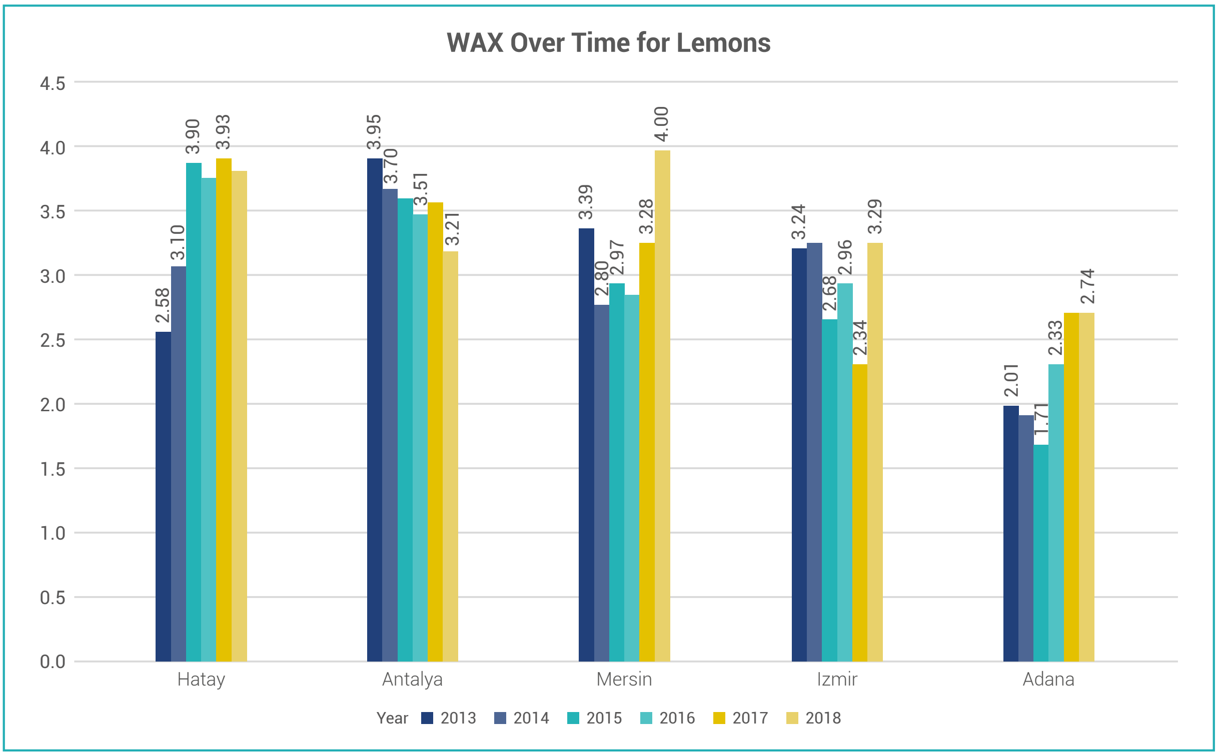


Figure 23 Wax Over Time for Lemons *(Source: Authors using TurkStat)*



a. Employment & Human Capital

In order to explore strategies for improving Turkey's low productivity, it is important to understand the structure of labor, a critical input. Agriculture accounts for approximately 1/5th of employment in Turkey and is a key employer. However, relative share of employment in agriculture has decreased by approximately half since the early 1990s. The most pronounced changes occurred between 2000 and 2007, after which it has stabilized (see Figure 15 below). Turkish agriculture is predominantly reliant on family labor using outdated techniques and on subsistence production.

Figure 24 Employment in Agriculture in Turkey, *(Source:World Bank)*

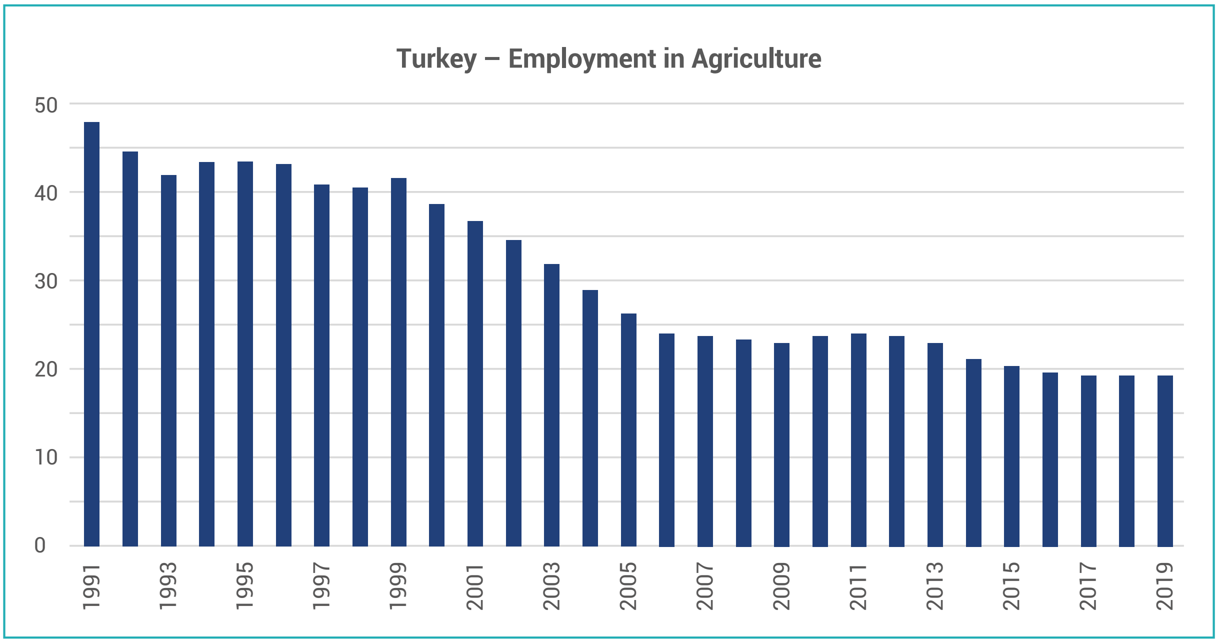
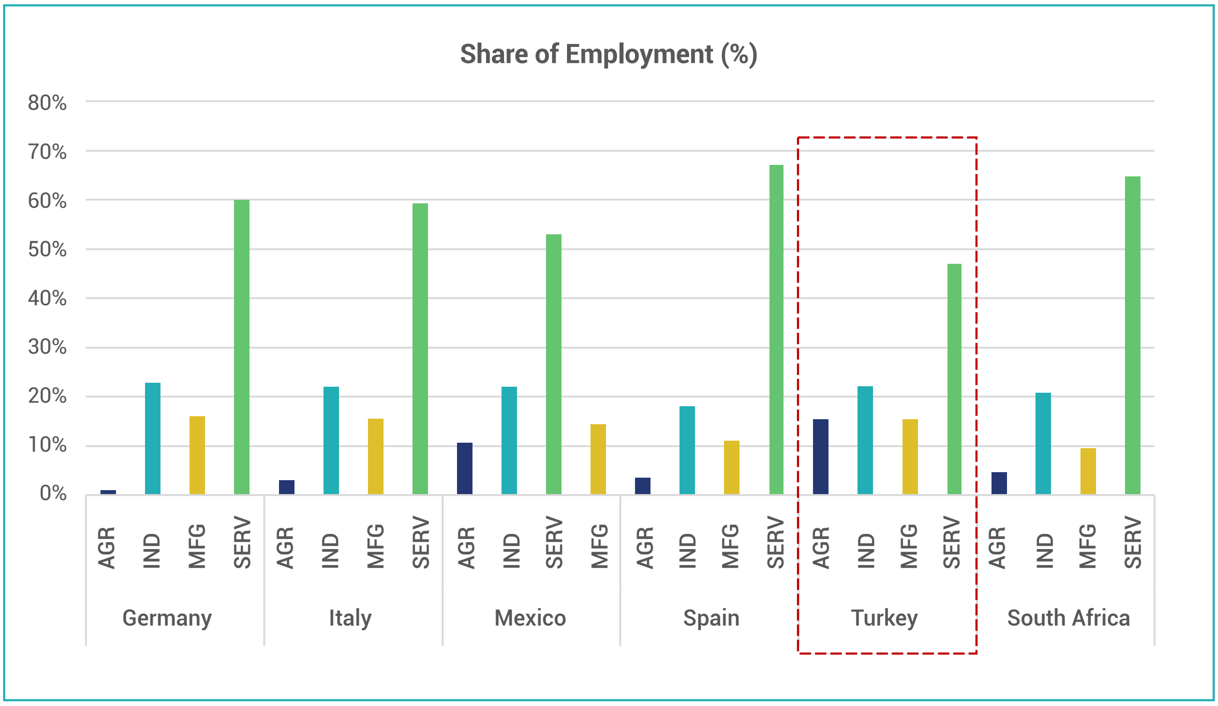


Figure 25 Share of Employment in Select OECD Countries, *(Source: OECD)*



Turkey's share of agricultural employment is considerably higher than that of large-scale exporters. As mentioned, agriculture is critically important for rural employment despite the decreasing share of employment. Zooming in on the rural unemployment in the tables indicates significant regional and gender disparities. Hatay in particular has high unemployment for both genders in the 20-24 age group. This is explained in part by a large refugee cohort in the region.[14] Based on this, we anticipate significant opportunities to address socio-economic disparities through opportunities in organic agriculture, packaging, and processing value-chain segments.

14. Turkish Red Crescent and World Food Programme. (2019). Refugees In Turkey: Livelihoods Survey Findings. Ankara, Turkey.

Table 20 Unemployment in Selected Regions in

Unemployment Rate	Mersin	Antalya	Hatay	Izmir
Female (15- 19)	15.9	19.6	26.7	22
Female (20- 24)	29.6	37.6	40.9	32.7
Female (25- 34)	19.2	20.2	21.2	21.5
Female (35- 54)	9.1	12.1	13.5	15.5
Female (55+)	3.5	4.4	4.2	11.3
Male (15- 19)	10.6	17.6	11.6	18.2
Male (20- 24)	18.2	20.2	27.2	19.5
Male (25- 34)	12.6	8.4	11.7	10.3
Male (35- 54)	7.1	6.6	9.5	8.1
Male (55+)	7.2	7.9	10.9	12.4

Source:Turkstat

Table 21 Labour Participation in Selected Regions

Labour Force Participation Rate (%)	Mersin	Antalya	Hatay	Izmir
Female (15- 19)	18.2	19.6	20.6	22.8
Female (20- 24)	46.8	57.3	41.2	61.6
Female (25- 34)	43.1	52.9	40.9	57.5
Female (35- 54)	40.3	52.6	36.6	49.9
Female (55+)	16.3	22.9	18.5	15.8
Male (15- 19)	40.9	37.3	43.5	45.1
Male (20- 24)	76.9	74.6	74.6	78.8
Male (25- 34)	91	94	92.4	94.9
Male (35- 54)	86.7	90.8	88.5	91
Male (55+)	48	55.5	54	56.4

Source:Turkstat

b. Investment Regimes

In order to address regional disparities, accelerate economic growth and attract foreign investors, the Turkish Government has implemented a new incentive regime.[15] Under this regime, the country is divided into six regions, based on economic growth and prioritizing less advantageous regions.[16]

Figure 26 Map of Regions by Investment Regime

15. Decision on the State Investment Incentives numbered 2012/3305
16. A Brief Overview Of The Investment Incentive Regime In Turkey (Mondaq)) Retrieved 25 December 2019, http://www.mondaq.com/turkey/x/872634/Economic+Analysis/A+Brief+Overview+Of+The+Investment+Incentive+Regime+In+Turkey

Antalya and Izmir are in region 1 while Mersin is classified as region 3. Hatay is classified as region 4. The table below shows a breakdown of investment incentives by region:

Table 22: Support Measures of Regional Investment Incentive Scheme[17]

		REGIONS					
Support Measures		1	2	3	4	5	6
VAT Exemption		•	•	•	•	•	•
Customs Duty Exemption		•	•	•	•	•	•
Tax Deduction	Tax Reduction Rate (%)	50	55	60	70	80	90
	Reduced Tax Rate (%)	10	9	8	6	4	2
	Rate of Contribution (%)	15	20	25	30	40	50
SSP Support (Employer`s Share)	Term of Support (years)	2	3	5	6	7	10
	Cap for Support (Certain Portion of Investment Amount - %)	10	15	20	25	35	No Limit
Land Allocation		•	•	•	•	•	•
Interest Rate Support	TRY Denominated Loans (points)	-		3	4	5	7
	FX Loans (points)			1	1	2	2
	Cap for Support (Thousand TRY)	-	-	500	600	700	900
SSP Support (Employees Share) (years)		-	-	-	-	-	10
Income Tax Withholding Support (years)		-	-	-	-	-	10

Region 1 is granted the least advantageous incentives, whilst Region 6 was granted the best incentives. From the tables above, Antalya and Izmir are ranked as Region 1, which is indicative of regions that are well-developed and receive less support for tax exemption as well as concessional interest rates. This will disincentivize foreign direct investment compared to Hatay (Region 4). With the right upgrading strategy, these incentives can catalyze Hatay's export values and productivity and narrow the gap in regional disparities.

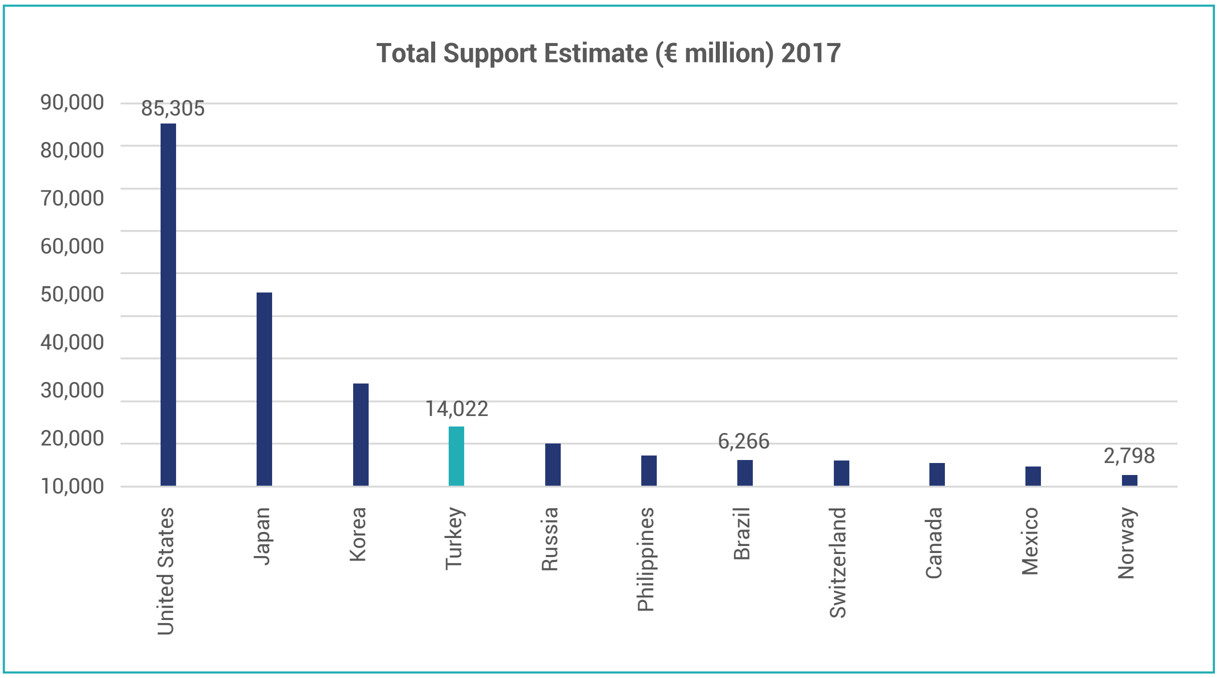
Apart from regional regimes, the country has additional policies aimed at agriculture. According to the Agricultural Strategy Paper (2006-2010) and the Agriculture Law, the focus of agriculture investment regimes in Turkey is to foster a sector that is "sustainable, highly competitive and organized by taking into account economic, social, environmental and international development dimensions within the principle of the utilization of the resources effectively."[18] This aligns well with our GVC analysis which aims to identify opportunities to increase investment, catalyze job creation and increasing export value of the FV sector.

The 2018-22 Strategic Plan of the Ministry of Food, Agriculture and Livestock (MoFAL) has the objectives of ensuring sustainable production, access to adequate and reliable food, rural development and competitiveness of the sector. Measures to support this includes the Agricultural Basin Model where the Ministry has mapped Turkish climate and topography and has selected suitable and optimal products for particular regions. Farmers are incentivized to grow those crops in the selected basins, the scheme also support the financing of warehouses for products selected in the basins.[19]

In addition to direct payment to producers, Turkey has applied import tariffs, market price support, export subsidies and production quotas. Total Support Estimates for agriculture sector in 2017 are €14 billions.[20] Table below highlights total monetary support estimates to agriculture for selected countries.[21]

17. Regional Investment Scheme - Ministry of Trade Retrieved 25 December 2019, https://www.trade.gov.tr/investment/schemes/regional-investments
18. Strategic Plan of the Ministry of Agriculture and Forestry Republic of Turkey. (n.d.). Retrieved from https://www.tarimorman.gov.tr/Links/23/Strategic-Plan
19. Agricultural Basin Model of Ministry of Agriculture and Forestry Republic of Turkey. (n.d.). Retrieved from https://www.tarimorman.gov.tr/Konular/Plant-Production/Agricultural-Basins
20. OECD defines this as "Total Support Estimate (TSE): The annual monetary value of all gross transfers from taxpayers and consumers arising from policy measures that support agriculture, net of the associated budgetary receipts, regardless of their objectives and impacts on farm production and income, or consumption of farm products." https://www.oecd.org/unitedstates/producerandconsumersupportestimatesdatabase.htm#tables
21. OECD - Producer and Consumer Support Estimates Database https://www.oecd.org/unitedstates/producerandconsumersupportestimatesdatabase.htm#tables

Figure 27 Total Support Estimates to Agriculture for Selected Countries

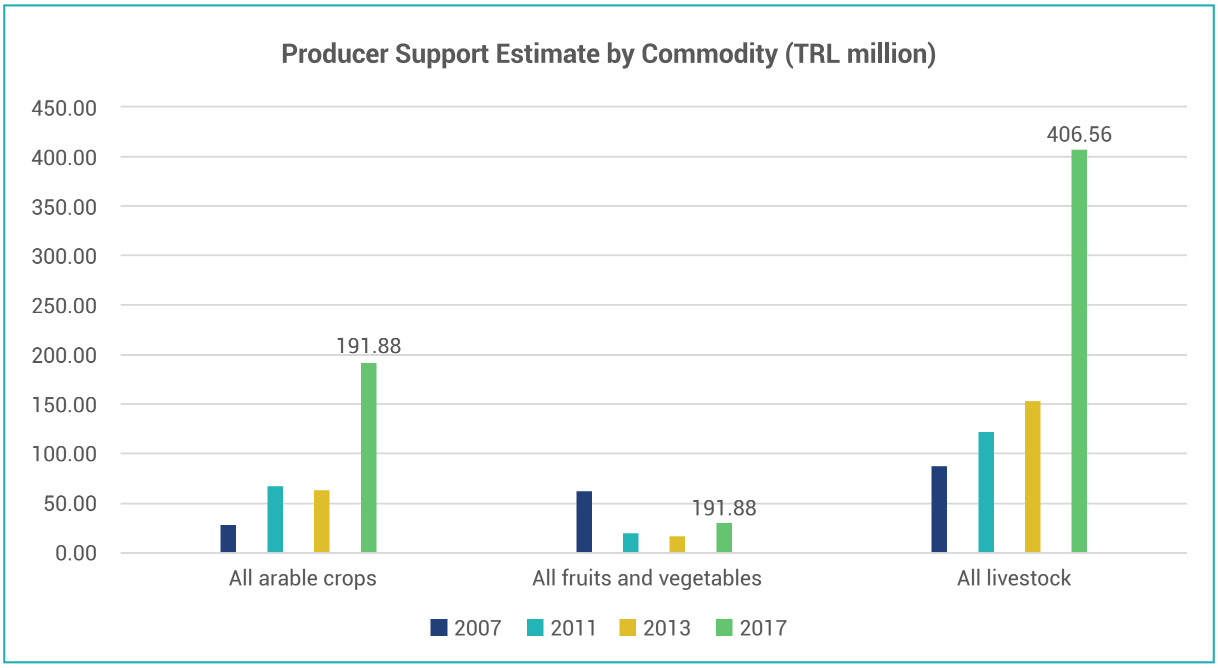


Source:OECD

The OECD estimates that the level of agricultural support is at 20%, which is higher than for OECD peers. For General Services Support, defined as "total budgetary expenditure to support general services provided to agriculture."[22] Of this support, the bulk is in the form of producer support.[23] Producer support dominates the agricultural support services and is focused primarily on livestock and arable crops with fruits and vegetables receiving a comparably small share, driven by a need to ensure domestic price stability for meat and milk products.[24]

22. OECD's Producer Support Estimate and Related Indicators of Agricultural Support: Concepts, Calculation, Interpretation and Use (the PSE Manual) available on the OECD public website www.oecd.org/tad/agricultural-policies/psemanual.htm
23. OECD - Producer and Consumer Support Estimates Database https://www.oecd.org/unitedstates producerandconsumersupportestimatesdatabase.htm#tables
24. Ibid

Figure 28 Producer Support Estimates for Turkish Producers

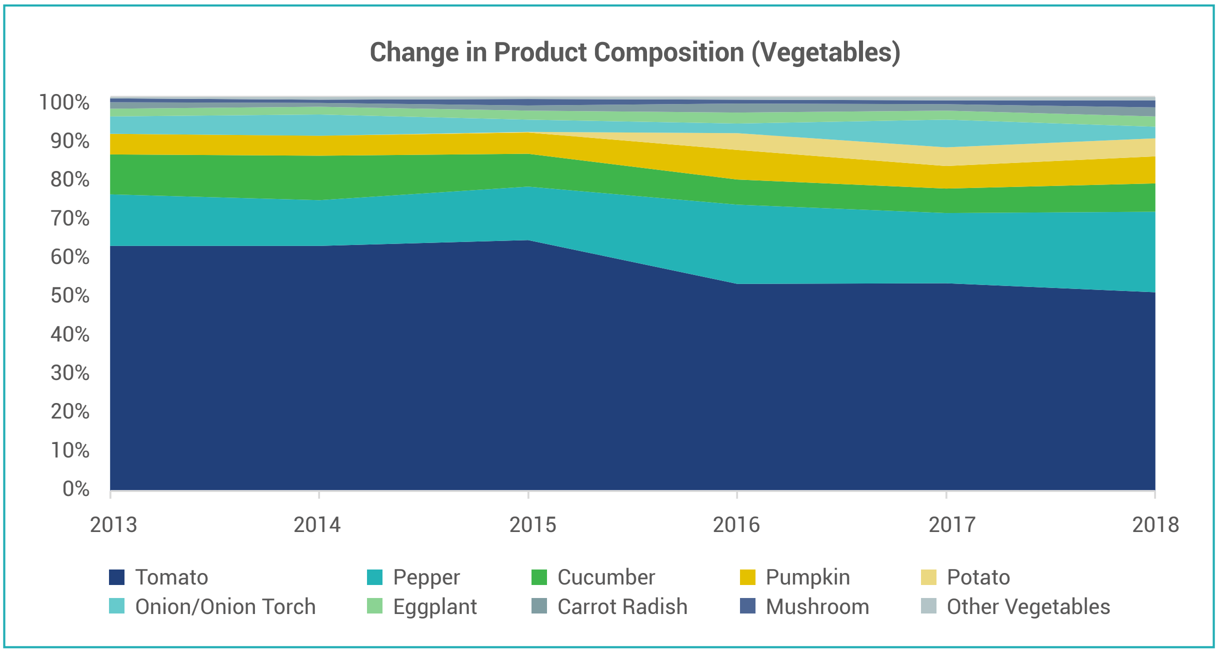


c. Evidence of Industry Upgrading in Turkey

In general, both the values and volumes of both the fruit and vegetable sectors has increased over the time. Unpacking this, we investigate whether there been a shift in product composition in the FV sector as well as diversification of export markets.

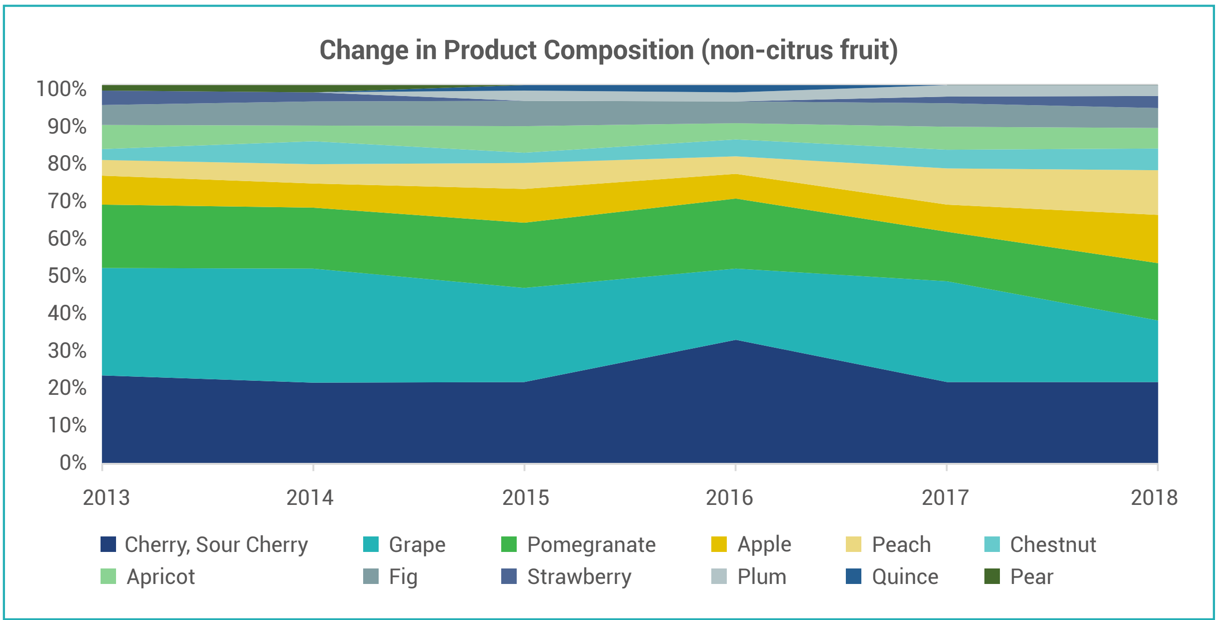
Breaking down the proportionate changes in export composition for vegetables reveals that tomatoes (unit value US$0.54) have maintained the largest share over the time although this has decreased from a high of 64% of total vegetable export value in 2015 to 50% in 2018. There is evidence of some degree of product diversification, and hence upgrading, with increase in share of total exports of peppers (US$0.94), pumpkin (US$0.60) and potatoes (US$0.10). It is worth noting that while potatoes have a low unit value per kg, they might contribute to diversification in other ways as a cash crop, with long shelf life.

Figure 29. Change in Product Composition (Export Values) for Vegetables 2013-2018,



Source: fresh fruit and vegetable sector council

Figure 30 Change in Export Market Concentration for Non-Citrus Fruits

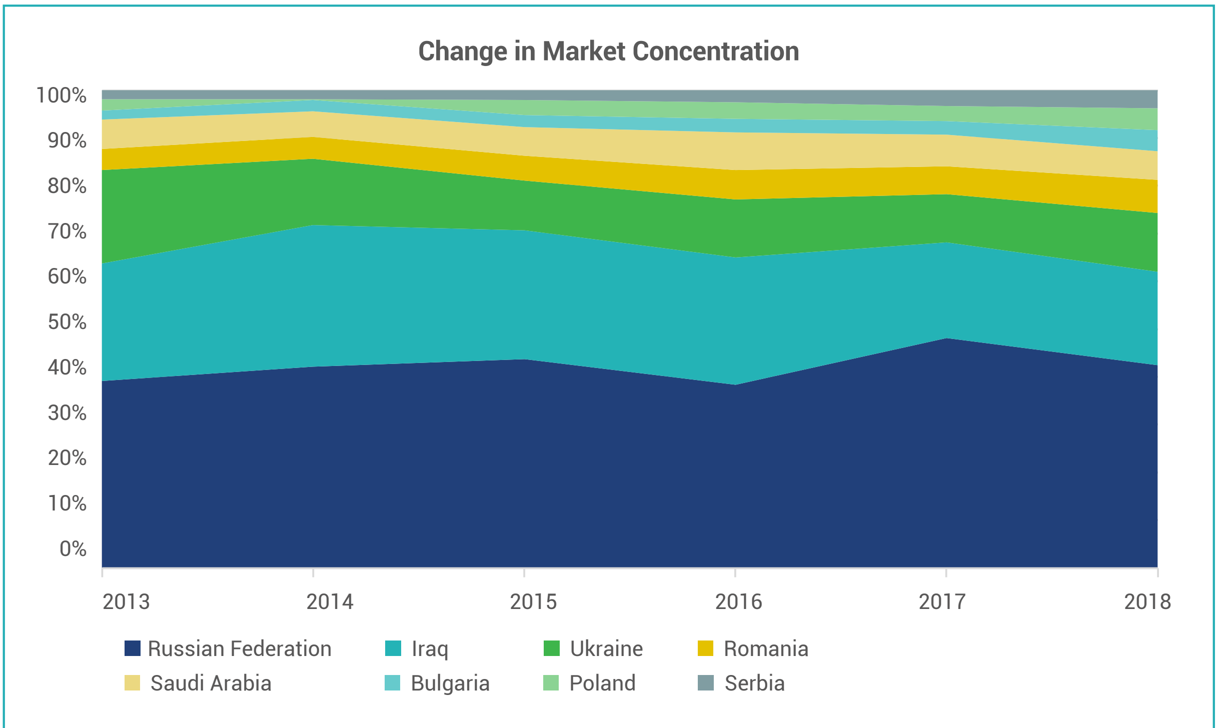


Source: fresh fruit and vegetable sector council

Moving to the fruit segment (as per the figure above) reveals a similar dynamic with decreasing share of grape exports, and increase in share of apples, peaches, and apricots, cherries record the highest share at 23% in 2018. The value of peach exports increased from 4% in 2013 to 12% in 2018.

To establish if there has been a diversification in exports markets, we look at the relative changes of exports, and entry into new markets. Figure 31 indicates that markets remain highly concentrated with ample opportunity for diversification.

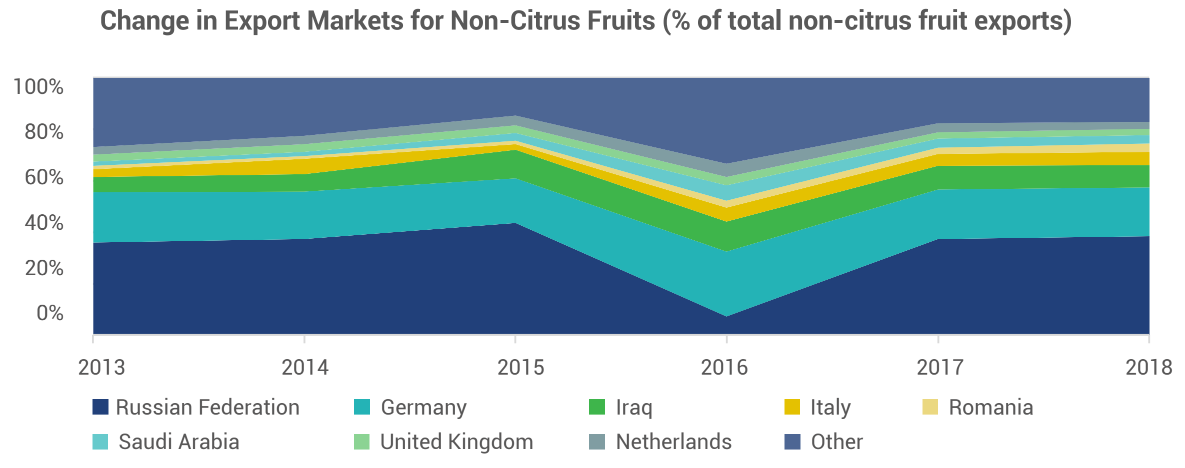
Figure 31 Change in Export Market Concentration for Turkish Citrus Fruits



Source: fresh fruit and vegetable sector council

The market for citrus fruits (as per the table above) in 2013 was very concentrated with the majority of exported citrus fruits headed to just three countries, Russia, Iraq and the Ukraine. Moving to 2017, the exports have slightly diversified, although three countries still dominate. Russia and Iraq also continue to account for close to half of non-citrus fruit exports, although there has been a small increase in market share into higher-value EU markets.

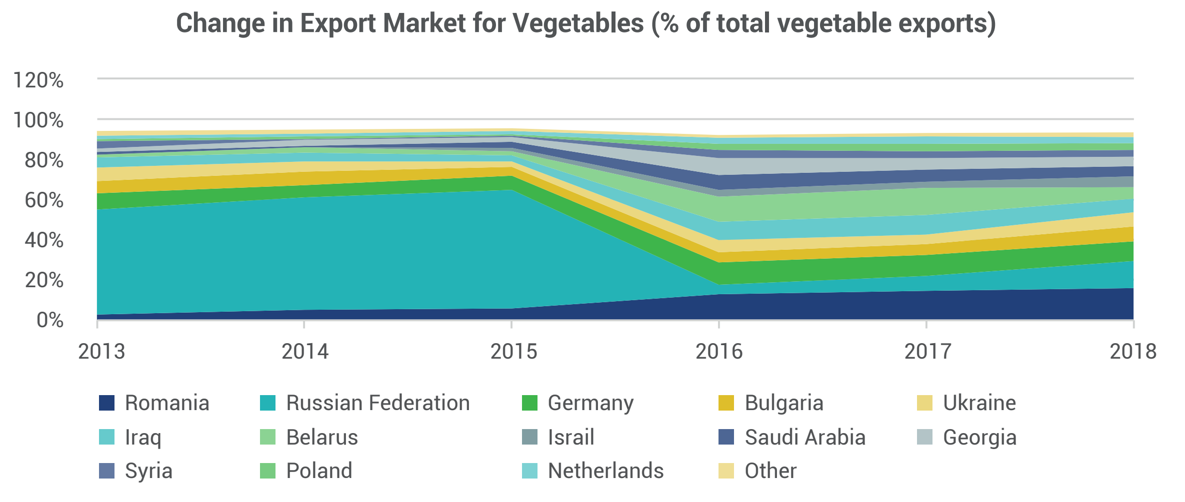
Figure 32 Change in Export Market Concentration for Turkish Non-Citrus Fruits



Source: fresh fruit and vegetable sector council

Due to the country's export dependence on Russia, a 2016 ban on Turkish fruits and vegetables to Russia created significant disruption in the sector. Vegetable exports to Russia still have not recovered and stand at 13% in 2018 down from 52% in 2015.

Figure 33 Change in Export Market Concentration for Turkish Vegetables



Source: fresh fruit and vegetable sector council

Increase in share of apples, peaches, and apricots, cherries record the highest share at 23% in 2018. The value of peach exports increased from 4% in 2013 to 12% in 2018.

1.1.6. Opportunities and Challenges

a. Opportunities

- Turkey is an ideal country to implement product diversification due to Turkey's favorable climate conditions, vast agricultural land and rich biodiversity.
- The geographical location makes Turkey an ideal logistics hub, having access to different types of markets, ranging from high-end markets like the EU to the lower-value markets in Africa.
- Turkey has a huge potential to become the top exporting countries for fresh fruit and vegetables, even though Turkey produces similar volume of fresh fruit and vegetable as Spain, its export value is significantly lower.
- The current small-scale farm structure makes it an ideal situation to produce high value-added fruits and vegetables, where it is difficult to mechanize, boosting incomes for rural populations.

b. Challenges

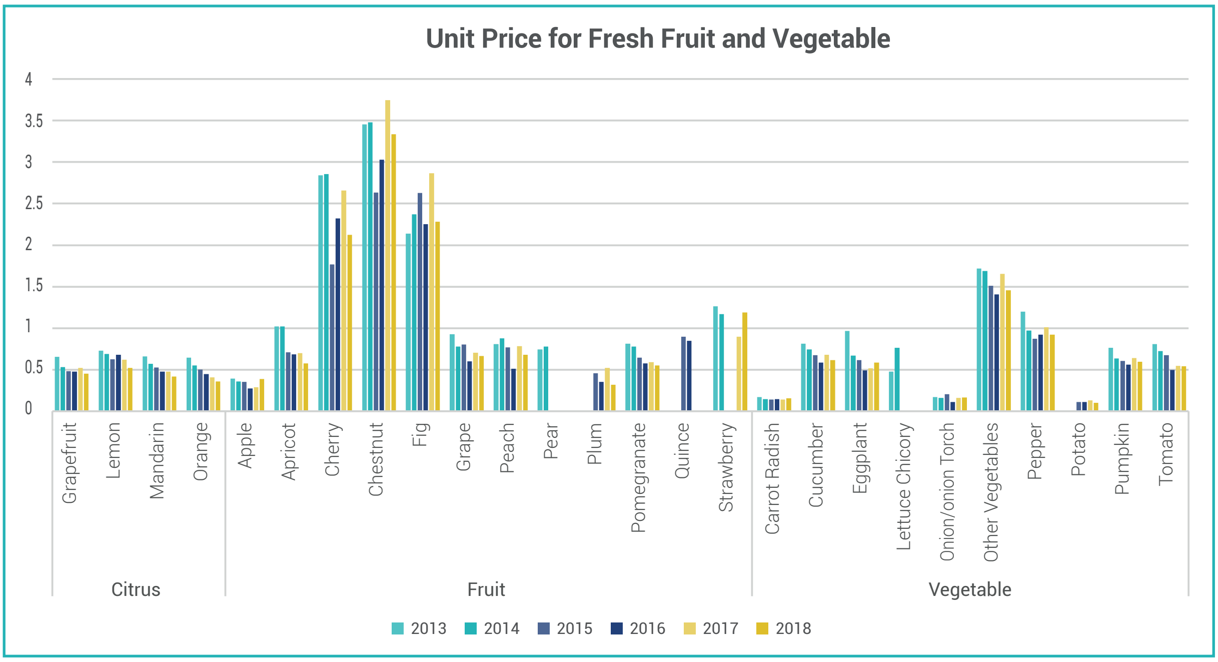
- Historically the agriculture sector has always concentrated in meeting local demand, and with a large local market, producers have not been required to integrate into the market, resulting in poor marketing and sale skills.
- A lower focus on quality standards forces producers to focus on low-value markets.
- Small and fragmented structure of agricultural farmland limits farmers to access finance and lowers their bargaining power with respect to other value chain actors.
- Too many associations without the necessary skills for coordination hinder the flow of information resulting in poor planning and execution.

1.1.7. Potential Upgrading Trajectories

This preliminary analysis illustrates that there are multiple ways to increase the value add for Turkey's fresh fruit and vegetable industry. The most obvious way is to improve food processing in the country. However, you can also achieve higher value-added production by diversifying away from commodity product (product upgrading), expanding to other higher-end market (market diversification) or by improving the process of production to increase the yields (process upgrading).

Product Upgrading: Diversify into higher-value products and decrease concentration on commodity products. Currently, the majority of Turkey's export for fresh fruits and vegetables are in "commodity" products. This results in pressure on the price of products that are exported. As highlighted in figure 13, the unit price, whether fruit, vegetable or citrus is in a declining trend. The most alarming part of this trend is that the biggest and the most consistent decrease is witnessed for citrus fruit, Turkey's number one export of fresh fruit and vegetable. Turkey needs to diversify the varieties they produce and increase the production of higher value products, or they face the risk of losing its competitive edge in this industry. Chile is an example where they saw the potential to diversify by producing berries, and now in less than 20 years, Chile's export of berries exceeds US$600 million (Comtrade).

Figure 34: Unit Price Over the Years for Turkey Fresh Fruit and Vegetables



Source: fresh fruit and vegetable sector council
Note : Mushroom has been removed due to a very high unit price compared to the rest. Mushroom unit price has a decreasing trend

Market Diversification: Diversify away from countries with high exposure and low value-added markets. Over the years, Turkey has started to concentrate its exports of fresh fruit and vegetables in just two countries, Russia and Iraq. The two countries account for 38% of Turkey's total export for fresh fruit and vegetables in 2018. There are two issues in concentrating exports in these countries; first, both countries have a high political risk, as seen in 2016 ban (excluding citrus) by Russia reducing exports from US$581 million to only US$60 million. The second issue, as illustrated in table 13, both Russian and Iraqi market are low to mid end. Lowering the value-added earned by producers.

Functional Upgrading: Improve agri-food processing, specially frozen vegetable and fruit juice manufacturing. Even though Turkey has 3% share of the global exports of processed fruit and vegetable, a deeper look shows two areas that are lagging compared to other fruit and vegetable manufacturing, the two areas are:

- Frozen vegetables and production of juice. Despite the fact, Turkey has a 1.45 % global share of fresh vegetable traded and 1.77% share of chilled processed vegetable; Turkey only has a 0.45% global share for traded frozen vegetables.
- Similarly, Turkey's global share of juice manufacturing is only 1.73%, while having a 3% share of the traded fresh fruit market.

Furthermore, the average loss of fresh fruit and vegetable throughout the value chain is approximately US$3.4 billions (TRY 20 billions), which is 25% of production. The main factor is a lack of cold storage, inadequate packing, and distribution; investing in infrastructure can reduce major loss and increase usable production significantly. (TANYAŞ)

Process upgrading: Increase the yields for fresh fruit and vegetable in the regions that are lagging and invest in the infrastructure to reduce losses. There are significant gaps in yields between regions, even top producing areas can observe relatively low yields, which has a negative effect on the country's productivity. This is an opportunity for process upgrading and diversifying to other products to get the most value from the land. Increasing the yields will also trickle down to support the expansion of the food processing segment which depends on stable and sufficient raw material to maximize on fixed capital.

Table 23 Potential Upgrading Trajectories for the fresh fruit and vegetable value chain

Upgrading Strategy	Domestic Value Added	Exports	Employment
Product Diversification	**Increase** By applying product diversification, more niche products can be produced. The produce can be sold for a higher value and create more domestic value add.	**Increase** The result does not directly increase the export quantity, however, will increases the export value.	**Increase** Product diversification help make small farms more competitive as economies of scale have less effect for some niche product. These products require higher level of delicacy and require more labor.
Market Diversification	**Increase** Nearly 40 % of market concentration is in low to medium value markets. Diversifying to higher end market, will increase the margins of the producers.	**Increase** Export values will increase when concentrating in higher end markets. Diversifying exports from the countries of high exposure will help reduce export risk and in the long term can lead to higher exports.	**Neutral** Rather than increase employment this will require an increase the skill of the farmer. Positive employment effects for agronomists providing training to farmers
Process Upgrading	**Increase** Process upgrading can be achieved by utilizing technology or best practices to increase the yields of the production area and reduce losses. Increase productivity will increase the output.	**Increase** Process upgrading will lead to the use of resource more efficiently, hence increase the output and export amounts.	**Minor increase** Increasing yields may result in increase in temporary labor for harvest, however, investing in cold storage, packing unit, and distribution will increase the employment in the process section of the value chain.
Functional Upgrading into Agro-Processing (Expansion)	**Increase** By capitalizing the gaps in the processing stage of the value chain will result in domestic value add	**Increase** Exporting different type of products or expanding current product manufacturing will increase the export for the sector	**Minor Increase** Upgrading into processing will increase the amount of skill jobs required to run the processing plant

Among the key preliminary GVC analysis outcome for the agriculture industry are as follows:

1. The industry lacks export diversification with a large share of fruits and vegetables going to three countries; Russia, Iraq and Syria.
2. The predominance of small-sized, subsistence and semi-subsistence farms reduces productivity.
3. Dominance of lower-value commodity fruits and vegetables over higher value produce.
4. Turkey has a low agricultural productivity per worker compared to neighboring countries.
5. Turkey has major loses trough out the fresh fruit and vegetable value chain

1.1.8. Annexes

Table 24. HS-Codes Included, Fresh Fruit (H2)

Apples, fresh
H2-080810
Apricots, fresh
H2-080910
Avocados, fresh/dried
H2-080440
Bananas, incl. plantains, fresh/dried
H2-080300
Black/white/red currants & gooseberries, fresh
H2-081030
Cherries, fresh
H2-080920
Cranberries, bilberries & oth. fruits of the genus Vaccinium, fresh
H2-081040
Dates, fresh/dried
H2-080410
Durians, fresh
H2-081060
Figs, fresh/dried
H2-080420
Fresh fruit, n.e.s.
H2-081090
Grapefruit, fresh/dried
H2-080540
Grapes, fresh
H2-080610
Guavas, mangoes & mangosteens, fresh/dried
H2-080450
Kiwifruit, fresh
H2-081050
Lemons (Citrus limon/limonum) & limes (Citrus aurantifolia/latifolia), fres...
H2-080550
Mandarins, incl. tangerines & satsumas; clementines, wilkings & sim. citrus...
H2-080520
Oranges, fresh/dried
H2-080510
Peaches, incl. nectarines, fresh
H2-080930
Pears & quinces, fresh
H2-080820
Pineapples, fresh/dried
H2-080430
Plums & sloes, fresh

H2-080940
Raspberries, blackberries, mulberries & loganberries, fresh
H2-081020
Strawberries, fresh
H2-081010
Watermelons, fresh
H2-080711

Table 25. HS-Codes Included, Fresh Vegetables (H2)

Asparagus, fresh/chilled
070920
Aubergines (eggplants), fresh/chilled
070930
Beans (Vigna spp., Phaseolus spp.), shelled/unshelled, fresh/chilled
070820
Brussels sprouts, fresh/chilled
070420
Cabbage lettuce (head lettuce), fresh/chilled
070511
Cabbages, kohlrabi, kale & sim. edible brassicas (excl. cauliflowers, heade...
070490
Carrots & turnips, fresh/chilled
070610
Cauliflowers & headed broccoli, fresh/chilled
070410
Celery (excl. celeriac), fresh/chilled
070940
Chicory (excl. witloof chicory), fresh/chilled
070529
Cucumbers & gherkins, fresh/chilled
070700
Fruits of the genera Capsicum/Pimenta, fresh/chilled
070960
Globe artichokes, fresh/chilled
070910
Leeks & oth. alliaceous vegetables, fresh/chilled
070390
Leguminous vegetables (excl. of 0708.10 & 0708.20), shelled/unshelled, fres...
070890
Lettuce (Lactuca sativa) (excl. cabbage lettuce) fresh/chilled
070519
Mushrooms of the genus Agaricus, fresh/chilled
070951
Mushrooms other than of the genus Agaricus, fresh/chilled
070959
Onions & shallots, fresh/chilled

070310
Peas (Pisum sativum), shelled/unshelled, fresh/chilled
070810
Potatoes other than seed potatoes, fresh/chilled
070190
Salad beetroot, salsify, celeriac, radishes & sim. edible roots (excl. carr...
070690
Seed potatoes, fresh/chilled
070110
Spinach, New Zealand spinach & orache spinach (garden spinach), fresh/chill...
070970
Vegetables, n.e.s., fresh/chilled
070990
Witloof chicory (Cichorium intybus var. foliosum), fresh/chilled
070521

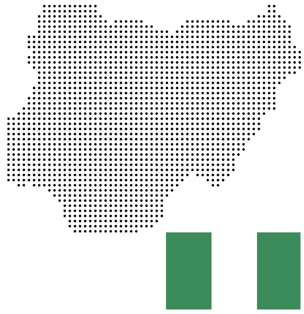
Table 26. HS-Codes Included, Processed Fruits (H2)

Fruit, nuts and other edible parts of plants, otherwise prepared or preserved, whether or not containing added sugar or other sweetening matter or spirit, not elsewhere specified or included.
2008
Fruit juices (including grape must) and vegetable juices
2009
Fruit and nuts, uncooked or cooked by steaming or boiling in water, frozen, whether or not containing added sugar or other sweetening matter.
0811
Vegetables, fruit, nuts, fruit-peel and other parts of plants, preserved by sugar
2006

Table 27. HS-Codes Included, Processed Vegetables (H2)

Vegetables (uncooked or cooked by steaming or boiling in water), frozen.
0710
Dried vegetables, whole, cut, sliced, broken or in powder, but not further prepared.
0712
Manioc, Arrowroot, salep etc, fresh, dried, sago pith
0714
Vegetables, fruit, nuts and other edible parts of plants, prepared or preserved by vinegar or acetic acid
2001
Tomatoes prepared or preserved otherwise than by vinegar or acetic acid.
2002
Mushrooms and truffles, prepared or preserved otherwise than by vinegar or acetic acid
2003
Other vegetables prepared or preserved otherwise than by vinegar or acetic acid, frozen, other than products of heading 20.06.
2004
Other vegetables prepared or preserved otherwise than by vinegar or acetic acid, not frozen, other than products of heading 20.06
2005

1.2 NIGERIA IN THE COCOA-CHOCOLATE GLOBAL VALUE CHAIN



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Summary

The cocoa-chocolate GVC has been growing over the past 5 years driven by increased demand for chocolate, which is expected to grow annually at 4% over the next decade (Mordor Intelligence, 2020). The following market trends are shaping the industry: i) liberalization of the sector which exposed smallholder farmers to the risks of production and market volatility (Abdulsamad et al., 2015); ii) Increasing global disposable incomes in emerging markets which has been driving demand for chocolate (Hamrick & Fernandez-Stark, 2018); iii) climate change which is threatening the yields and future of production in traditional locations; iv) the sustainability concerns in cocoa-chocolate GVC transforming the sourcing strategies of many lead firms (Thorlakson, 2018). The GVC of chocolate has the following key stages: Research and Development; Cocoa Beans Production and Primary Processing; Cocoa Marketing and Trading; Cocoa Beans Processing; Industrial Chocolate Manufacturing; Branded Chocolate Production; Distribution and Retailing.

The cocoa-chocolate GVC has an export volume of nearly US$49 billions in 2018. As of 2018, chocolate exports make 61% of the total exports value in the GVC, followed by cocoa beans (17%). The production of cocoa beans is undertaken in developing southern countries, while the consumption of chocolate takes place in developed North. The production of chocolate is mostly by developed northern countries. Cote d'Ivoire and Ghana have consistently been the top two cocoa beans exporters. In 2018, their share in global cocoa beans exports were 38% and 29% respectively. Germany and Belgium have been the top two biggest exporters of chocolate, though other high growth markets in developing countries are emerging.

The cocoa- chocolate value-chain is characterized by two sets of transnational lead firms: (i) the traders/ grinders and (ii) branded chocolate manufacturers, mainly headquartered in Europe and North America. The top-5 traders/ grinders, Barry Callebaut, Olam, Cargill, Ecom, and Sucden accounted for nearly 88% of the total cocoa trade in 2017 and five manufactures (Mondelēz, Nestlé, Mars, Hershey, Ferrero, and Lindt) use about 40% of all cocoa produced (IISD, 2019).

Nigeria mainly participates to the Cocoa-Chocolate GVC as an exporter of cocoa beans and to a small extend cocoa ingredients. Cocoa beans exports stood at US$302 million in 2018 (UNComtrade, 2020a). Only about 20% of cocoa beans are processed in-country, while the remaining is exported (PwC Nigeria, 2020). The second major export item is cocoa butter. Cocoa butter exports stood at US$55 million in 2018. Nigeria export destinations have increasingly become concentrated over the years with the share of Asian markets going up.

Key constraints faced by Nigerian industry include: (i) low yields and quality of beans; (ii) inadequate farming and processing infrastructure; (iii) absence of a sector coordination body and weak institutional support; (iv) absence of government incentives to encourage domestic value-addition, and (v) outdated farming practices of farmers. However, Nigeria has the potential to upgrade in GVC.

The purpose of this report is to guide Nigerian government officials on how to further participate in the cocoa-chocolate GVC. The first chapter of this report covers extensively the global cocoa-chocolate industry. The second chapter explains Nigeria's participation and weight of the cocoa-chocolate GVC. The last chapter details the challenges for Nigeria and the corresponding policy recommendations.

1.2.1. The Global Cocoa-Chocolate Industry

The Global Cocoa-Chocolate Industry

The cocoa bean is the key ingredient in the US$100 billions-plus chocolate industry, which is forecasted to grow at a cumulative annual growth rate (CAGR) of above 4% (Mordor Intelligence, 2020). The cocoa-chocolate Global Value Chain (GVC) trade has grown over the past 5 years, with exports reaching nearly US$49 billions in 2018, up from US$44 billions in 2015 (UNComtrade, 2020a). The upstream portion, namely production of cocoa, is based in developing countries located at the tropical belt within 10-20 degrees of equator. The consumption of chocolate is dominated by developed nations in the West. Cocoa beans production and primary processing is undertaken by around 6 million smallholder farmers mainly in Africa, Latin America and South-East Asia on 2-4 ha fields (Wickramasuriya, 2018). Africa is the largest producer accounting for around 76.6% of global output. Americas and Asia accounted for around 17.7% and 5.7% of the global production respectively in 2019 (Statista, 2020). Cote D'Ivoire and Ghana are the leading producers, accounting for 60% of the production. These countries heavily depend on cocoa-derived revenues for their macro economies and rural households' income.

Africa is the largest producer accounting for around **76.6%** of global output. Americas and Asia accounted for around **17.7%** and **5.7%** of the global production respectively in 2019. Cote D'Ivoire and Ghana are the leading producers, accounting for **60%** of the production.

The key importers of cocoa beans are mainly the Western markets, which process chocolate for export to the rest of the world. The top importers of cocoa beans during 2015-18 period were Netherlands (US$9 billions), U.S. (US$5 billions), Germany (US$4 billions), and Belgium (US$3 billions) (UNComtrade, 2020a). Overall, these four countries account for 55% of global cocoa beans imports. Some of the key characteristics and trends which are shaping the industry are summarized below. These have implications for countries, such as Nigeria, which are seeking to expand their presence in the sector.

First, global liberalization policies have exposed smallholder farmers to bear the increasing costs and risks of production (Abdulsamad et al., 2015). The dismantling of commodity boards[1] in late 80s deprived the farmers of government-provided subsidized inputs and services, including credit, extension, quality control and marketing. The liberalization was expected to free the market for private actors to take over the key relevant functions—reducing costs, improving quality, and eliminating inefficiencies. However, often, that didn't happen, leaving the majority of the smallholders exposed to extensive market failures, high transaction costs, risks, and service gaps (World Bank, 2008). The gap left by the absence of government bodies was taken by global transnational companies, which now dominate the GVC.

Second, increasing global disposable incomes in emerging markets like Brazil, China, India, Russia, and South Africa, have been driving demand for chocolate products (Hamrick & Fernandez-Stark, 2018). These emerging economies account for 70% of global confectionery growth (KPMG, 2014). Chinese import of chocolate grew seven times from 2005 to 2018, rising from US$64 million to almost US$448 million (UNComtrade, 2020a). Expansion of cold chain capabilities in these emerging markets has also helped to drive demand providing opportunities for retail (Barrientos, 2015). These emerging actors together with the mature markets in the West make a total size of the global cocoa-chocolate trade market of US$98 billions (UNComtrade, 2020a). These trends hold promising potential for growth of GVC.

Third, climate change is threatening the production systems in traditional cocoa-growing regions leading to low productivity and higher incidence of diseases such as Black Pod disease[2]. This has led to a reduction in cocoa output in some countries such as Indonesia. Climate change is expected to impact cocoa-producing regions with consequences for millions of smallholder farmers, and the global cocoa/chocolate industry. According to recent studies, land suitable for cocoa production will decrease significantly in the near future (World Cocoa Foundation, 2020a). Some areas of Côte d'Ivoire and Ghana are likely to become unsuitable for growing cocoa by 2050 and production is likely to be reduced in Indonesia (Fairtrade Foundation, 2016). To address these issues, the World Cocoa Foundation started Climate Smart Cocoa initiative. These issues affect the supply side, which mostly relates to developing producing countries, most of which are IsDB members (Cote d'Ivoire, Nigeria, Indonesia, Malaysia, Cameroon).

Fourth, the sustainability concern in cocoa-chocolate GVC is transforming the sourcing strategies of many lead firms (Thorlakson, 2018). Most of the lead processors and manufacturers have committed to 100% sustainable sourcing of their inputs in the coming years. For instance, Barry Callebaut has committed to 100% sustainable sourcing by 2025, with Cargill aiming to achieve the same by 2030. Further, many lead firms have also established their own corporate sustainability standards driven by a need for more reliable and cost-efficient sustainability practices and market imperatives to secure supply (Voora et al., 2019). Under these corporate programs, many firms have partnered with national institutes to implement productivity improvement and certification initiatives and strengthened their supply chain capabilities by establishing closer links with farmers (Thorlakson, 2018).

Overall, the significant increase in demand took place simultaneously with stagnation in the supply of cocoa beans, resulting in a global shortage. In turn, this has led to a rise in global prices. The nearby future price of cocoa beans per ton increased from US$1,950 as of August 2017 to US$2,750 as of February 2020 (International Cocoa Organization, 2017; 2020a). It also raised concerns about the sustainable supply of raw materials for the chocolate industry (Hamrick et al., 2017). For the first time since the 1970s, perceived uncertainty in relation to an adequate supply of cocoa has raised concerns for the cocoa and chocolate industry (International Cocoa Organization, 2014). In the recent years, quite stagnant production quantities of the producing countries confirm the aforementioned challenges; in 2017/2018 season, global cocoa beans production was 4.6 million metric tons, compared to forecast 4.8 million metric tons in 2019/2020 season (International Cocoa Organization, 2020b). The bright side of the coin is that these challenges bring prospects for countries which attempt producing more, probably with the condition that they should be able to sustain their production levels.

Mapping the Cocoa-Chocolate Global Value Chain

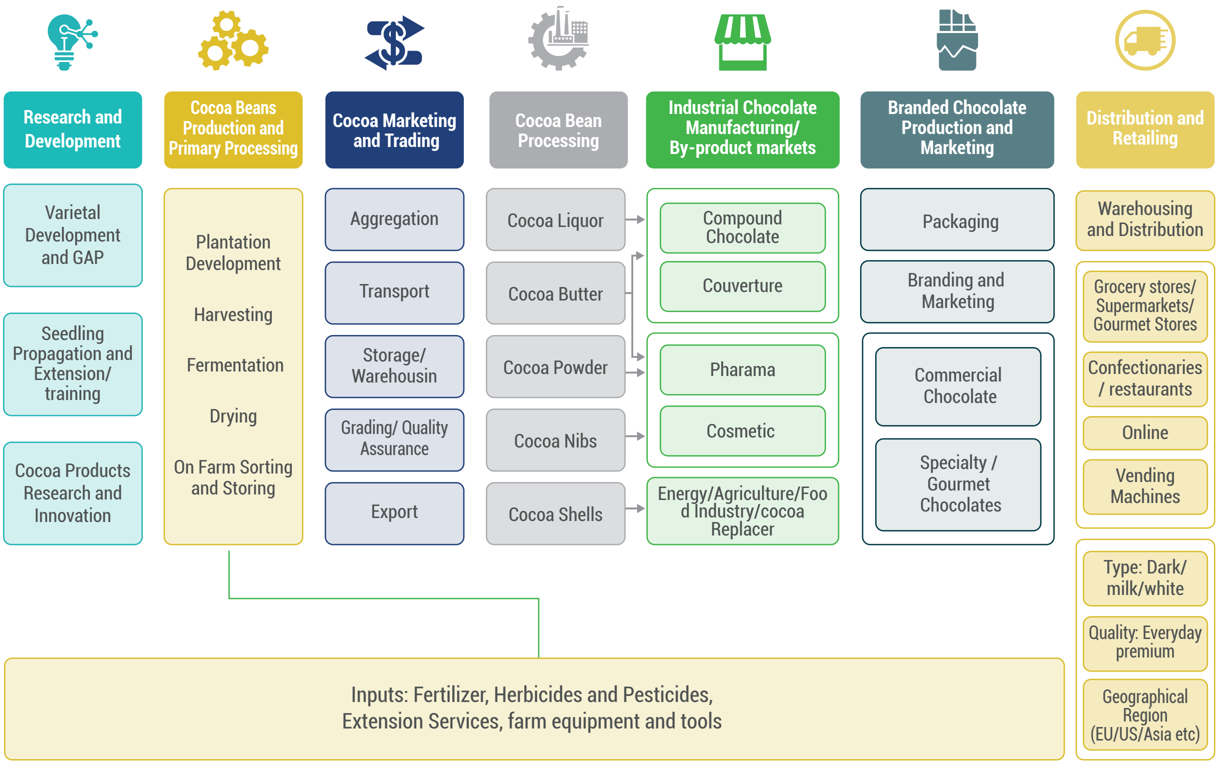
The cocoa-chocolate value-chain is organized as a GVC, with several countries and firms from across the globe involved in production, processing and end markets through trade and production/ service networks. The GVC begins with breeding and production of cocoa seedlings, which are used to plant cocoa trees. The cocoa beans harvested from

1. **Commodity Boards** are established for the export promotion of primary and traditional items of export in the country. (Commodity Boards, Functions, Kinds of Commodity Boards in India, 2020)
2. Black pod disease is caused by many different Phytophthora pathogens all expressing the same symptoms in cocoa trees. If it is not treated, it can destroy all yields; annually the pathogen can cause a yield loss of up to 1/3 and up to 10% of total trees can be lost completely. (Black pod disease, 2020).

these trees undergo various processing stages to reach end markets through various channels. Figure 1. provides a visual representation of the GVC, highlighting the key elements at each stage.

Research and Development: This stage of the value-chain mainly involves two key activities: (i) the development of improved cocoa seed varieties and farming methods; (ii) the propagation of the seedlings and farming techniques. The first stage in the value-chain is the development and propagation of seedlings for cocoa tree plantation in the local ecological context. This stage is critical as it provides the foundation for cocoa tree plantation. The varieties and farming techniques are major determinants of yields, plants resilience to biotic and abiotic stress, crop adaptation to climate change impacts, development of desired morphological and agronomical traits and to introduce sensory qualities that are critical for securing premium prices and fulfil bean quality requirements of manufacturers (Caobisco, 2015).

Figure 1. Cocoa-Chocolate Global Value Chain



Source: Authors, 2020. Formulation based on Hamrick et al., 2018.

The agricultural innovation system for this activity comprises of national research centers, which mainly lead the breeding activities; the international CGIAR research institutes such as International Institute of Tropical Agriculture (IIATA); regional and international networks, private universities and farmers. The development of new varieties takes a long time (5-10 years), require highly skilled manpower, access to a diversity of germplasm resources and knowledge on their traits, and significant funding over long years (Laliberte, 2012). While the government is the main funding provider, donors, lead firms and global research centers also support this activity.

The seed propagation and training on seedling development is also a joint effort of various stakeholders. It involves multiplication of the improved varieties in government or farmer-managed nurseries under closely monitored production systems. Typically, the seedlings are distributed at subsidized rates to farmers by government, donors or lead firms (Wessel et al., 2015). This activity requires medium-skilled workforce, the existence of public or private sector nurseries, comprehensive distribution network, and participatory extension system. Training of nursery owners on good production practices is critical in developing high-quality seedlings for distribution (Laliberte, 2012).

Cocoa Beans Production and Primary Processing: This stage in value-chain involves the production of cocoa beans and their primary on-farm processing, mainly undertaken by small family-run farms in developing countries. Cocoa beans are obtained from the cocoa tree, a perennial shade understory rain forest tree, which grows within 15-20 degrees of the equator. The cocoa tree bears fruits in around 2-5 years depending on the variety and ecology, with hybrid varieties maturing early. It has an average productive life of around 25-35 years. 90% of the production comes from small family-run firms, which also deploy seasonal labour (UNCTAD, 2001). The cocoa tree is fragile and requires routine weeding, fertilization, pruning, pest management, soil management, irrigation and drainage, windbreaks and appropriate shading. It is highly susceptible to extreme or erratic rainfall, long droughts, high or varying temperatures or humidity. Inappropriate management can lead to low productivity and infestation, which can result in nearly 30% loss of production (Cocoa Initiative, 2011).

The cocoa beans are harvested throughout the year, though there are two main seasons: a major season and a minor or mid-crop season (ICCO, 2014). Appropriate harvesting techniques are important to ensure long productive life of the tree. The harvested pods are opened to obtain beans, which are then fermented and dried. The dried beans are sorted to remove foreign material, packed in bags and stored in on-farm storages prior to their sale by the farmers. Drying and fermenting techniques are extremely important to develop the flavor and aroma characteristics in the beans (FAO, 2013). The processing methods need to be tailored to the variety, climate, quality and the technology used to undertake the process. Inadequate storage especially in humid environments can increase the moisture content of the beans and lower their quality, a common issue on many smallholder farms (FAO, 2013). The activities at this stage of the value-chain are labour-intensive and the options for mechanization for smallholders are limited and not feasible in most cases (Nieburg, 2015). This stage of GVC is being increasingly influenced by the lead firms in their bid towards quality improvement and sustainable and certified cocoa sourcing. It is also leading to the growth of certified or sustainably cocoa production, the market for which is estimated to have grown by 46% between 2008 to 2016, driven by lead firm practices (Voora et al., 2019). The type and quality of inputs used, and the agricultural practices of the farmers determine the quality of the cocoa and are important to obtain certifications. Training, thus, is important at this stage of the chain.

Cocoa Marketing and Trading: The cocoa marketing and export activities mainly involve aggregation of produce from smallholder farmers by local aggregators, who thereafter sell it to the final buyers (local processors or exporters). Some aggregators also provide further pre-processing services prior to the marketing of the crops. These agents are also a key conduit of extending input and credit services to farmers and major link in traceability programs. Several aggregators of various capacities could be involved in the supply chain, with each retaining its own margin, thus, reducing the farmgate prices received by the farmers. Where farmer cooperatives are well functioning and large, they sell directly to large aggregators/ exporters or export themselves to their partner buyers in foreign markets. In some countries, such as Ghana, the cocoa trading is a monopsony in the sense that the licensed buying agents supply all the produce to COCOBOD, the Government marketing company, which eventually exports directly to the foreign markets (ILO, 2019). Over the years, due to liberalization of markets, improvement in transport and storage technology, as well as high financing requirement, the trading of cocoa has become concentrated among very few large TNC firms, which control the market (ICCO, 1998). Given the increasing focus on sustainable sourcing, many of these TNCs have either established a strong partnership with local traders or have assigned their local agents or set-up market centers for procurement of cocoa from origin countries.

Cocoa Beans Processing: The next stage in cocoa-chocolate value-chain is the production of semi-finished cocoa products mainly through roasting, winnowing and grinding. There are five key products that are produced as a result of this process: cocoa paste, cocoa butter, cocoa cake/ powder, cocoa shells/ husks and cocoa nibs. Cocoa butter is the highest traded commodity, with a total export value of US$5.4 billions in 2018, followed by cocoa paste at US$2.8 billions and cocoa powder at US$2.3 billions; the export of cocoa shells/ husks only amounted to US$181 million (UNComtrade, 2020a). Cocoa paste and butter are major ingredients in chocolate manufacturing and are mainly sold to chocolate manufacturers, with a small amount of cocoa butter destined for cosmetic and pharma industry. Cocoa powder is used in making chocolate-based drinks or confectionaries in beverages and bakery industry.

The roasting and alkalization process used in the production of these products are key determinants of the quality and taste of semi-processed products (Rocha et al, 2017). The acceptability of these products in the international market is determined by the adoption of Good Manufacturing Practices (GMPs) and food safety requirements for end destination, which require a deep understanding of the buyer requirements (CBI, 2018). The process itself is capital intensive, the direct employment impact is moderate mainly in the form of improvement in job quality, and margins are low thus requiring large scale. Reliable electricity, availability of packaging material, skilled labor and affordable finance are key determinants of competitiveness at this stage (ILO, 2019). Traditionally, this stage of the value-chain was undertaken by importing countries in Europe and the U.S. to control the process, quality, cost, just-in-time delivery requirement of downstream manufacturers and short life. However, due to advancement in storage and transport technologies, relatively simple industrial capability required, and to capture new regional and 'single-origin' markets, origin grinding is also increasing (46%). However, these grinding activities are also controlled by the large trading companies, which serve as a hub for re-export within the main end-buyer markets, mainly in Europe (CBI, 2016).

Industrial Chocolate Manufacturing: This typically penultimate stage in branded chocolate manufacturing involves the mixture of cocoa paste, cocoa butter and other ingredients, mainly sugar and milk, to produce couverture or compound chocolate. Couverture is high-quality chocolate which contains a high percentage of cocoa butter, while compound chocolate is low quality which uses vegetable fats and sweeteners. The key processes at this stage include refining and conching, which along with the recipes used to determine the final chocolate quality (UNCTAD, 2016). After conching, the industrial chocolate is shipped to bakeries, confectionaries, and branded chocolate makers in bulk or molds for use in the production of consumer products. While overtime, majority of the industrial chocolate processing is undertaken by the integrated trader- grinder firms (almost 50%), a significant part is still undertaken by the branded chocolate manufacturers in-house (85% of their requirement) due to the specialized and often proprietary nature of the activity, and to maintain quality, consistency and competitive edge (Neilson et al., 2018). Traditionally, this stage of the value-chain was conducted in Europe or American markets, though the chocolate manufacturers have expanded in other growing or origin markets where consumption is increasing at a faster pace.

Branded Chocolate Production: The industrial chocolate is processed using specialized recipes to produce consumer chocolate products by branded chocolate makers. This is the highest value-adding activity in the entire cocoa-chocolate value-chain (UNCTAD, 2016). The manufacturers at this stage can be differentiated by commercial brand chocolate makers and gourmet or fine chocolate makers, which produce very high quality and serve niche market though their share remains small at 5% (FCIA, 2020). This stage of the value-chain prizes innovation, market share, and quality, brand differentiation and product offering. Most of the firms are concentrated in Europe and America, though growing consumers markets have led to some expansion in other regions especially Asia and the Middle East. This is one of the fastest-growing segments of the value chain, with specialty, healthy and certified chocolates being the growing markets (Statista, 2020). The firms operating at this stage control the marketing activities through strong collaboration with supermarkets or distribution companies (Neilson et al., 2018).

Distribution and Retailing: The last segment in the value-chain is distribution and retailing to end markets. Given the impulsive nature of chocolate demand, the chocolate retailing is done through various channels, with easy access to potential buyers, including supermarkets, grocery stores, pharmacies, restaurants, cafes, vending machines, and other means. In most countries, supermarkets remain the key sale point. Some luxury brands, such as Mars and Lindt, have also established their own retail outlets to increase brand loyalty. In addition, e-markets and online sale channels have also emerged as new platforms for retail (UNCTAD, 2016). Improvement in cold chain capabilities is a critical factor for the integrity of the chocolate distribution network and reaching to remote markets in growing emerging markets.

Global Supply and Demand in the Cocoa-Chocolate Global Value-Chain

This section focuses on the developments in the global supply and demand of the cocoa-chocolate GVC to analyze emerging trends. The global trade in cocoa-chocolate GVC reached around US$49 billions in 2018. The total volume of cocoa bean imports grew on an average by 2.7% annually between 2010-2018 (UNComtrade, 2020a). African countries continue to dominate the cocoa bean supply, though re-exports from major trading hubs in Europe is also a marked feature of the market. However, direct import from several European and emerging markets is on the rise, often offering price premiums (CBI, 2019). Certification is gaining an increasingly important aspect in the trade of beans. Due to the rise of origin grinding, the market for semi-processed products is less concentrated, with a growing share of producing countries in exports. Europe

and North America remain the key producers and consumers of chocolate, though the share of developing countries is increasing driven by rising incomes of consumers. However, 75% of the world chocolate is consumed in the country where it is manufactured (Neilson et al., 2018).

Global Supply: Production of cocoa beans is highly concentrated in developing countries of Africa, Latin America and Asia. Africa is the largest producer accounting for nearly 76% of the total production in 2019 (Statista, 2020). Cote d'Ivoire is by far the largest producing country accounting for 42% of total production in 2017. Top two producers (the second being Ghana) accounted for nearly 61% of the total world production (ICCO, 2018). The chocolate supply has remained concentrated in Europe and the U.S., which are home to some of the lead chocolate manufacturers. The cocoa-chocolate GVC export volume increased at a CAGR of 3.6% since 2010 and was valued at US$49 billions in 2018 (UNComtrade, 2020b). Chocolate is the leading export commodity by value in GVC accounting for 61% of the total exports value, followed by cocoa beans at 17%. Tables 1., 2. and 11. to 13. present the top ten exporters by value in different segments of the value chain over the period 2010-2018.

The export of cocoa beans is dominated by top producers, who have experienced increased market consolidation and compete on volume in the bulk cocoa market. As presented in Table 1., Cote d'Ivoire and Ghana have consistently been the top exporters of cocoa beans. Their cumulative share of global exports has increased from 42% in 2010 to 67% in 2018 (UNComtrade, 2020b). Indonesia, which maintained a 15% export share in 2010 has experienced a decline accounting for only 1% in 2018. This can be attributed to increased local grinding due to government taxation policies as well as a 36% fall in production owing to pests and diseases (PwC Nigeria, 2020). On the other hand, Ecuador has fast emerged as the third-largest exporter mainly supplying fine cocoa beans (Amores et al., 2007). The introduction of new varieties, entry into bilateral and multilateral trade agreements with the U.S. and EU, and efforts of ANECACAO, the national cocoa association, were key in this respect. Nigeria is also among the top ten exporters though its share has continuously declined from 13% in 2010 to 4% in 2018.

The share of producing countries in semi-processed exports has risen due to the trend towards 'origin grinding', while chocolate manufacturing and exports remain highly concentrated in Europe and the U.S. As the largest global producer of cocoa beans, Cote d'Ivoire achieved to shift into higher-value stages of the chain. It has been one of the top two cocoa paste exporters since 2010 (Table 11.). Similarly, since 2010 while Indonesia's cocoa beans exports and production declined, it has risen as a major cocoa paste and butter exporter (Table 1., Table 11., Table 12.). In terms of cocoa paste, butter and powder exports, the major competitor of these developing countries is the Netherlands. The rise in origin grinding is driven by the taxation on unprocessed bean exports, favourable investment policies of producing countries, need by lead firms to have greater control over sourcing and supply, cost imperatives, and rising regional markets, especially in Asia (UNCTAD, 2016). The highest value add activity in the GVC, chocolate manufacturing, remains largely grounded in Europe and North America. Germany and Belgium have consistently been the top two exporters (Table 2.).

Table 1. Top Ten Exporters of Cocoa Beans, by Value (US$), 2010-2018

Exporter	Export Value (US$ million)					Export Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**8,015.95**	**10,043.68**	**7,312.02**	**8,844.35**	**8,547.73**	**100%**	**100%**	**100%**	**100%**	**100%**
Cote d'Ivoire	2,492.52	2,324.95	3,045.10	3,060.00	3,253.07	31%	23%	42%	35%	38%
Ghana	847.38	1,967.76	--	1,886.22	2,437.19	11%	20%	--	21%	29%
Ecuador	350.20	346.19	587.53	621.97	665.18	4%	3%	8%	7%	8%
Belgium	292.16	340.60	435.32	609.16	543.00	4%	3%	6%	7%	6%
Netherlands	384.66	413.14	609.91	438.69	444.23	5%	4%	8%	5%	5%
Malaysia	--	--	293.04	276.49	353.49	--	--	4%	3%	4%
Nigeria	1,048.00	3,033.00	627.03	230.74	302.06	13%	30%	9%	3%	4%
Peru	--	--	152.84	202.33	159.00	--	--	2%	2%	2%
Estonia	123.04	158.60	--	--	75.34	2%	2%	--	--	1%
Indonesia	1,190.74	384.83	196.49	--	72.44	15%	4%	3%	--	1%
Cameroon	610.99	394.83	563.63	669.61	--	8%	4%	8%	8%	--
Dominican Rep.	164.52	173.95	212.12	227.94	--	2%	2%	3%	3%	--

Source: UN Comtrade, 2020
Note: HS 2002-1801; downloaded 04/02/2020

Table 2. Top Ten Exporters of Chocolate, by Value (US$ million), 2010-2018

Exporter	Export Value (US$ million)					Export Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**20,137**	**24,162.00**	**27,961.70**	**26,572.21**	**29,295.46**	**100%**	**100%**	**100%**	**100%**	**100%**
Germany	3,494.97	4,013.54	4,964.28	4,553.91	5,208.90	17%	17%	18%	17%	18%
Belgium	2,261.85	2,487.16	2,952.84	2,958.32	3,094.73	11%	10%	11%	11%	11%
Italy	1,291.69	1,606.32	1,713.67	1,649.99	2,078.53	6%	7%	6%	6%	7%
Netherlands	1,184.41	1,704.05	1,989.12	1,859.06	2,018.10	6%	7%	7%	7%	7%
Poland	888.77	1,099.53	1,405.25	1,552.31	1,736.03	4%	5%	5%	6%	6%
U.S.	1,035.49	1,376.05	1,646.53	1,609.73	1,673.97	5%	6%	6%	6%	6%
Canada	889.63	1,019.48	1,199.65	1,467.65	1,442.67	4%	4%	4%	6%	5%
France	1,327.79	1,522.64	1,617.43	1,430.74	1,424.20	7%	6%	6%	5%	5%
United Kingdom	582.46	817.59	935.86	868.94	966.26	3%	3%	3%	3%	3%
Switzerland	743.51	763.08	869.53	802.16	863.63	4%	3%	3%	3%	3%
Nigeria	5.55	4.29	0.22	0.17	1.69	0%	0%	0%	0%	0%

Source: UN Comtrade, 2020
Note: HS 2002-1806; downloaded 04/02/2020

Global Demand: The global demand for chocolate products has grown significantly, with the global market reaching US$108 billions in 2019 (Statista, 2020). The value of imports for chocolates has also grown by 47% over the period 2010 to 2018 with a CAGR of around 5.18% (UNComtrade, 2020a). The chocolate confectionery segment has the highest value of imports across all cocoa products amounting to US$28 billions in 2018 (Table 4.). The total imports of cocoa paste, butter and powder stood at US$3.17 billions, US$5.43 billions and US$2.27 billions in 2018 respectively (Tables 14. to 16.). The growth in the chocolate market has driven the demand for cocoa beans. The cocoa beans demand has increased by 27% in terms of volume between 2010 and 2018 (UNComtrade, 2020b). However, the total import values of cocoa beans have remained largely consistent over the last decade, averaging around US$9.35 billions from 2010-2018 period owing to price fluctuations (Table 3.). The main growth geographies are traditional chocolate manufacturing countries as well as new growing markets mainly in Asia. Within the bulk cocoa category, certified cocoa imports are growing significantly, and origin sourcing is rising (CBI, 2019). The import of chocolate is more diversified globally and the market is less consolidated with the share of developing countries gradually growing and top-10 importers accounting for 53% of total imports.

Cocoa beans are imported mainly by key global grinding centres, located in Western Europe and the U.S., though demand from Asian markets with growing grinding industry and direct imports from Eastern Europe and Nordic countries is increasing, with opportunity for price premiums. The import market is consolidated with top-10 importers accounting for nearly 80% of the total imports in 2018. The Netherlands, the United States and Germany were the top three importers for almost the entire last decade, accounting for around 46% of total imports in 2018 (UNComtrade, 2020b). The Netherlands plays a central role in the value chain, present in almost all segments. It is a major European trade hub and reexports nearly 50% of the imported total beans to other European markets (CBI, 2019). It is also one of the fastest-growing markets, with imports increasing by 43% in value and 100% in volume between 2010 and 2018. However, in recent years, direct imports from several European countries, especially in Eastern Europe and Nordic, such as Austria, Bulgaria, Slovakia, Finland, Norway and the Czech Republic has grown. These markets also offer price premiums as most of the companies directly importing deal in high-quality chocolate. Some other small markets in the Middle East and Asia also provide similar incentives. In Indonesia, the total imports of cocoa beans rose by nearly 500% between 2010 to 2018. The growth in imports in Indonesia can be attributed to three key factors: (i) rising local (S-GE, 2019) and regional demand for chocolate confectionery in the Asia region (Euromonitor International, 2017); (ii) growth in grinding industry (CBI, 2019); and (iii) decline in local production (Statista, 2019).

There is a growing demand for high value certified beans, especially UTZ certification (which merged with Rainforest alliance recently) for bulk cocoa, in major importing markets. The voluntary sustainability standards (VSS) compliant cocoa experienced a CAGR of about 46% between 2008 and 2016, accounting for nearly 29% of the total cocoa produced (Voora et al., 2019) and 22% of total cocoa traded (WCF, 2017). Majority of this production came from Africa led by Cote d'Ivoire and Ghana, which supply 70-80% of certified cocoa beans (Lernoud et al., 2018). Though not fixed and often negotiated, 15-25% of the premium is typically common and explains the high price (around 29%) received by Ghana and Cote d'Ivoire exports compared to other African countries (CBI, 2019). Several lead traders and manufacturing companies have committed to sourcing 100% sustainable cocoa by 2020. The full adoption of sustainability standards by lead firms would make it increasingly difficult for non-certified suppliers to access the import markets (Voora et al., 2019).

Though imports of semi-processed products and chocolate are mainly to developed countries, the fast growth markets are mainly in developing countries in Eastern Europe, Asia, and the Middle East. Germany, Netherlands, and the U.S. are the largest importers in all cocoa product segments. The growth in developed countries imports for semi-processed products is driven by rising demand by the end buyers in developing countries. However, there are still some growing markets in Western Europe, such as Belgium, Italy and Spain which have experienced strong growth in imports mainly owing to rising local chocolate manufacturing industry (CBI, 2020). In semi-processed products, Malaysia is a fast-growing market, experiencing a CAGR of 16% between 2010-2018 for cocoa butter. Apart from the traditional top importers, Poland, Turkey, Japan, China and Singapore have also risen as emerging players in semi-processed imports since 2016. A similar trend can be noticed in the chocolate segment, where developing countries such as China, Brazil, Saudi Arabia, Poland, Romania, Morocco, UAE, South Africa are among the fastest-growing markets. The total imports of Nigeria have also grown considerably, almost doubling between 2016-18 (UNCTAD, 2020). Rising incomes and changing consumer preferences will continue to drive growth in developing countries in the coming years.

Table 3. Top Ten Importers of Cocoa Beans, by Value (US$ million), 2010-2018

Importer	Import Value (US$ million)					Import Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**9,426.24**	**8,416.22**	**9,447.06**	**10,310.15**	**9,160.60**	**100%**	**100%**	**100%**	**100%**	**100%**
Netherlands	1,698.95	1,679.71	1,853.12	2,550.03	2,426.26	18%	20%	20%	25%	26%
U.S.	1,292.20	1,033.81	1,354.14	1,327.80	990.25	14%	12%	14%	13%	11%
Germany	1,126.49	1,028.12	764.83	1,092.69	844.78	12%	12%	8%	11%	9%
Malaysia	971.68	877.53	916.78	653.92	787.85	10%	10%	10%	6%	9%
Belgium	578.23	596.97	873.25	1,003.83	592.91	6%	7%	9%	10%	6%
Indonesia	--	--	341.44	--	528.95	--	--	4%	--	6%
France	480.76	388.03	436.07	485.47	419.07	5%	5%	5%	5%	5%
United Kingdom	447.33	281.32	--	--	264.47	5%	3%	--	--	3%
Italy	275.78	283.27	296.39	312.20	256.10	3%	3%	3%	3%	3%
Spain	310.78	237.75	341.00	350.05	227.62	3%	3%	4%	3%	2%
Turkey	--	243.18	--	281.92	--	--	3%	--	3%	--
Singapore	291.75	--	269.61	268.97	--	3%	--	3%	3%	--
Nigeria	0.10	0.69	3.58	0.27	0.09	0%	0%	0%	0%	0%

Source: UN Comtrade, 2020.
Note: HS 2002 – 1801; Downloaded 04/01/2020.

Table 4. Top Ten Importers of Chocolate, by Value (US$ million), 2010-2018

Importer	Import Value (US$ million)					Import Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**19,227.21**	**22,964.86**	**27,090.70**	**25,957.90**	**28,338.09**	**100%**	**100%**	**100%**	**100%**	**100%**
U.S.	1,741.96	2,074.26	2,319.66	2,660.41	2,748.02	10%	9%	9%	10%	10%
Germany	1,710.13	2,030.61	2,606.86	2,376.31	2,561.79	9%	9%	10%	9%	9%
France	1,656.01	1,805.23	2,065.79	2,109.78	2,233.42	9%	8%	8%	8%	8%
United Kingdom	1,549.53	1,713.23	2,215.55	1,937.53	2,134.47	8%	7%	8%	7%	8%
Netherlands	747.48	926.38	1,236.73	1,187.05	1,331.06	4%	4%	5%	5%	5%
Canada	757.02	856.51	938.69	963.10	1,022.30	4%	4%	3%	4%	4%
Belgium	519.23	633.82	798.84	845.35	957.15	3%	3%	3%	3%	3%
Poland	--	--	--	647.90	843.14	--	--	--	2%	3%
Spain	567.82	--	652.75	615.26	665.74	3%	--	2%	2%	2%
UAE	--	--	--	--	638.27	--	--	--	--	2%
Japan	--	626.08	656.00	--	--	--	3%	2%	--	--
Italy	521.27	575.61	632.28	--	--	3%	3%	2%	--	--
Russian Federation	612.94	825.96	--	--	--	3%	4%	--	--	--
Saudi Arabia	--	--	--	601.58	--	--	--	--	2%	--
Nigeria	7.95	7.03	21.14	10.79	18.21	0%	0%	0%	0%	0%

Source: UN Comtrade, 2020.
Note: HS 2002 – 1806; Downloaded 04/01/2020.

Lead Firms and Governance Structures in the Cocoa-Chocolate GVC

The cocoa-chocolate GVC is a buyer-driven market. Power is concentrated in downstream actors, mainly transnational cocoa traders and chocolate manufacturers. This governance structure has evolved as a result of three major trends: (i) liberalization of the market in cocoa producing states in the mid-80s; (ii) horizontal integration of manufacturers; and (iii) vertical integration among traders (Fold, 2002). Most lead traders also undertake semi-processing with some moving into industrial chocolate manufacturing, which makes it difficult for cocoa-producing countries to move up the value-chain without partnering with these lead firms. Further, chocolate manufacturers are increasingly getting engaged in direct sourcing. This trend provides an opportunity for cocoa producers to establish direct link with chocolate manufacturing firms to obtain better prices for their produce. However, this trend has further consolidated power in the GVC and increased power asymmetries between farmers and lead firms. Few key aspects of the governance in the GVC are outlined below.

Cocoa producers, who are mainly smallholders have quite limited power in the chain and must adhere to the standards and requirements of the lead firms. 90% of cocoa is produced by smallholder farmers working on less than 5 ha of land. The lack of understanding of quality requirements, little access to market and market information, weak organization, lack of income to buy necessary inputs and limited knowledge of improved farming techniques, especially for certified products puts these farmers at a very weak bargaining position in comparison to other players in the value-chain (Wegner, 2012). These farmers often rely on local aggregators or agents of lead company traders for credit, inputs, and transport of their produce. Estimates from Fairtrade Foundation (Fairtrade, 2011) suggest that their market power has declined over the years. Cocoa growers receive around 6% of the price of chocolate compared to around 16% in the late 1980s (the era of government marketing boards). More recently, the efforts by lead companies and traders to establish a long-term relationship with farmers for sustainable sourcing has given some space to these farmers to negotiate around prices though it also risks strengthening the existing captive relationship (Oomes et al., 2016).

The power in cocoa-chocolate GVC is held by two sets of transnational lead firms: (i) the traders/ grinders (cocoa processors) and (ii) branded chocolate manufacturers, mainly headquartered in Europe and North America. The top-5 traders/ grinders, Barry Callebaut, Olam, Cargill, Ecom, and Sucden accounted for nearly 88% of the total cocoa trade in 2017 and six manufactures (Mondelēz, Nestlé, Mars, Hershey, Ferrero, and Lindt) control about 60% of the chocolate market share (Statista, 2017) and use about 40% of all cocoa produced (IISD, 2019). Most of these lead firms are global businesses, operate diversified product lines, have very large scale and strong financial capabilities. The market control, economies of scale and scope, and research capabilities of these firms to develop new products and processes enable them to create barriers to entry for new firms. In this bipolar governance, lead chocolate manufacturers still have the upper hand given their brand recognition, loyal consumer base, ability to set product standards, and product innovation capacity. However, the processors have started to consolidate their power by venturing into the higher end of value-chain, including in industrial chocolate manufacturing. Table 5. provides key characteristics of lead firms with additional details in Tables 19. and 20.

The lead processing firms have increasingly consolidated power through vertical and horizontal integration along the value-chain creating significant entry barriers for new firms. The integration of trading, grinding and more recently industrial chocolate manufacturing under one firm has led to the bipolar governance structure in GVC (Fold, 2002). This integration of activities emerged due to significant market concentration that took place in chocolate manufacturing and the lead manufacturers tendency to interact with processors with large capacities and supply chain capabilities (Dand, 2011). The ability of the large processors to meet the quantity, quality and in-time supply needs of chocolate manufacturers have meant the consolidation of power among large sophisticated global processors with supply chain management capability who strengthened their share through mergers and acquisitions (such as the buy-out of ADM cocoa processing business by Olam International in 2014). The market consolidation was further facilitated by technological improvements in bulk cocoa transport and improvement in processing technologies, which favored the large traders and processors (Kaplinsky, 2004). More recently, these firms have consolidated their market share by entering industrial chocolate production and now control 70% of the open market (Abdulsamad et al., 2015). The unique capabilities of lead processing firms make it very difficult for new firms to enter this market without partnering with the lead firms. These lead firms exert power through their well-established global supply chain capabilities, global logistics and industrial network, production experience, R&D, economies of scale (grinding is high volume, low margin business) in operations and strong presence in both buyer and consumer markets (Fold, 2002).

Lead processors also control access to the buyer markets by acting as reliable cocoa ingredient supply chain managers and have developed long-term partnerships with lead manufacturing firm's (Neilson et al., 2018; Abdulsamad et al., 2015). These processors are the main supplier of cocoa ingredients to leading manufacturers. They work closely with the manufacturing firms to develop tailored cocoa products as well as to modify and improve their sourcing strategies to fulfil the needs of manufacturers. The increasing consumer trend towards healthy, organic, traceable, single-origin and environmentally friendly chocolates has forced the grinders to establish greater control over their supply chains at the demands of the manufacturers by establishing their own corporate sourcing programs such as Barry Callebaut Forever Chocolate Program (Statista, 2019). Further, the increased trend of UTZ and Fairtrade certified sourcing by all major traders/ grinders is driven by the demands and strategies of the chocolate manufacturers for sustainable sourcing of inputs. The need to meet the quantity, quality and sourcing requirements of lead manufacturers made it imperative for the traders to consolidate their sourcing networks over time (Dand, 2011). These processors have established strong local sourcing operations often involving local intermediaries and farmer cooperatives through which they control the farm gate prices and influence and support production processes (Fold, 2002).

The need to have increased control over the supply chain has led to an increase in origin grinding by lead processors which offers value-addition opportunities for cocoa-producing countries. The proportion of origin grindings has increased from 25% in 2002-03 to 44% by 2015-16 (ICCO, 2012; 2017). The relative lack of industrial capacity required, cost imperative, the need for tighter control oversupply, and investment/ trade policies of producing countries have led to the growth of origin grinding (Neilson et al., 2018). The demand from chocolate manufacturers for sustainability and improved supply chain management functions has also driven this trend (Neilson et al., 2018). The trade policy in attracting FDI from lead firms in producing countries is significantly important. For instance, the export tax levied by Indonesia on raw cocoa beans in 2010 resulted in new investments in processing facilities by Barry Callebaut and Cargill (Firdaus et al., 2014).

Lead Firms in branded chocolate manufacturing have also globalized their manufacturing and branding operations, though interfirm partnerships stay strong (Neilson et al., 2018). The competitive imperative to capture market power in emerging markets has led to the development of new manufacturing facilities closer to customers. For instance, major lead firms such as Nestle, Mars, and Mondelez established plants in China in the 1990s to capture the growing market. The decisions of regional expansions by lead manufacturing firms are driven by several factors. The paramount factor is the local/ regional market demand, followed by other institutional considerations such as availability of key raw materials, especially milk and sugar (Mada & Wisnumurti, 2007), reliable energy, logistics and storage infrastructure including cold storage distribution network, skilled human capital and favorable trade policies (Neilson et al., 2018). Wherever the firms have expanded operations, it has mainly been done through intrafirm coordination and expansion by undertaking foreign direct investments rather than interfirm collaboration. This is imperative to safeguard industrial recipes and to ensure consistency in quality. Apart from grinding operations, most of these firms have retained industrial chocolate production in house and do not source from lead processors who mainly serve the open market (Neilson et al., 2018). Regardless, despite this general trend, some of the high-end brands, such as Ferrero Rocher and Lindt, have continued to manufacture their flagship brands from their European plants to avoid any taste variation from locally sourced ingredients or processes and often engage in all segments of the chain.

The sustainable sourcing commitments by lead manufacturing firms both open stronger direct partnership opportunities with farmers but also put non-compliant producers at risk of losing the market (Barrientos, 2015; Fairtrade Foundation, 2016; Lamb, 2014). Recently, lead firms have been faced by growing concerns over future cocoa supply, sustainability concerns, child labor issues, and environmental concerns. These factors have given rise to supply chain traceability and certification trends (ISID, 2018). As a result, lead firms are increasingly engaging with the cocoa farmers either directly or through their intermediary suppliers, requiring the adoption of sustainable practices and adopting corporate sustainability programs. Major lead manufacturers such as Nestlé, Olam International, and Lindt & Sprüngli also enter into direct relationships with farmers by providing inputs like seeds and fertilizers, training, and/or credit and directly sourcing from them under contract arrangements (Ros–Tonen et al., 2015). Most lead firms undertake these activities as part of implementing their own sustainability commitment, such as Mondelez Cocoa Life Sustainability Program launched in 2017; Mars Cocoa for Generations program, and Nestlé Cocoa Plan.

Public governance trends in producing countries are shifting power. Due to the rising demand for chocolate and the geographical specificities of cocoa production, producing countries hold a unique advantage in controlling supply. Recently, Ghana and Ivory Coast collaborated to push for an increase in the price of cocoa by US$400 per ton in 2019 (Reuters, 2019). Such collaboration of producing countries, especially in Africa could pave the way for shifting some value from the traditional chocolate manufacturers to the cocoa producers through collective bargaining efforts.

Table 5. Lead Firms in Cocoa- Chocolate Value-chain (Summarized)

Lead Chocolate Manufacturers				
Firm	**HQ**	**Revenue, US$ million (2018)a**	**Sourcing Strategy**	**Key Brands**
Mars	U.S.	37000.0	- Cocoa for Generation Plan - 100% sustainable by 2025	M&M's, Snickers, Galaxy, Dove, Mars, Twix, Maltesers Bounty
Lindt	Switzerland	4576.7	- Lindt & Sprüngli Farming Program - 100% traceable sourcing by 2020	Lindt, Ghirardelli, Caffarel
Ferrero	Italy	12,626.0	- F-ACTS sustainable sourcing program - 100% sustainable by 2020	Nutella, Kinder, Ferrero Rocher, Raffaello, Golden Galery
Hershey	U.S.	7,791.1	- Cocoa For Good - 100% sustainable sourcing by 2020	Hershey's, Kisses, Reese's, Kit Kat, Cadbury
Mondelēz	U.S.	25,938.0	- Cocoa Life - 100% sustainable sourcing by 2020	Cadbury, Dairy Milk, Milka, Toblerone

Lead Traders/ Processors				
Firm	**HQ**	**Revenue, US$ million (2018)a**	**Geographic Scope**	**Sourcing Strategy**
Olam	Singapore	7,711	60 countries, including Nigeria, where it has processing facilities and branded food businesses.	- 11 producer countries directly; Africa a main source (including Nigeria), Asia and South America. - Cocoa Compass Initiative - 100% sustainable cocoa by 2020.
Berry Callebaut	Switzerland	7,195	Global (selling to 140 countries);	- Direct sourcing from cocoa origin countries from cooperatives including Ghana, Ivory Coast, Cameroon. - Forever Chocolate Program - 100% sustainable by 2025.
Bloomer Chocolate (Fuji Oil Holding)	U.S.	907	Mainly U.S.	- Direct sourcing from Cote d'Ivoire, Ghana, Indonesia, Ecuador. - Sustainable Origins Program - 100,000 MT of sustainable and traceable cocoa by 2020.
Cargill	U.S.; HQ of Cargill Cocoa and Chocolate in Schiphol Netherlands.	114,695	Chocolate and cocoa presence in 47 locations with sales globally.	- Cocoa Promise - 2030: full traceability and sustainability. - Sourcing countries: Brazil, Ghana, Cameroon Ivory Coast, Indonesia.
Puratos	Belgium	2,055	Global (sale to 100 countries) with local subsidiaries	- Cocoa Trace Program - Sourcing from: Ivory Coast, Ghana Vietnam, The Philippines, Papua New Guinea and Mexico
ECOM	Switzerland	7,200 (2016)	Processing facilities in Netherlands, Mexico and Malaysia with trading offices in all producing countrie	- Direct sourcing from countries: Mexico, Indonesia, Papua New Guinea, Ivory Coast, Nigeria, Cameroon, Ghana, Ecuador, Malaysia. - Sustainable management code and Supplier code of conduct.

Source: Authors, 2020. Based on the cited sources from the lead firms in the report.

Upgrading in the Cocoa-Chocolate GVC

Economic upgrading in GVCs allows firms or a country to become more competitive and capture greater value from their participation in GVCs (Humphrey & Schmitz, 2002). In agricultural GVC, such as cocoa-chocolate, this can be achieved in multiple ways. Various countries have pursued different upgrading strategies to improve their position in the GVC in the past. These strategies have varied from improving the productivity of cocoa beans (process upgrading) to increasing the share of certified beans in export (product upgrading), to moving from production into semi-processing (functional upgrading) among others. Table 6. provides a summary of key upgrading strategies that have been pursued by the countries in coco-chocolate GVC.

Table 6. Examples of all major upgrading trajectories

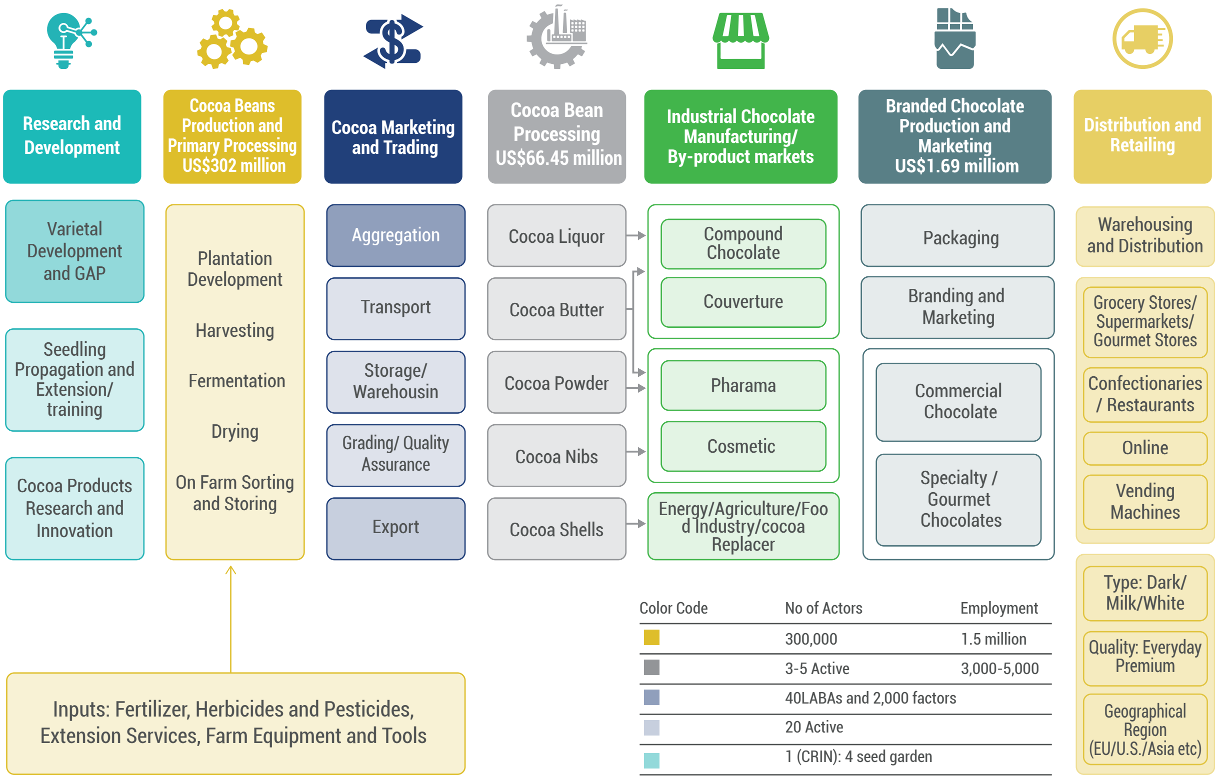
Upgrading trajectory	Description	Example
Process Upgrading	Increasing efficiency of cocoa bean production or chocolate manufacturing by introducing new technology or production processes. In the case of cocoa beans, process upgrading is primarily focused on increasing the yield of cocoa.	Between 2009 and 2012, to increase productivity, the national confederation of cocoa producers in the Dominican Republic (CONACADO) together with several companies, implemented a program to educate farmers on pruning and encouraged the planting of new cocoa trees. Even before new plants reached maturity, the introduction of organic fertilizer, weeding and pruning had increased output by 77% (Fernandez-Stark & Bamber, 2012).
Product Upgrading	Producing high-value cocoa in the country, such as certified cocoa. This requires understanding and knowledge of the certification body requirement and often accompanies process upgrading.	UTZ has implemented a cocoa Program in Ghana since 2010 with the collaboration of producer groups. The purpose has been to improve smallholder cocoa productivity, incomes, working conditions. The groups were all certified by 2012. According to the independent impact evaluation on the Program: Certified farmers enjoyed a higher increase on their profit per kilogram than non-certified farmers (24% compared to 18%). Certification holders have also profited from a premium between 3% and 6% (Waarts et al., 2016).
Functional Upgrading	Moving into high-value/ high-skill operations in cocoa value-chain such as processing of cocoa in-country or chocolate manufacturing or retail. Most of these require industrial infrastructure and skills enhancement. Government trade policies also play a key role.	In Cote D'Ivoire, the government instituted tax incentives for grinders to set up operations in the country in the 1990s (Monnier, 2015). By 2016, 12 grinders with 720,000T of capacity were operating locally. Among those were the market leaders; Barry Callebaut, Olam International, Cargill and Cemoi. New policy initiatives include tax-incentives for grinders expanding their capacity, and a secondary market limiting access to the mid-crop to locally based grinders to improve their competitiveness (Monnier, 2016).
End Market Upgrading	Expansion into new markets which require a more specialized cocoa product, such as single origin chocolate or moving into new geographical markets such as retailing chocolate in growing Asian markets. Requires strong marketing and retail linkages/ skills.	First, in 2014, Mars Inc. set up megastore in Shanghai to take advantage of growing Chinese demand for chocolate (Freifelder, 2014). Afterwards, to expand into new end market segments involving even rural customers in China, Mars Inc. did a business partnership with Alibaba Group in 2016 to elevate the online shopping. Mars established an integrated online and offline business model to more effectively serve its hundreds of millions of new clientele in China (Mars Inc., 2016).
Chain/ intersectoral Upgrading	Supplying cocoa ingredients to other industries such as cosmetics or non-chocolate food industry or building a tourism experience around local cocoa or artisanal chocolate manufacturing.	In terms of tourism, in the Dominican Republic, the Ruta del Cacao seeks to link cocoa production and local cultures by offering tours of production areas and exhibitions on processing. It is complemented with traditional meals, dance and local art for sell. This is within the scope of pro-poor tourism, as attracted tourists allow cocoa-producing farmers to expand into new economic opportunities (Ashley et al., 2005).

Source: Authors, 2020. Partially based on Hamrick et al., 2017 and Hamrick & Fernandez-Stark, 2018.

1.2.2. Nigeria and the Cocoa-Chocolate Global Value Chain

Nigeria is the fourth-largest producer of cocoa beans, accounting for around 5.6% of total global production (ICCO, 2018). Cocoa is produced on around 800,000 ha by nearly 300,000 smallholder farmers on 2-5 ha of land. The production is undertaken in around 14 states in the South of Nigeria. The key cocoa-growing states include Ondo, Cross River, Osun, Ekiti and Abia. Two states, Ondo and Cross River provide nearly 72% of the total cocoa produced in Nigeria (PIND, 2019). Cocoa is the second largest non-oil export commodity, accounting for 30% of agricultural export, provides employment to around 2 million people and is a major source of foreign exchange earner (NEPC, 2020). Despite this importance, the cocoa sector has not experienced any significant growth. The production has remained volatile over the years while exports have remained concentrated in raw and fermented cocoa beans. The production is constrained by low yields and returns, while the processing industry is beset by a series of institutional and infrastructure challenges (PwC Nigeria, 2020). Efforts to revive the industry have been fragmented and institutional infrastructure is weak, which has led to non-coordinated efforts in revival of the industry. These aspects are further explored in the below sections.

Figure 2. Nigeria's Participation into Cocoa-Chocolate Global Value Chain

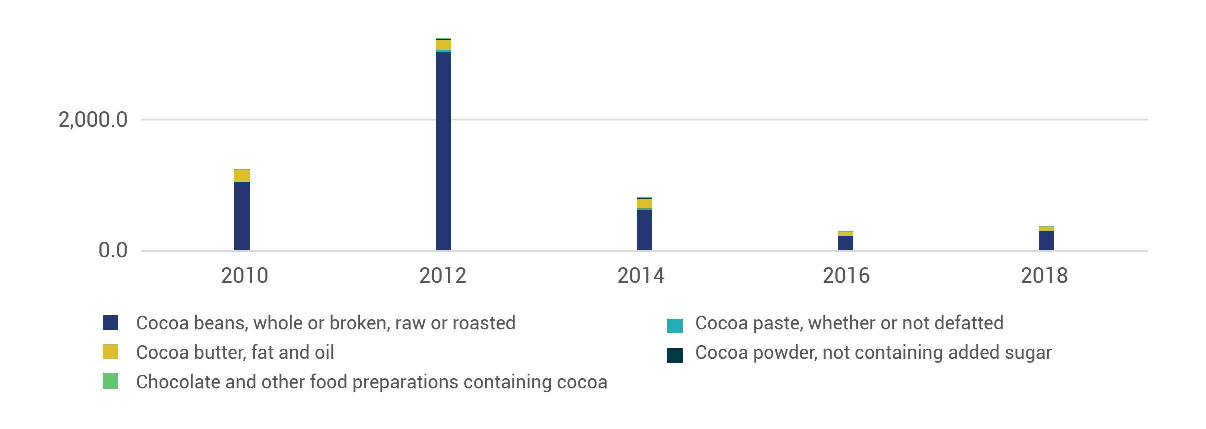


Source: Authors, 2020

Current Participation of Nigeria in the GVC

Nigeria participates in upstream segments of the value-chain, mainly through production and export of bulk category (Forastero) cocoa beans and at a small scale through the export of processed cocoa products. Only about 10-20% of cocoa beans are processed in-country, while the remaining are exported as either raw or fermented beans (PwC Nigeria, 2020). The red boundary rectangles in Figure-2 demonstrate Nigeria's presence in the GVC. Nigeria's exports of cocoa beans totalled US$302 million in 2018 (UNComtrade, 2020a). Overall, as noted in Figure 3., there has been a trend decline in Nigeria's total exports. Overall, the share of Nigeria in cocoa bean world exports fell from 13% in 2010 to 4% in 2018. The composition of export commodities has not changed much, with the second major export item being cocoa butter, whose export fell from US$184 million in 2010 to US$55 million in 2018. Compared to its competing exporters, Nigerian cocoa prices are around 30% lower mainly due to low quality as well as the fact that around 35% of exports were of raw beans. The price comparison is presented in Table 17.

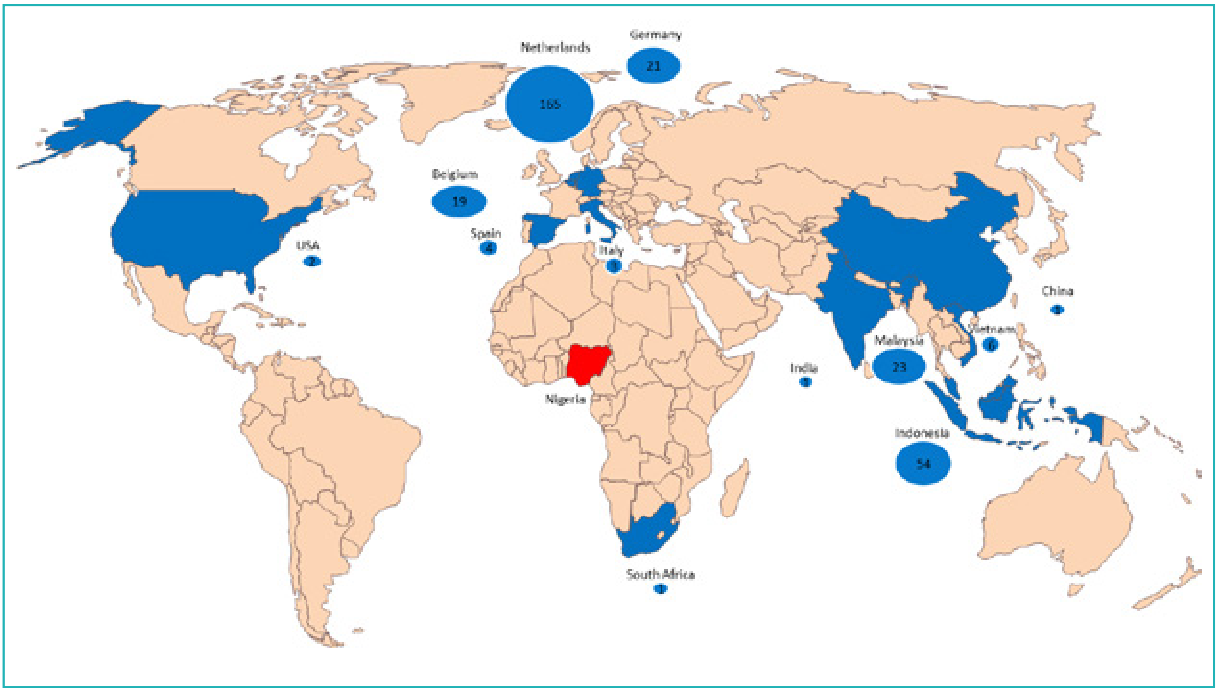
Figure 3. Nigerian Cocoa-Chocolate Exports Value by GVC Segment, US$ million 2010-2018[3]



Source: Authors, 2020. Based on UN Comtrade, HS2002- 1801; downloaded 04/16/2020.

Nigeria's exports have been more concentrated over the years. The top destinations for Nigerian beans in 2018 were Netherlands (US$165 million) followed by Indonesia (US$54 million), Malaysia (US$23 million), Germany (US$21 million) and Belgium (US$19 million). However, Nigeria exports all over the world as presented in Figure 4. The concentration of exports in top countries has increased from around 35% in 2010 to 86% in 2018. Further, an increasing number of Nigerian exports are destined for the Indonesian market, which generally has lower quality requirements and pays less price compared to European markets.

Figure 4. Nigerian Cocoa Beans Exports Value by Trade Partner, US$ million, 2018



Source: Authors, 2020. Based on UN Comtrade, HS2002- 1801; downloaded 04/16/2020.

3. Significant increase shown in 2012 can be attributed to data issues on UNComtrade as other sources (such as Global Trade Atlas) and reports do not report such an increase. It is not consistent with the total production volumes which were around 225,000 tons in 2012.

Employment and Human Capital

Cocoa-Chocolate value-chain employs over 2 million people in Nigeria, though the majority of the jobs are low paid (Brandspur, 2017). Majority of these jobs are concentrated at the production stage and are low paid and have low skill content. Around 300,000 smallholder farmers cultivate cocoa in Nigeria, with an average household size of around 10 (Adeola & Olawoye, 2014; Adesina, 2013; Segun, 2016). Given the labour-intensive nature of the activity, most of the farmers typically employ 5 workers in addition to an equal number of family members which also support farming (IITA, 2002). The employed labor is deployed under various structures, with dominant one being sharecropping (44%), while the remaining are in the form of household labor or hired/ seasonal labor on informal contracts (Oluyole et al., 2013). Majority of the farm labor is men, constituting nearly 70% of the labor force based on sample studies (Akanni & Dada, 2012). Children (10-18 years old) make up a significant portion of labor in farming activities at around 16%, with low participation by female labor force at 14%. The high engagement of child labor could pose problems in export/ growth of Nigerian cocoa as the lead players have started introducing stricter ethical standards in sourcing (ICI, 2020). There is also clear segregation of activities between male and female, with women largely involved in pruning and post-harvest activities including fermentation, roasting, packing and marketing activities (Oluyole et al. 2013; Penrhys-Evans, 2018). Demographically, most of the farmers and labourers are old, with various studies indicating the average age of around 46-50 years, with the young population not showing interest in farming due to low returns (Segun, 2016; Kyei et al., 2011; Idowu et al., 2007).

Despite the significant potential for employment creation in the cocoa sector, it is limited by both demand and supply-side constraints. On the demand side, large tracts of land suitable for cocoa production remain uncultivated. Nigeria is only exploiting less than a quarter of its total land suitable for cocoa production, which remains currently idle or is being released for palm oil estate plantations (CRIN, 2007). Significant employment can be generated by bringing more area under cultivation or intercropping cocoa with palm oil and creating profitable cocoa production rural enterprises over larger firms under the management of young farmers. Secondly, the low profitability and incentives of farm enterprises discourage farmers to employ the optimal number of laborers as plantation management is a very labour-intensive activity and necessitates hiring additional labor. Increasing the farmers' productivity, land security and profits would motivate them to invest more in their plantations and deploy more labor to undertake necessary maintenance activities. For example, Akani and Dada (2012) found that most farmers undertake insufficient pruning, weeding and fertilization due to the high cost of labor. On the supply side, poor farm wages and seasonal migration of laborers to urban areas for better income are the key determinants. Sample studies in Ondo state (Oluyole et al., 2013) and Osun State (Penrhys-Evans, 2018) found that the daily wage rate for various cocoa farming activities ranged between US$3.6-$5 (2013 and 2018 estimates) which is much lower than the daily wage rate in agricultural zones of Abuja at US$6.47 (Julius, 2012). Potential for employment generation in cocoa would rest upon making cocoa an attractive business enterprise, with farmers getting high prices and offering high wages to the labourers.

Processing sector, due to its capital-intensive nature and small size, generates few but high-paying jobs. Over the years, the processing sector has continued to shrink in terms of the number of firms due to various constraints (see further below), with only around 3-5 firms operational now (Guardian, 2018; PFI, 2019). According to the Cocoa Association of Nigeria (CAN) estimates, the close of 10 companies in the processing sector led to unemployment of around 6,000 staff (Guardian, 2018). However, Ghana's experience suggests that the potential for employment creation by expanding the processing sector may be limited. For example, Goodman (2017) estimates that a little over 1,293 workers are directly employed by the major processing companies in Ghana. This is a very low rate considering that the total installed processing capacity in Ghana is 431,000MT. Further, the number of employees per firm has been declining due to increased automation and low utilized capacity resulting from the high price of cocoa beans or lack of their availability.

Key Local Value-chain Actors and Governance:

The local value-chain of cocoa comprises of the large number of smallholder farmers, who do not have any power and are the price takers on one end, and a highly concentrated exporting companies segment, which dictate the price and quality standards and act as lead players. There are several intermediaries involved in getting the produce from farmers to buyers, mainly as Local Buying Agents (around 40 LBAs and 2,000 'factors' or small buyers), who coordinate the supply chain on behalf of the producers and a small processing segment. This governance structure has led to a captive market structure where exporters hold strong market power in fixing price and setting quality standards by passing on the cost of taxes and market inefficiencies to the producers. The fear of rejection of produce by exporters has also given rise to an increasing number of intermediaries which are the first market for farmers to sell their produce (FAO, 2013), resulting in weak relationships between exporters and farmers. The list of key firms working in Nigeria value-chain is provided in Table 7. and Table 21., with an elaboration of the governance structure.

Farmers: **Around 300,000 farmers who cultivate cocoa are the key players in the sector, though they do not hold any power and are constrained by low productivity.** They cultivate over an area of around 800,000ha in the Southern part of Nigeria, which offers excellent climate and soil conditions for cocoa production (Abayomi, 2017). The production systems are diversified, with cocoa inter-planted with other orchids such as plantain, oil palm, kola, avocado cashew, and native wild mangos. Food crops are also grown in farrows between trees (Dawn, 2017). This production system is ideal for smallholders to diversify their risks and secure food for the families. The production recently has fluctuated between 200-250 thousand tons (Figure 5.). As shown in Figure 6., the yields of cocoa are among the lowest compared to other countries (FAOSTAT, 2020). The yields are hampered (Figure 7.) by aging trees (with around 80% over 40 years old), lack of availability of improved seedlings, inadequate extension system, high loses to diseases (nearly 50%), outdated production practices, lack of use of fertilizer and insufficient management of farms (FAO, 2013). Studies also show that ageing farmers are reluctant to replant their old trees and slow in adopting new production practices (FAO, 2013). Under the current low yield productions system, cost of labor and cocoa prices are major determinants of profitability on cocoa farms with farmers often deploying less labor then optimal given its scarcity and thus high cost in rural areas (Oluyole et al., 2013). Around 30% of the produce in Nigeria has some form of certification, which is still much lower compared to Cote d'Ivoire and Ghana (IISD, 2018). Farmers are organized in cooperative marketing unions or associations, while they are represented at the national level under Cocoa Farmers Association of Nigeria (CFAN).

Licensed Buying Agents (LBAs): **LBAs are important actors in Nigerian value-chain and possess power in terms of coordinating the cocoa bean supply chain for exporters and processors.** These LBAs could either be individuals (called "factors"), companies or Cooperative Multipurpose Unions (farmer organizations). Several of the bigger LBAs are also involved in basic processing including proper drying and cleaning of beans after sourcing them from the farmers. They act as aggregators and coordinators of downstream value-chain from farms to merchant warehouses. The small farmers have no direct relationship with the processors and exporters in most cases, which rely on the network of LBAs for coordinating the local sourcing operations. A study from Osun state, the second-largest producing state, suggested that farmer prefer to deal with LBAs rather than directly supplying to exporters due to high transportation costs and uncertainty with regards to grading, which could lead to

reject of their products or lower their prices. Given their field presence and their links to both upstream and downstream stakeholders, LBAs play an important role in facilitating management of the local value-chain by processors and exporters and to diffuse improved production practices, supplying credit to farmers, securing supply and tracking certification requirements (PIND, 2019). Several exporters and processors maintain a strong relationship with these LBAs, with many tied into a long-term relationship with their customers given their important role in securing supply and managing the value-chain.

Exporters: **The export segment is highly concentrated and managed by the lead players.** Of the 20 regular exporters, the top-7 exporters, which account for 85% of the total cocoa export market, are the lead players in cocoa value-chain. Nearly 80-90% of the beans produced are destined for exports (of the 10-20% processed locally). Among them, a local company, Bolawole Enterprises controls 25% of the market share. The other key exporters are either subsidiaries of the main trading houses, including Olam, Armajaro and Amtrada or are Nigerian companies (such as Agro Trade and Saro Agro Sciences) with strong links to global lead players (e.g. Cargill). These exporting companies derive power from their strong financial capacity and strong linkages with global lead firms, as well as their ability to offer world market prices to local traders. They source beans from their network of LBAs and have a presence in major cocoa-producing states; they have established a strong logistics infrastructure system to aggregate the produce. Most of these exporters are large companies engaged in export of multiple cash commodities. These companies sourcing practices are also influenced by the demands of lead firms, with many starting to implement sustainability programs and certifications to fulfill the demands of their buyers. For example, Bolawole Trading has started a UTZ certification to meet the needs of its buyers. Many of these companies provide training to farmers, implement social projects to ensure commitment (e.g. Bolawole Rural Clinic Program in Osun state), and extend credit through their network of LBAs to secure supply from farmers (Adebayo, 2019). However, the absence of reliable and long-term connections between the farmers and traders is a key constraint to increasing the number of exporters financed sustainability programs as they are never guaranteed to receive the product produced from their support programs (Hutz-Adams, 2016).

Processors: **The processing segment of cocoa is small and declining and local firms are slowly being eliminated from this segment.** These firms produce cocoa powder, butter and mass. Only cocoa powder is sold to domestic food manufacturers, while the other products are destined for exports. Only 10-20% of the cocoa produce is sold to local processors (around 50,000MT) due to better prices available in export markets (PwC, 2017). Thus, the processors are not the major players in the value-chain. There has also been a significant decline in the number of processing companies over the years. The number of operational processing companies has gradually fallen from around 20 in 2008 to 8 in 2013 (Aikpokpodion, 2013) and around 3-5 in 2018 (Guardian, 2018; PFI, 2019). While the total processing capacity available is sufficient to process all cocoa produced in the country (at around 220,000MT), the remaining processing companies operate below capacity, with only one company processing significant quantity in 2018 as per Cocoa Processors Association of Nigeria (COPAN), with others processing less than 3,000MT of cocoa (Allafrica, 2018; Waystocap 2018). 4 of the surviving processing companies were in Ondo state, the key cocoa producing state in Nigeria, with one in Osun State, recently revived by the Government with support of a Chinese food processing company. The key reason for the decline is low profitability and difficult business environment owing to expensive cocoa beans, difficulty in getting machinery spare parts, depreciation/volatility of Naira and difficult access to foreign currency, high cost of finance (25% interest rates), lack of availability and poor quality of beans (absence of economies of scale and unsafe pesticide usage), high transportation costs due to poor infrastructure (with illegal taxation during transport), sporadic power supply (resulting in the installation of own diesel-based sources), lack of local skilled labor, elimination of subsidy on processing (export expansion grant scheme) and high duty on exports compared to competitors (Adefeko, 2018; Reuters, 2015). The local grinders face a challenging situation where they do not possess international market linkages and hence are unable to sell their processed goods, which was a key reason for their exit from the sector (PIND, 2019). Further, these local grinders also face difficulty in competing with international subsidiaries since they do not have access to cheap capital from the parent companies, the way international subsidiaries do. As a result, most of the surviving processors are either subsidiaries or foreign companies or have tight linkages with transnational corporations which avail them with cheap credit and ready buyer market.

Local Food Manufacturers: **Given its large size, Nigeria has the potential to build capabilities in cocoa food products, though as of now the industry is small and cocoa consumption low.** Four international firms: Nestle, Cadbury (Mondelez International), Promasidor and Friedsland dominate the cocoa-based food market. The lead manufacturers mainly use cocoa powder for cocoa beverage production and buy the processed cocoa mostly from local grinders. There are also a few local food manufacturers which produce cocoa-based products such as Graceco Limited and Leventis Foods, though their scale remains much small. There is also a small emerging local artisanal chocolate industry, with key players being Loshes chocolate and Kalabari Gecko chocolate. They focus on high quality, single-origin premium chocolates. These companies focus on traceability and high quality could enable them to build the capacity of producers to provide high-quality cocoa at a premium price. Given the large population size of Nigeria, there is a significant potential to promote increased use of cocoa products in the local market to grow the potential for the domestic manufacturing industry. However, the local food industry continues to face challenges in the form of weak energy and transport infrastructure, lack of skilled manpower, access to finance, unsuitable foreign exchange regime, and difficulty in import and management of industrial machinery.

Table 7. Lead Firms in Nigeria (Summarized)

Name	Local/ International	Segment in Value-chain and key activities	Capacity (Processing, Export, Grinding in MT), No of Employees and Turn Over
Tulip cocoa processing	International Subsidiary of Ecom Agroindustrial	Trader and processor; Pioneer of traceability program with full traceability by 2020. UTZ sustainability programs. Training on GAP; provides credit. Investment in 2018 to double processing capacity.	13,500MT (will increase to 30,000MT after recent investment); 200 employees
Nestle Nigeria PLC	International	Manufacturer: sources cocoa powder from local grinders and mainly produces cocoa beverages.	Uses 10,000MT of beans annually; US$9 million for cocoa sourcing.
Stanmark Cocoa Processing Plant)	International- Cadbury Nigeria (Mondelez)	Processor. Cocoa Powder for local market and cocoa butter for exports through Olam and Aramjaro	12,000MT
Cocoa Products (Ile Oluji)	Local, owned by Skye Bank and Bank of Industry	Processor and Exporter of cocoa products: liquor, butter, cake and powder. Supplies to both local producers and exports to foreign markets.	30,000MT; Processed 2000MT in by mid 2018; US$14 million export revenue
COOP Cocoa Company	Subsidiary of OLAM- International	Processor and Exporter. Supplies to both local food companies and exports to foreign markets. Providing loans (Osun, Ondo and Cross Rive) for Personal Protection Equipment and agrochemical spraying; Installed solar dryers in 28 farming communities in Osun, Cross Rive and Ondo State;	40,000 MT exports;
Starlink Global and Ideal Limited	Local: Warehouses in Ondo, Osun, Cross River and Ekiti	Export/ Marketing of cocoa and cashew. Training on GAP/ certification; Linked with Ecom Dutch, Sucden, Olam, Armajaro Trading	25,000MT Exports; US$13 million
Bolawale Enterprises	Local	Exporter of cocoa; plans to enter into processing of cocoa; Other businesses: cocoa plantation; Traceability program. Also operates a palm processing plant. Relationship with Barry Callebaut, Cargill, Carma, KVB (Germany). Provides extension services; inputs; farmer groups for certifications (UTZ).	60,000 MT (25% of total produce generally); 500; US$100 million
Agro Traders	Local	Provides UTZ certified. Also exports other products. Europe is the main export market. Provides training to farmers to ensure UTZ certification. Cargill one of the main clients.	20,000MT
Ede Cocoa Processing Plant	Local/ concession with Golden monkey of China	Processes cocoa liquor for local and international use	20000MT
Saro Agro Allied	Local	Exports Cocoa; Main partnership with OLAM/ ADM; Pioneered cocoa certification in Nigeria with ADM; Focus on UTZ certification throughout-growers scheme. Has a "golden cocoa" program; Training on GAP and provision of inputs; opening processing facility	30,000MT (12.5% of cocoa)

Source: Authors, 2020. Based on the cited sources from the key local lead firms, in the report.

Key Support Institutions in Nigeria:

The institutional set-up for development of the cocoa industry in Nigeria comprises of a multitude of actors in a public-private continuum, though a central coordinating body is absent. Federal Ministry of Agriculture and Rural Development (FMARD) is the main government body responsible for providing policy direction and supporting states in the promotion of agriculture, including cocoa. State ministries play an important role in the implementation of federation policies. Their limited budget puts a significant constraint on the ability of government bodies to support the sector (Hamisu et al., 2017). However, given their broad mandates on the development of the agricultural sector, their focus on the promotion of cocoa has not been targeted. In every instance in the past, government programs for the promotion of the sector led to the formation of new temporary bodies, such as National Cocoa Development committee in 2005 and special body under Minister of Agriculture to driven cocoa transformation program in the 2010s. However, these temporary structures, while were effective in short-term, could not last beyond the programs.

The support from international donors, NGOs and other private actors in cocoa value-chain has been a key source of finance and technical assistance in implementing sustainable cocoa development programs. In fact, private processors and their international partners have been the pioneer in promoting certified cocoa in Nigeria. For example, Saro Agroallied, a local firm, was the first exporter of organic cocoa and UTZ certified cocoa from Nigeria. Driven by the international drive towards sustainable cocoa production and certification, many value-chain actors have worked with their international partners (global lead firms) to implement capacity building programs to complement government efforts. However, there is a lack of coordination among the efforts of various actors, the number of programs is small compared to other African countries and support of government is limited (Hutz-Adams, 2016). Several of the international companies and private bodies bypass the state government and directly work with the farmers given the weak support provided by the local governments (Hutz-Adams, 2016). During the last few years the companies, donors and governments have worked together to implement some large programs. For example, USAID, Sustainable Trade Initiative (IDH) and World Cocoa Foundation have implemented programs in collaboration with international NGOs, state agencies and private companies to promote sustainable cocoa production. The focus of most programs is on promoting Good Agricultural Practices (GAP); capacity building and development of certified cocoa production, most importantly UTZ; improving quality of plantations; provision of inputs and finance for cocoa producers, and provision of social services. The list of key organizations and their role in supporting the value-chain is provided in Table 8. and Table 22.

Cocoa Association of Nigeria (CAN) and Cocoa Farmers Association of Nigeria (CFAN) are the two major private sector coordinating bodies that are constituted to promote the cocoa industry. Both the organizations have a common objective to promote sustainable development of the cocoa industry. CAN is dominated by Local Buying Agents (LBAs), processors and exporters, while CFAN is mainly a farmer's association. They are important conduits to implement programs for improving production and quality of cocoa and linking industry players with international market requirements. Both the organizations are working to promote the production of certified beans and traceability set-ups. However, the coordination among the two bodies has remained weak which has resulted in lack of information flow between the members of two bodies on requirements of the buyers in international markets, coordination among LBAs and farmers, feedback mechanism among various value-chain agents and constraints faced by producers. These associations can play a major role in enhancing coordination between the various actors of value-chain to increase the efficiency, lower transactions costs, and provide better quality beans to the market.

Table 8. Key Organizations Providing Support to Cocoa Value-chain (Summarized)

Organization	Key Focus Area
Federal Ministry of Agriculture and Rural Development (FMARD)	Coordination, policy direction and organization of the agricultural sector, including agro-industrial development. Undertakes activities/ projects on agricultural productivity enhancement, value-chain and livelihood development, GAP etc. Has a "Green Alternative" agriculture strategy to promote agricultural export among other objectives with cocoa once of the key crops selected for export development.
State Ministries of Agriculture: Agriculture Development Programs (ADPs) or Agriculture Services/ State agriculture units/ departments (Tree crop units/ produce departments)	Regulation and policy implementation for the promotion of agriculture in the respective states. ADPs, mainly involved in the provision of extension services to farmers. Also provide support for inputs, finance etc. Constrained by lack of funding in running extension infrastructure.
Nigeria Export Promotion Council	Regulation, promotion, and monitoring of exports. Services include market information, trade fairs, and training among others. Training on cocoa grading and standards; IPM; supply of inputs.
Research Institutes and Universities: Cocoa Research Institute of Nigeria/ Various state universities such as Ekiti State University	Owns 18 seed gardens with an annual potential pod production capacity of 0.5 million, though only 4 gardens are functional. Mainly involved in the breeding of new varieties/ production practices/ technology, multiplication activities and propagation of planting material, often at subsidized rate. Also provides training on all aspects from nursery development, production to processing. Provides pods to nursery operators, who provide to farmers. Close coordination with major international partners, research agencies and local organizations. Constrained by lack of funding.
Donor agencies: USAID, AFDB, GIZ, IFAD, UNIDO, WB, UNICEF, EU	Provision of funding for various agriculture development programs, including training. AFDB: one of the 5 cash crops in its agribusiness promotion strategy. Promoting special agro-industrial processing zones; USAID funding for ACI-I (completed) and II; Markets II initiative engaging 22,000 smallholders; NEXTT (completed)—projects focusing on promoting trade and investment; GIZ Sustainable Smallholder Agribusiness Cocoa Food Link Program trained 27000 smallholders on GAP and Farmer Business Schools; IFAD "LIFE" program for entire Nigeria; World Bank Appeal program (focus on both food and cash crops)
Cocoa Association of Nigeria (CAN)	The body that represents all stakeholder in the cocoa export industry (dominated by LBAs and processors). Objective to promote sustainable development of the cocoa industry. Private sector representative of Nigeria in international cocoa organizations. Comprises of all stakeholders. Focuses on collaboration, empowering cocoa farmer, ensure quality meets international standards. Pest and crop management. Provides training on IPM, GAP, and other activities.
Cocoa Farmers Association of Nigeria	Representative of farmers with 60 members. Provides information on production and marketing, training, farmers interests. A major initiative to increase cocoa yields, production of high-quality certified cocoa, cocoa farmers database digitization (traceability). Seeks to establish Cocoa resource center. Does not coordinate much with CAN.
Cocoa Processors Association	Safeguard interests of cocoa processors and promote the processing sector.
Various local farmer organizations, including Agricultural Development Farmers Association Oyo State, State Farmer's Congress (Ondo/ Osun)	Bring together farmers for improving production. Provide training and other aggregation services to their members, including training of young agropreneurs; training to farmers on GAP and quality improvement utilizing farmer field schools.
International / local Cocoa Processors, traders and chocolate makers including Ferrero, Ecom Agroindustrial, Yara.	Training on sustainable cocoa production and certifications (Fairtrade, Rainforest Alliance, UTZ); GAPs/ inputs and finance; infrastructure and stores. Generally, work with out-growers or those on certification programs. Tulip working with Cocoa organizations; other social infrastructure under sustainable cocoa sourcing initiative and to build loyalty for securing supply.
Olam	Promoting sustainability under CocoaAction; Providing loans (Osun, Ondo and Cross River) for Personal Protection Equipment and agrochemical spraying; Installed solar dryers in 28 farming communities in Osun, Cross Rive and Ondo State; Social work in Ondo state with digging 10 boreholes; health education.
Local Buying Agents (individual companies or Cooperatives)	Training on the use of inputs in collaboration with agro-chemical processors. First market for producers to sell inputs; provide inputs and credits to farmers.
Local and International NGOs: (i) Farming world and rural development initiative-NGO; (ii) Oxfam Novib; (iii) Solidaridad; (iv) Technoserve (international NGO)	Training on GAP; provision of inputs; Certified and sustainable cocoa, mainly UTZ. Works closely with private sector companies and other agencies. (Technoserve) Business development and networking services. Training on business development, GAPs and entrepreneurship including access to finance models.

Source: Authors, 2020. Based on the cited sources on the key organizations, in the report.

Industry Evolution in Nigeria Cocoa-Chocolate Global Value-chain

Nigeria's participation in cocoa-chocolate value-chain has gone through a few phases of evolution driven by various players over the years (Table 9.). These phases can be divided into four broad periods. The first phase is the period of regulated cocoa sector prior to 1986, when cocoa was deemed as the main export commodity accounting for almost 40% of total agricultural exports. The growth of the sector was mainly driven by the Government-sponsored plantations programs under the Regional Production Development Boards. By 1965, Nigeria became the second largest cocoa producer with a production of around 270,000MT (Hamzat, 2006). Abundant labor and suitable land were the main drivers of uptake by the rural population, which took up cocoa as an additional income-generating activity. This period also saw the first World Bank program for rehabilitating cocoa plantations over 17,000 ha, which commenced in 1971. The discovery of oil in the 1970s took the focus away from cocoa as the key export commodity, though it remained the main source of income for the large number of smallholders. The government support for the sector continued to decline. During this period, the cocoa local market was a monopsony like other West African countries, with the Cocoa Board being the sole buyer of the cocoa producer from the farmers. Farmers were paid a regulated price for their produce in return for the sale of output to the Cocoa Board. CRIN was the main research agency responsible for providing improved seedlings to farmers throughout this period. CRIN developed improved disease-resistant varieties in 1972 and undertook propagation with support of the World Bank to replace old plantations. The first local cocoa processing facility was also established in 1984 to undertake local grinding of beans (Hamzat, 2006).

The liberalization of the market in 1986 led to the dismantling of the Cocoa Board and proliferation of intermediary buyers and exporters. CAN, a private sector coordinating body, was also established at the same time to manage the cocoa sector affairs (CAN, 2020). The major shift during this period was the entry of international trading firms in Nigeria market. Both Olam and Cadbury established their trading arms locally, while also setting up origin grinding facilities in 1989 and 1991 respectively. However, due to lack of government support, the production continued to decline reaching its lowest levels at around 145,000 tons in 2000. The quality of cocoa beans also started to deteriorate due to the absence of controls which in the earlier period were imposed by the Cocoa Board. The Nigeria farmers lost a US$75/ton premium they used to receive on their main variety (Alomnado) following the dismantling of Cocoa Board (Oxfam, 2002). The absence of a regulated market, mainly driven by a large number of local traders lead to declining quality controls as well as export coordination, thus limiting the opportunities for forward sales, sales by tender and sales on CIF basis (FAO, 2013).

The cocoa sector received renewed attention from 2000 onwards. This was prompted by the significant decline in cocoa production and the policy of the government to diversify exports from oil (FAO, 2013). Driven by the efforts of CAN, Government set up the National Cocoa Development Committee (NCDC) in 2000. Cocoa Farmers Association of Nigeria was also established in the same year to promote the farmers' interest. The Cocoa Development Program of NCDC initiated in all 14 producing states targeted to achieve total production of 1 million MT by the year 2010. The key aspect of the program was to replant 15,000 ha annually over the 10-year period through provision of improved plantation material and inputs. NCDC collaborated with international donor agencies and local stakeholders to develop around 62 million high yielding hybrid seedlings for plantation on around 56,000 hectares. While the production went up reaching around 236,000MT it was well short of the 1 million MT target (Dawn, 2017). The key reason was the weak ability of CRIN to distribute the improved planting material to the farmers and lack of training of farmers on GAPs. This period also saw the expansion of the grinding industry as several new processing facilities, both by local and international firms, opened. The year 2009 was also the first time Nigeria was able to export organic cocoa to international market-driven, mainly through the out-grower program supported by a lead exporting company. IITA and IFAD introduced Farmer Field Schools as new models of extension for tree crops under various programs during this decade.

The government program for revitalization of cocoa continued in the post-2010 period mainly under the Cocoa Transformation Agenda of Nigeria. The key goals of the transformation agenda included doubling cocoa production to 0.5 million MT by 2015, create 390,000 new jobs, grind 40% produce locally, increase local cocoa consumption, and improve industry coordination (Aikpokpodian, 2013). This period was also marked by the global shift towards sustainable sourcing of cocoa. As a result, several government and donor-driven programs have been implemented in the last decade to improve the productivity of cocoa and to improve farmers income. A foremost development during this period was the introduction of promising high yielding disease resistant and early maturing TC 1-8 variety by CRIN in 2011. In the same year, Saro Agroallied was also able to successfully export UTZ certified cocoa for the first time in Nigeria's history. Government program focused on two key tracks: upgrading old plantations and developing new plantations on virgin lands. The success achieved on the program was only moderate, hampered again by the limited capacity of CRIN to distribute planting material as well as adverse weather condition (El Nino) and lack of adoption of improved varieties and fertilizer by the farmers. Several international donors and cocoa stakeholders also implemented various programs to support the sector during this decade, including MARET-II (2013-17) program by USAID which enabled nearly 15,000 farmers to produce certified cocoa; GIZ Sustainable Smallholder Agrobusiness Cocoa program (2014-19) implemented to provide agri-finance and to establish Business Service Centers; IFAD Community Based Natural Resource Management Program for establishing farmer-owned nurseries and cocoa confectionery and a chocolate factory, and Tulip Cocoa Outgrower Program to provide credit and inputs to farmers. The processing industry, however, experienced a continued decline during this decade with many plants stopping operations. Elimination of Export Expansion Grant in 2016 was one of the main reasons for this decline. The depreciation of Naira provided some relief to local processors and farmers, though the effect has not been long-lasting due to stringent exchange rate regimes (Dawn, 2017). Despite the recent efforts of government and partners to improve cocoa yield and production, the impact on the development of the industry has been limited due to decline and volatility of international cocoa prices as well as other structural and macroeconomic constraints which provide disincentives for the farmers to increase their production. These constraints need to be addressed for Nigeria to improve its position in Cocoa GVC, while it should bank on its strength and opportunities (Table 18.) to capture additional value from its participation.

Table 9. Evolution of Nigeria's Participation in Cocoa-Chocolate GVC

Time Period	Key Industry Characteristics
1960-1986	- 2nd largest producer with a production of 420,000MT - Decline in government focus on cocoa from the discovery of oil - Cocoa Board main buyer of cocoa at fixed prices (regulated industry) - Received price premium of US$75 per ton vs. Cote d'Ivoire
1986-2000	- Dissolution of the Cocoa Board under IMF Structural Adjustment Programs - CAN established in 1986 as a private sector industry coordinator. - Entry of OLAM and Cadbury. - Establishment of Olam and Cadbury processing plants. - Decline in quality and loss of premium. - Decline in production to 145,000 tons in 2000
2000-2010	- National Cocoa Development Committee (NCDC) established to coordinate cocoa Development Program in 14 states; production stabilized - IITA sustainable Tree Crop programs promoting FFS - 2005-2009 several new processing plants opened - CFAN established as farmers representative organization - Organically certified cocoa exported by Saro Agroallied
2010- Up till now.	- Cocoa Transformation Agenda 2011 to double production by 2015 - Introduction of promising hybrid cocoa "TC 1-8" by CRIN - Declining capacity of CRIN: Reduction in seed gardens from 14 in states to 4 - Devaluation of Naira and increased cocoa competitiveness after 2016 - USAID/ GIZ/ WCF/ IFAD programs on productivity enhancement - Several state programs: Cross River State goal of 7% increase in cultivation with 2,000 ha; Ede Cocoa processing plant operational - Elimination of Export Expansion Grant in 2016

Source: Authors, 2020. Based on the cited sources in Section 2.2.

1.2.3. Challenges and Recommendations

Key challenges: Nigeria has had a modest success in the cocoa GVC thanks to its strengths. Nigeria has suitable agro-ecology for production of cocoa and, in turn, an existing history of cocoa bean production, thanks to experienced farmers (80% more than 10 years); and history of exports, mainly thanks to linkages of local firms with lead players. The Government intends to promote agriculture as a viable alternative to oil for economic diversification and employment generation for its large youth labor force (Oluyole et al., 2013). Nigeria has also experience and history of grinding with an existing idle grinding capacity.

However, significant challenges exist that threaten the future growth and stability of the industry. First, youth are not interested in farming. Farmers increasingly switch to other cash crops such as oil palm, avocado, cashew due to low returns in cocoa farming and volatility in cocoa prices. High production in West Africa reduces overall prices, which brings up a need for working together as Africa region. On the more downstream side, foreign grinders have access to finance and internal parent company finances at low-interest rates and can thus secure cheap supply of beans and hence are more competitive than local processors. Further, global market instability as a result of COVID-19 illustrates the need for Nigeria to upgrade the cocoa GVC to reduce dependency on oil markets and also to allow them to maintain their position in other export-oriented industries. Table 10. recaps the key challenges Nigeria faces in the cocoa GVC.

Table 10. Key Challenges

Challenge	Description and Relevance
Inputs Availability/ Quality	Farm-level: Inadequate farm inputs is a general issue due to: i) low input utilization systems, ii) weak capacity of CRIN to provide and distribute high yielding seedlings to replace plantations, iii) weak research and development. Additionally, ageing farmers are not willing to plant new seeds even if available. There is the reluctance to replant old trees due to long maturity of cocoa. Low levels of agricultural mechanization and poor farm management practices are other relevant issues. All these situations, when topped up with ageing and low yielding trees, result overall in low cocoa yields. Fungal and blackpod diseases and the factors mentioned above already lead to loss of productivity. Also, due to poor farm management practices and high moisture content, the quality of cocoa is low. Hence, it ends up in cake, butter and soap markets. Extension and support services are inadequate.
	Process level: Overall, there is also a lack of domestic demand for cocoa and capacity utilization of processors is low. As such, nearly 80-90% of the beans produced are destined for exports (of the 10-20% processed locally). However, certification and traceability capacity in the country is weak. At the same time, sustainability programs by chocolate makers are insufficient. The exporting companies' sourcing practices are influenced by the demands of lead firms, with some starting to implement sustainability programs and certifications to fulfill the demands of their buyers. However, the absence of reliable and long-term connections between the farmers and traders is a major constraint to increasing the number of exporters-financed sustainability programs as they are never guaranteed to receive the product produced from their support programs (Hutz-Adams, 2016).
Infrastructure	Farm-level: Access to farming land and resources. e.g. Poor access roads and lack of irrigation.
	Process level: Unstable energy supply and reliance on generators impedes the ability of processors to reduce costs or expand production. Low return on processing due to weak transport networks to ports is also an issue. Lack of farm storage facilities can lead to molds especially during rains (weak warehouse and storage). Lack of drying spaces and primary processing infrastructure, especially for fermentation is another relevant issue.
Market Access	Farm-level: High transport cost to buying centers pushes farmers to accept lower prices because of the increased risk and cost associated with going to higher-paying buyers.
	Process level: The local grinders specifically face a challenging situation where they do not possess international market linkages, hence are unable to sell their processed goods.
Education/ Skills	Farm-level: Lack of sufficient education in the development and propagation of seedlings, fertilization, pest and soil management. This issue challenges the efforts for certification.
	Process level: For the country to proceed further into more downstream stages of the cocoa value chain, there is a need for specialized trained labor for processing facilities.
Finance	Farm-level: Access to and cost of finance is a common issue faced by farmers.
	Process level: Foreign grinders have access to finance at much cheaper rates than local processors and hence are more competitive. One key reason for the decline in the number of local processing firms is the high cost of finance (25% interest rate).
Governance/ Tax Policies	Farm-level: The local value-chain of cocoa comprises of a large number of smallholder farmers, which do not have any power and are the price takers; and a highly concentrated exporting companies segment, which dictate the price and quality standards and act as lead players. There are several intermediaries involved in getting the produce from farmers to buyers, mainly as Local Buying Agents, who coordinate the supply chain on behalf of the producers and a small processing segment. This governance structure has led to a captive market structure where exporters hold strong market power in fixing price and setting quality standards by passing on the cost of taxes and market inefficiencies to the producers.
	Process level: Red tape; illegal taxation; exchange rate policy are barriers to the growth of local processors. 4 of the surviving processing firms in Nigeria were in Ondo state, the key cocoa producing state in Nigeria, with one in Osun State, recently revived by the Government with support of a Chinese food processing company. Some key reasons for the decline in the number of local processing firms are illegal taxation during transport; elimination of subsidy on processing (export expansion grant scheme) and high duty on exports compared to competitors (Adefeko, 2018; Reuters, 2015). Further, these local grinders also face difficulty in competing with international subsidiaries since they do not have access to cheap capital from the parent companies, the way international subsidiaries do. As a result, most of the surviving processors are either subsidiaries or foreign companies or have tight linkages with transnational corporations which avail them with cheap credit and ready market.

Source: Authors, 2020

Policy Recommendations: To address these challenges and help position Nigeria to maintain its current level of participation in the short term and to better position the nation for growth in the post-COVID-19 world, we suggest the following policies be implemented. They aim to improve the productivity and quality of the production and grinding sector. First are the two cross-cutting recommendations:

Policy Recommendation#1: Make targeted investments to improve farming and processing infrastructure in selective states. Inadequate and inefficient infrastructure is a major constraint for both the farming and processing sector. For farmers, the lack of rural roads makes access to market difficult and transport costs of local marketing high. In addition, inadequate drying, fermentation and storage facilities lead to a low quality of beans. There will be two forms of investments made in this respect. First, capital investments in public goods mainly rural feeder and secondary roads targeting high producing regions. While the second would be at farmer cooperative level, to provide them with primary processing facilities such as artificial fermentation equipment, drying floors, and communal storage facilities.

For processors, unreliable energy supply has led to the use of own energy generation which reduces their margin. High transport costs of processed products to ports further adds to this constraint. Given the concentration of processing facilities in cocoa-growing regions, it would be ideal to target these large investments to connect the states with the ports. To make these investments economically feasible, the focus should be put on states producing several commodities (such as palm oil, sesame, cashews etc.) in large quantities. Federal and state governments should take the lead in making significant infrastructure investments in this respect in coordination with donors active in the agriculture sector. They could partner with various international lead firms to implement rural infrastructure enhancement programs under their sustainability initiatives. This will be a medium to long term intervention, though prospects for short-term wins are also there especially for basic rural infrastructure.

Policy Recommendation#2: Improve the organization of the sector to coordinate and drive its strategic growth. Prior to 1986, the Cocoa Board played an effective role in coordinating the development of the sector. However, with the advent of oil and disbandment of the Cocoa Board, no agency has yet played that role. Cocoa Association of Nigeria, which was established as a private sector agency to play the role of Cocoa Board, has not been effective. It remains largely dominated by traders and processors. Various state governments pursue their own independent non-harmonized strategies for development of the sector in their regions. This is not efficient for the growth of the sector. There is an absence of a national body that could drive strategic interventions to support the industry. In the past, Government attempted to institutionalize such structures for instance under the Cocoa Program in 2012. However, these attempts were transitory and never put in place a permanent organized national body to support the cocoa sector. It would be appropriate to set up a public-private partnership based cocoa commodity body under FAMARD and delegating it the responsibility to lead the formulating of a national strategy for the cocoa sector, developing and coordinating national projects and driving regulations to safeguard the interests of all players in the sector. The unit through its various programs should mainly focus on the following: (i) regulating local farm gate price to safeguard producers; (ii) a seed propagation and replanting program (with CRIN); (iii) certification program; and (iv) cocoa marketing program. This could be a short-term intervention with wide-ranging benefits. It may also be worthwhile to consider re-regulation of the sector along with the lines undertaken by Ghana and Cote d'Ivoire. A capacity building and reverse linkage operation would be worthwhile to undertake.

In addition to the forgoing broad structural recommendations, the following specific policy recommendations are also advised to pursue the following upgrading trajectories.

Process Upgrading

- **Implement cocoa productivity and production enhancement program focusing on four components: (i) training farmers on good agricultural practices using Farmer Field School methodology, (ii) improving the old plantation (iii) expanding production through intercropping or setting up young farmer based new estate plantations, and (iv) promoting farmer cooperatives based agriculture service centers.** As already stated, the cocoa plantations have low yield due to old plantations and outdated farming and primary processing practices. Improving the yields would lead Nigeria to export more cocoa and provide the raw material for local cocoa grinding industry. It would also be the basis for making farming more profitable and incentivizing farmers to invest in fertilizers and other inputs. This would require building the seedling development and distribution capacity of CRIN, undertaking farmers training on GAP, and linking them with input and farm service suppliers. In addition, enhancing production project would focus on developing cocoa plantations in intercropping with palm oil and cashew trees as well as on virgin new lands under sustainable agroforestry system. The lead in this respect would have to be taken by FAMARD while working closely with the multitude of partners, including state agriculture development programs, lead firms, CRIN and input suppliers' network. Donors and global industry organizations would be an important source of funding for such programs. The experience of the Dominican Republic in this regard could serve as a successful example (Box 1.).

Box 1. Increasing Productivity of Certified Cocoa Among Smallholders in the Dominican Republic

In the Dominican Republic, the Fairtrade certified cooperative CONACADO implemented a "Cooperative Development Program (CDP)" in cooperation with USAID and private export company, Equal Exchange. At the time of program commencement, the average productivity of CONACADO members was around 436 kilos/hectare, much lower than other cocoa-producing countries, Brazil, Columbia and Peru. This low productivity resulted in low income for farmers, low exports of Fairtrade certified cocoa, and lack of interest by the young generation to continue cocoa farming. Under the CDP project, 8 demonstration plots following Fairtrade practices were selected to showcase and train farmers on improved production practices. A program for replacing old plantations was also implemented at the same time. The demonstration plots provided a group learning opportunity for the cooperative members, while also serving as clonal gardens to provide seeds/ grafts for renewal of the old trees. By the end of the project in 2017, the productivity levels had significantly gone up on the demonstration sites and adjacent areas. The productivity in demo sites increased by 496 per cent from 353kg/ha to 2,104kg/ha, while the adjacent plots experienced a productivity gain of around 258 per cent. Given the success of this experience, CONACADO has expanded the program to other regions to serve additional cooperative members.

Source: Fairtrade, 2020

Product Upgrading

- **Develop and implement training programs to help smallholders gain UTZ or lead companies' private certifications.** As more lead firms require UTZ certification in order to sell and participate in their chain, it is crucial that Nigeria helps its smallholders meet UTZ requirements. Otherwise, over the long term, they will be unable to sell their products and will stay in local markets at low prices. Developing a training program requires the coordination of industry associations, smallholders and lead firms sourcing from Nigeria. Cocoa Farmers Association could take a lead in this respect, though it would need to work closely with NGOs, lead firms, and donors to expand this program. The experience of Cote d'Ivoire, one of the largest producers of certified cocoa, serves as a successful example to follow for Nigeria (Box 2.).

Training farmers on good agricultural practices using Farmer Field School methodology,

Box 2. Increasing Certification Among Smallholders in Cote D'Ivoire

The increase in UTZ certified beans in Cote D'Ivoire has been achieved through the effort of multiple actors working at various levels. The UTZ certification in Cote D'Ivoire was introduced around the same time as Nigeria in 2008. The key exporters, such as Cargill and ECOM, along with the NGOs, Solidaridad, Oxfam Novib and WWF implemented the pilot program, which led to the certification of two cooperatives, CFAD and Coopaga. The production of UTZ certified cocoa amounted to around 100,000MT in 2012. In 2011, the Dutch government-funded- Sustainable Trade Initiative, introduced Cocoa Productivity and Quality Program. The program's objective was to increase farmers income through the adoption of sustainable cocoa production practices. Specifically, the program aimed to certify around 30,000 farmers to produce around 64,000 tons of UTZ certified cocoa. The program focused on five key tools to achieve this: GAPs, input provision, developing standard systems and protocols, strengthening farmer organizations, and financing. At the same time, a comprehensive program around increasing fertilizer use to restore soil fertility was also implemented by IDH. Both the programs collaborated strongly with all the private lead firms operating in the country as well as local governments, UTZ, donors, and NGOs. These programs acted as a key coordinating platform for various lead companies who were trying to increase the share of certified cocoa in their sourcing strategies. UTZ also set up an Ivorian office in 2015 and adopted digital training via "UTZ Academy Online". The focus of the programs is on training the trainers in the value-chain such as export companies, processors, service providers, government extension agents. UTZ. As a result of these programs, the UTZ certified cocoa production increased to around 400,000MT in 2016 i.e. a 400% increase over a 5-year period. The certified cocoa farmers received a premium of around € 84/ ton and had an average yield differential of 25% from non-certified farmers. However, few important lessons from Cote D'Ivoire experience are worth noting: (i) well-organized cooperatives are key for fast scale-up of the certification programs; (ii) multitude of actors must work in unison to ensure that certified farmers have a secure market to sell their produce, and (iii) price falls could wipe away the benefits derived from certified farming unless a minimum price is guaranteed to the farmers to incentivize them to .adopt better production practices for long-term benefits and growth of the sector

Source: Ingram et al., 2018

Functional Upgrading

- **Introduce trade financing mechanisms to support the cocoa processors.** The cocoa processors obtain credit from local banks at very high cost. Given that cocoa processing is a low margin and scale business, this significantly reduces their margins thus making them uncompetitive. The government could work with the international donor agencies to extend trade financing at reasonable rates to these processors. Ministry of Finance could play a key role in this regard. This will be a short-term intervention which can be implemented rather quickly.

1.2.4. Annexes

Table 11. Top Ten Exporters of Cocoa Paste, by Value (US$ million), 2010-2018

Exporter	Export Value (US$ million)					Export Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**2,508.41**	**2,467.46**	**3,010.29**	**2,934.91**	**2,832.99**	**100%**	**100%**	**100%**	**100%**	**100%**
Cote d'Ivoire	601.84	437.26	764.50	681.33	562.30	24%	18%	25%	23%	20%
Netherlands	675.88	521.12	667.30	516.07	536.36	27%	21%	22%	18%	19%
Ghana	--	--	--	--	396.37	--	--	--	--	14%
Germany	266.86	289.64	289.14	431.74	314.87	11%	12%	10%	15%	11%
Indonesia	66.09	208.67	233.73	244.86	156.56	3%	8%	8%	8%	6%
France	119.26	164.55	185.55	175.91	137.78	5%	7%	6%	6%	5%
Malaysia	149.78	157.06	127.81	147.32	120.46	6%	6%	4%	5%	4%
Belgium	64.21	63.58	57.75	81.03	95.34	3%	3%	2%	3%	3%
U.S.	87.62	131.03	111.40	116.08	72.90	3%	5%	4%	4%	3%
Switzerland	--	51.05	--	66.74	65.63	--	2%	--	2%	2%
Poland	--	--	56.80	60.99	--	--	--	2%	2%	--
Cameroon	--	--	63.51	--	--	--	--	2%	--	--
Singapore	52.51	59.67	--	--	--	2%	2%	--	--	--
Brazil	51.41	--	--	--	--	2%	--	--	--	--
Nigeria	5.43	30.63	34.67	1.45	10.28	0%	1%	1%	0%	0%

Source: UN Comtrade, 2020
Note: HS 2002-1803; downloaded 04/02/2020

Table 12. Top Ten Exporters of Cocoa Butter, by Value (US$ million), 2010-2018

Exporter	Export Value (US$ million)					Export Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**4,256.47**	**2,824.52**	**5,638.00**	**5,309.82**	**5,378.85**	**100%**	**100%**	**100%**	**100%**	**100%**
Netherlands	1,350.23	764.40	1,653.93	1,652.46	1,536.15	32%	27%	29%	31%	29%
Indonesia	236.81	236.14	660.78	697.86	824.05	6%	8%	12%	13%	15%
Germany	239.56	159.64	494.81	502.32	496.14	6%	6%	9%	9%	9%
France	403.56	303.54	416.39	405.54	458.68	9%	11%	7%	8%	9%
Cote d'Ivoire	302.24	210.39	461.83	439.98	394.87	7%	7%	8%	8%	7%
Malaysia	614.68	311.28	625.38	500.44	390.54	14%	11%	11%	9%	7%
Ghana	--	--	--	--	287.23	--	--	--	--	5%
Singapore	141.43	102.55	190.53	167.60	144.74	3%	4%	3%	3%	3%
Brazil	151.72	77.52	117.46	199.61	123.24	4%	3%	2%	4%	2%
U.S.	106.76	73.87	136.97	108.31	89.82	3%	3%	2%	2%	2%
United Kingdom	--	--	--	63.82	--	--	--	--	1%	--
Nigeria	184.86	161.45	145.97	--	55.02	4%	6%	3%	--	--

Source: UN Comtrade, 2020
Note: HS 2002-1804; downloaded 04/02/2020

Table 13. Top Ten Exporters of Cocoa Powder, by Value (US$ million), 2010-2018

Exporter	Export Value (US$ million)					Export Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**2,724.54**	**3,250.65**	**2,044.73**	**2,470.47**	**2,271.48**	**100%**	**100%**	**100%**	**100%**	**100%**
Netherlands	945.10	1,048.99	639.47	692.50	676.24	35%	32%	31%	28%	30%
Germany	292.72	302.24	211.23	279.90	275.24	11%	9%	10%	11%	12%
Malaysia	340.45	453.44	269.01	297.85	225.70	12%	14%	13%	12%	10%
Spain	170.53	211.36	117.16	158.31	157.51	6%	7%	6%	6%	7%
Indonesia	103.18	165.18	104.24	163.91	146.10	4%	5%	5%	7%	6%
France	172.83	229.88	149.91	150.69	136.21	6%	7%	7%	6%	6%
Singapore	110.88	148.57	103.69	129.53	134.96	4%	5%	5%	5%	6%
Ghana	--	--	--	--	79.32	--	--	--	--	3%
U.S.	84.75	100.70	78.16	117.62	78.01	3%	3%	4%	5%	3%
Cote d'Ivoire	113.44	106.71	63.01	--	59.32	4%	3%	3%	--	3%
Belgium	--	--	--	104.01	--	--	--	--	4%	--
Brazil	93.98	133.26	68.90	66.16	--	3%	4%	3%	3%	--
Nigeria	0.43	3.05	3.69	0.20	1.17	0%	0%	0%	0%	0%

Source: UN Comtrade, 2020
Note: HS 2002-1805; downloaded 04/02/2020

Table 14. Top Ten Importers of Cocoa Paste, by Value (US$ million), 2010-2018

Importer	Import Value (US$ million)					Import Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**2,999.73**	**3,146.76**	**3,402.52**	**3,541.79**	**3,168.12**	**100%**	**100%**	**100%**	**100%**	**100%**
Netherlands	279.34	283.55	420.30	343.86	384.24	9%	9%	12%	10%	12%
Belgium	172.85	166.17	233.31	269.21	297.46	6%	5%	7%	8%	9%
France	311.43	331.12	393.03	318.05	295.71	10%	11%	12%	9%	9%
Germany	417.29	434.16	383.71	348.65	247.63	14%	14%	11%	10%	8%
U.S.	304.72	371.09	230.02	288.24	231.21	10%	12%	7%	8%	7%
Poland	144.97	140.67	174.37	202.88	170.20	5%	4%	5%	6%	5%
Russian Federation	162.71	147.93	174.44	154.68	159.73	5%	5%	5%	4%	5%
Spain	137.61	183.78	105.32	155.29	129.97	5%	6%	3%	4%	4%
Italy	--	--	--	--	106.87	--	--	--	--	3%
Malaysia	--	--	151.70	139.76	97.46	--	--	4%	4%	3%
Canada	101.88	83.67	--	133.26	--	3%	3%	--	4%	--
China	--	83.94	94.29	--	--	--	3%	3%	--	--
Ukraine	94.29	--	--	--	--	3%	--	--	--	--
Nigeria	0.00	0.04	0.26	0.02	0.01	0%	0%	0%	0%	0%

Source: UN Comtrade, 2020.
Note: HS 2002 – 1803; Downloaded 04/01/2020.

Table 15. Top Ten Importers of Cocoa Butter, by Value (US$ million), 2010-2018

Importer	Import Value (US$ million)					Import Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**4,107.17**	**2,664.58**	**5,968.48**	**5,299.78**	**5,433.19**	**100%**	**100%**	**100%**	**100%**	**100%**
Germany	570.27	403.41	1,016.40	843.14	863.75	14%	15%	17%	16%	16%
U.S.	587.71	237.16	673.14	548.82	619.95	14%	9%	11%	10%	11%
Belgium	366.65	251.19	564.14	612.52	605.97	9%	9%	9%	12%	11%
Netherlands	346.96	248.64	539.31	485.21	510.53	8%	9%	9%	9%	9%
France	319.54	223.81	395.91	331.26	403.56	8%	8%	7%	6%	7%
United Kingdom	275.03	156.67	296.99	323.34	277.64	7%	6%	5%	6%	5%
Russian Federation	178.59	111.02	260.60	202.78	224.61	4%	4%	4%	4%	4%
Poland	141.24	--	--	181.55	217.15	3%	--	--	3%	4%
Italy	--	96.06	204.40	181.13	189.40	--	4%	3%	3%	3%
Switzerland	168.85	110.59	200.40	--	169.49	4%	4%	3%	--	3%
Canada	129.05	96.62	--	184.24	--	3%	4%	--	3%	--
Japan	--	--	195.81	--	--	--	--	3%	--	--
Nigeria		0.01	0.08	0.03	0.01	0%	0%	0%	0%	0%

Source: UN Comtrade, 2020.
Note: HS 2002 – 1804; Downloaded 04/01/2020.

Table 16. Top Ten Importers of Cocoa Powder, by Value (US$ million), 2010-2018

Importer	Import Value (US$ million)					Import Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**2,571.72**	**3,269.17**	**2,147.90**	**2,482.61**	**2,273.21**	**100%**	**100%**	**100%**	**100%**	**100%**
U.S.	488.56	499.34	274.05	383.39	266.85	19%	15%	13%	15%	12%
Netherlands	123.69	158.30	137.38	82.64	159.42	5%	5%	6%	3%	7%
Germany	168.94	227.85	170.52	150.54	123.62	7%	7%	8%	6%	5%
Russian Federation	113.53	119.05	88.90	109.90	110.13	4%	4%	4%	4%	5%
France	134.19	179.80	154.72	121.22	110.00	5%	5%	7%	5%	5%
Italy	93.73	121.08	77.29	100.99	107.87	4%	4%	4%	4%	5%
China	81.55	139.36	86.85	98.46	102.22	3%	4%	4%	4%	4%
Belgium	--	--	--	139.45	66.91	--	--	--	6%	3%
Poland	70.57	--	--	63.03	62.21	3%	--	--	3%	3%
Japan	81.00	99.85	56.06	--	60.10	3%	3%	3%	--	3%
Turkey	--	--	50.48	--	--	--	--	2%	--	--
Canada	--	89.98	59.63	65.80	--	--	3%	3%	3%	--
Ukraine	75.55	105.74	--	--	--	3%	3%	--	--	--
Nigeria	0.36	0.05	0.03	0.01	0.00	0%	0%	0%	0%	0%

Source: UN Comtrade, 2020.
Note: HS 2002 – 1805; Downloaded 04/01/2020.

Table 17. Unit Value of Cocoa Beans, US$ per Metric Ton

Country	Price, US$ per metric ton	Last Reported Year
Cote d'Ivoire	2,900	2016
Ghana	2,888	2018
Indonesia	2,603	2018
Nigeria	2,035	2018
Cameroon	2,538	2016

Source: Authors own calculation from UNComtrade, 2020; HS1801;

Table 18. SWOT Analysis

Strengths	Weakness
- Existing history of cocoa bean production and export. - Experience among farmers, most of them have high technical efficiency and significant experience (80% more than 10 years). - Experience and history of grinding with existing idle grinding capacity. - Suitable agro-ecology for production of cocoa. - Government intention to promote agriculture as a viable alternate to oil for economic diversification. - Generally, most farmers have basic education, and this has been found to be linked with willingness to adopt improved practices. - Presence and linkages of local firms with lead players. - Some strong local lead firms.	- Aging and low yielding trees and farms. - Ageing farmers unwilling to replant their plantations. - Presence of some very small farms (less than 1Ha) which are not economically viable. - Low quality of beans due to outdated farming and primary processing activities. - Rudimentary farming practices utilizing very low fertilizer and other inputs which leads to low yields. - Remote farms with weak infrastructure and difficult access (to farms and markets). - Weak capacity of CRIN to produce and distribute seedlings of high quality. - Weak electricity and transport infrastructure for processing industry which uses unsustainable independent power sources using power generating sets running on diesel. - In processing specifically: Weak transport and energy infrastructure; red tape; illegal taxation; exchange rate policy; low availability of beans; expensive beans. - Inadequate extension and support services. - Lack of farming mapping which makes traceability difficult. - Absence of coordinating commodity body and weak farmer organizations. - Weak primary processing infrastructure and practices (drying, fermentation, storage). - Fungal diseases leading to loss of productivity and extremely high use of pesticides which make the produce unsuitable for exports given the import market food safety standards. - Access to and cost of finance for both farmers and processors. - Need for specialized trained labor for processing facilities
Opportunities	**Threats**
- Significant potential for expansion (extensive agriculture) on uncultivated savannah grassland (only cultivated on ¼ of 3 million hectares) as well as possible intercropping with other tree crops. - Availability of new varieties which mature in 18-24 months and have high yield - Potential to capture growing niche markets of cocoa in some Middle East and Eastern European countries. - Nearly one third of cocoa export is in raw (not fermented) form, which can be fermented in country to secure better prices. - International move towards sustainable cocoa sourcing and certifications which can provide premium prices. - Significant space to increase certified cocoa share in production. - Significant potential for raising productivity (by 3 times). - Potential to expand origin grinding by focusing on growth of existing players. - Possibility to improve quality of beans through simple improvements in agricultural practices - Unmet demand for semi-finished cocoa products in Netherland, Germany, US, China, Spain- ILO. - Large youth labor force and large potential consumer market to enable building capabilities locally. - Positive past experience with various productivity enhancement programs implemented such as ACI by WCF. - New entrants comprising of retirees and civil servants more adaptable to modern production technologies. - Some successful cases of youth interest in cocoa farming in Central River state, which provide a model to build on. - Potential to enter into EPA with Europe (Nigeria did not ratify) to save on duties and access European markets. - Potential for cross fertilization of knowledge with neighboring producing countries. - Small but growing local artisanal chocolate industry and potential for promoting origin-based products. - Large and growing food industry using cocoa products.	- Potential competition from neighboring countries. - Falling international demand for cocoa due to COVID-19, disruption in supply chains, and move by international processors to move processing back to Europe for building inclusive supply chains. - More growth/ bumper crop in West Africa reduces overall prices (need for working together as Africa region). - Farmers increasingly switch to other cash crops due to low returns in cocoa farming. - Insecurity in the country. - Lack of interest of youth in farming.

Source: Authors, 2020 based on various sources and own analysis (Vanguard, 2018; FAO, 2013)

Table 19. Lead Firms in Processing/ Trading

Firm	HQ	Primary GVC segments	Revenue, US$ million (2018)	Revenue, US$ million (2017)	Revenue, US$ million (2016)	Geographic Scope	Other Ag Industries	Sourcing Strategy	Key Processing locations	Key Brands
Olam	Singapore	Trading, Processing (cocoa powder, liquor, butter and fat)	7,711	8,136.80	7,129	Global: 60 countries, including Nigeria, where it has processing facilities and branded food businesses.	Coffee, dairy, nuts, spices, cotton, edible oils, rice, grains, animal feed, fertilizer, rubber, packaged foods	Sourcing mainly from producer countries directly; Africa a main source (including Nigeria), Asia and South America; Seeks to achieve 100% traceable and sustainable cocoa by 2020.	11 cocoa processing facilities; Germany, Spain, Netherlands, United Kingdom, U.S. for EU and NA markets. Singapore for Asian market. Cote D'Ivoire and Ghana (Kumasi) in Africa. Total capacity of 820,00MT	deZaan, Unicao (Cote D'Ivoire), Joanes, Macao, Huysman, Britannia (only cocoa chocolate ingredient brands)
Berry Callebaut	Zurich, Switzerland	Trading, Processing, industrial chocolate manufacturing	7,195	7,047.41	6,913	Global (selling to 140 countries);	-	Direct sourcing from cocoa origin countries from cooperatives including Ghana, Ivory Coast, Cameroon; 47% sustainable sourced cocoa beans (program "forever chocolate" on sustainable cocoa). Aims to have fully sustainable chocolate by 2025.	62 processing factories. Chocolate factories mainly in Europe (Belgium, Singapore, Switzerland, France, UK, Germany, Italy, Netherlands, Spain, Canada, U.S., China, Japan, Brazil) close to customers. Processing factories in Ghana, Ivory Coast, Cameroon, France, UK, Belgium, U.S., Malaysia i.e. both at origin as well as integrated with chocolate factories. New processing unit in Cote De 'Ivoire to raise capacity by 40%.	Barry Callebaut; Densdorp; Cacao Barry; Callebaut; Caprimo; Carma; Chocovic; D'orsogna; Getrude Hawk; IBC; La Morella; Mona Lisa; Van Houten
Bloomer Chocolate (Fuji Oil Holding)	Chicago, Illinois, U.S.	Processing, Industrial Chocolate	907	982	998	Mainly U.S.	Commodity risk management;	Mainly sources from major traders but works together for sustainable practices with the supply chain managers. Direct sourcing as well from Cote d'Ivoire, Ghana, Indonesia, Ecuador. Seeks to achieve 100,000 farmers and 100,000 MT of sustainable and traceable cocoa by 2020.	North America. (U.S. and Canada) and China (5 Factories)	Founder's Reserve, Signature Line, Wonder Line

Firm HQ		Primary GVC segments	Revenue, US$ million (2018)	Revenue, US$ million (2017)	Revenue, US$ million (2016)	Geographic Scope	Other Ag Industries	Sourcing Strategy	Key Processing locations	Key Brands
Cargill (including ADM business acquired in 2016)	Wayzata, Minnesota, U.S.; HQ of Cargill Cocoa and Chocolate in Schiphol Netherlands.	Trading, Processing, industrial chocolate	114,695	109,699	107,164	Chocolate and cocoa presence in 47 locations with sales globally.	Agriculture (various, origination till distribution), animal nutrition, meat and poultry, agricultural risk management; food service; Other food and beverage ingredients.	Focus on sustainable sourcing (Cargill Cocoa Promise; 48% is certified sustainable); By 2030 would have full trackability and sustainability. Sourcing countries: Brazil, Ghana, Cameroon Ivory Coast, Indonesia. Single origin chocolate also a key consideration. Works closely with cooperatives directly on local markets in origin countries. Seek to buy early in supply chain to get best beans.	Chocolate processing mainly in Europe (Belgium, France, Germany, Netherlands, UK); North America (Canada and U.S.); Smaller operations in Brazil. Cocoa processing in Europe (France, Germany, Netherlands, and UK), with origin grindings in Ghana/ Ivory Coast/ Indonesia, and Brazil	Ambrosia; Peter's Chocolate; Merckens; Wilbur; Gerkens Cocoa powder
Puratos	Belgium	Processing, Industrial Chocolate, Chocolate Manufacturing	2,055	1,990	1,749	Global (sale to 100 countries) with local subsidiaries	Bakery and Pâtissier (ingredients, application expertise).	Focus on traceable and sustainable origin sourcing. Ivory Coast, Ghana Vietnam, The Philippines, Papua New Guinea and Mexico	France, Cote D'Ivoire, U.S., Poland. UK, Germany	Belcolade, Carat, Chocolante
ECOM Agrotrade	Switzerland	Trading, Processing	NA	NA	7,200	Trading offices in US, Mexico, Switzerland, Singapore, Indonesia, Papua New Guinea, China, Ivory Coast, Nigeria, Cameroon, Ghana. Sale worldwide	Coffee, Cotton, Sugar, Financial Services; agriculture financial services (commodity price risk management)	Direct sourcing from countries: Mexico, Indonesia, Papua New Guinea, Ivory Coast, Nigeria, Cameroon, Ghana, Ecuador, Malaysia. Like others sustainability, trackability, ethical practices, and environment are key considerations. Has a sustainable management code and Supplier code of conduct. Local offices (decentralized structure responsible for ensuring implementation of sourcing strategies.)	Netherlands, Malaysia, Mexico and Nigeria	Dutch Cocoa, AMCO, ECOM

Source: Authors, 2020. Based on the cited sources from the lead firms in the report.

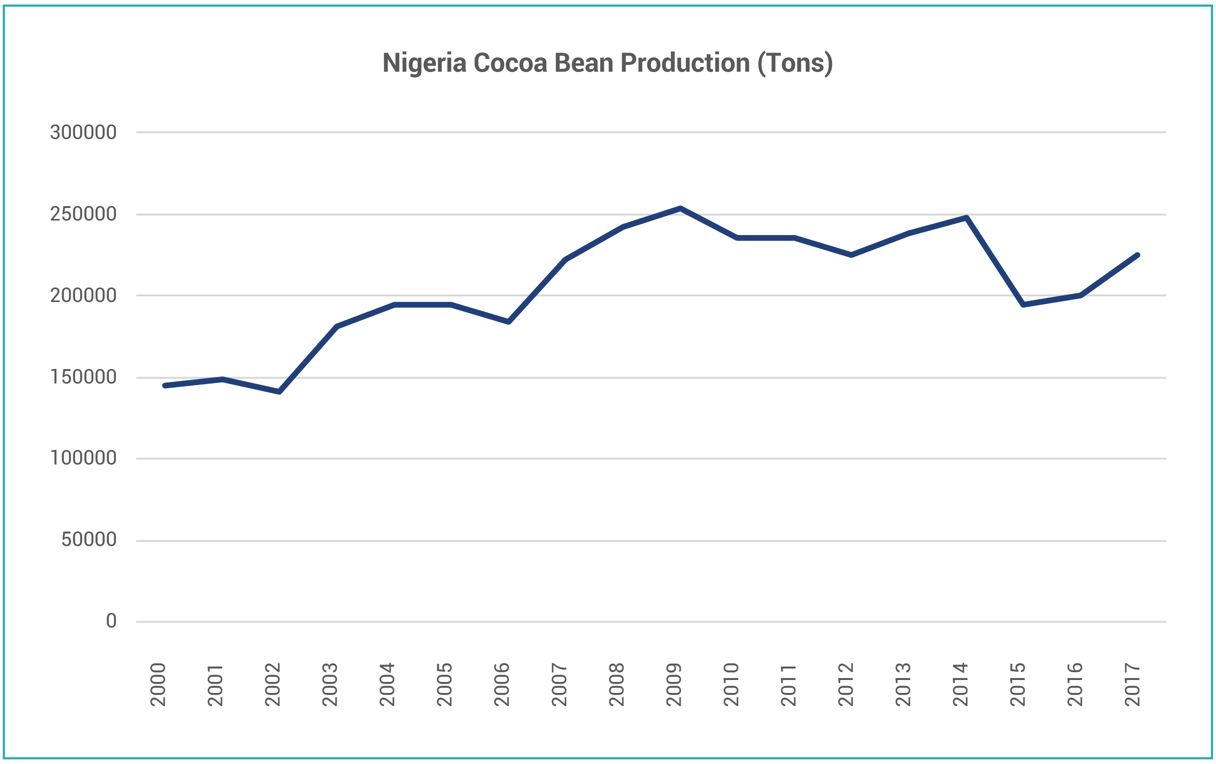
Table 20. Lead Firms in Chocolate Manufacturing, Retail

Firm	HQ	Primary GVC segments	Revenue, **US$ million** (2018)	Revenue, **US$ million** (2017)	Revenue, **US$ million** (2016)	Geographic Scope	Other Ag Industries	Sourcing Strategy	Key Processing locations	Key Brands
Mars	VA, U.S.	Processing, Chocolate Manufacturing, Retail	37000.0	35000.0	34000.0	180 countries	Petcare, Food, Confections, Beverages, Chewing Gum	Investing US$1 billions to build a new cocoa supply chain model centered on smallholder farmers	U.S., Canada, Mexico, Brasil, Chile, Argentina, China, Japan, Korea, India, Russia, Poland, Finland, Lithuania, United Kingdom, Netherland, Denmark, Ireland, Italy, Portugal, Germany, Norway, Czech Republic, Romania, Belgium, Switzerland, Austria, Slovakia, Hungary, France, Greece, Spain, South Africa, Australia	M&M's, Snickers, Galaxy, Dove, Mars, Twix, Maltesers Bounty, American Heritage, Ethel M,
Lindt	Kilchberg, Switzerland	Processing, Chocolate Manufacturing, Retail	4576.7	4381.8	4135.6	U.S., Canada, Mexico, Europe, Russian Federation, Japan, China, Australia, South Africa, Brazil, UAE	NA	Ensuring long-term supply of cocoa beans. In 2020: all the used beans come from a fully traceable and verifiable supply chain. "Lindt & Sprüngli Farming Program" The company has a major interest in a rich variety of cocoa beans and high availability of fine-flavor beans. Lindt & Sprüngli therefore supports efforts to preserve the diversity of cocoa varieties in Latin America – the fine-flavor bean's origin.	U.S., Switzerland, Germany, France, Italy, Austria	LINDT, GHIRARDELLI, CAFFAREL, HOFBAUER, KÜFFERLE, RUSSELL STOVER
Ferrero	Alba, Italy	Processing, Chocolate Manufacturing, Retail	12,626.0	11,865.0	10,591.6	170 countries	breath mints	"Sharing values to create value" Ferrero-Agricultural Commitment to Sustainability (F-ACTS), Ferrero Farming Values targets 100% certified cocoa beans as sustainable by 2020.	Mexico, Brasil, Argentina, Ecuador, South Africa, Turkey, Russia, Ireland, UK, France, Germany, Italy, Australia, Belgium, Poland, Canada, Cameroon, India, China	Nutella, Kinder, Ferrero Rocher, Raffaello, Golden Galery

Hershey	PA, U.S.	Processing, Chocolate Manufacturing, Retail	7,791.1	7,515.4	7,440.1	85 countries	Grocery goods, Popcorn, Chewing Gum	Cocoa for Good, the strategy for sustainable cocoa. "Investing half a billion dollars by 2030 to nourish children, elevate youth, build prosperous communities and preserve natural ecosystems."	U.S., Canada, China, Mexico, Brazil, India and Malaysia	HERSHEY'S, KISSES, REESE'S, KIT KAT®, BROOKSIDE, CADBURY, YORK, ALMOND JOY & MOUNDS
Mondelēz	IL, U.S.	Processing, Chocolate Manufacturing, Retail	25,938.0	25,896.0	25,923.0	150 countries	Biscuits, Beverages, Chewing Gum	Comprehensive approach to social sustainability across its businesses. Investing in key commodity programs, like Cocoa Life in cocoa. All is to, to ensure its ingredients are sourced sustainably and ethically. Source 100% sustainable cocoa. "We are scaling our Cocoa Life sustainability program so that by 2025, 100 percent of the cocoa volume for our chocolate brands is sourced sustainably."	52 countries in North America, Latin America, Europe, Asia-Middle East-Africa (including Nigeria)	5 Star, Alpen Gold, Cadbury, Milka, Toblerone, Core d'Or, Freia, Lacta, Marabou,
Nestlé	Vevey, Switzerland	Processing, Chocolate Manufacturing, Retail	97,025.9	96,013.6	94,851.9	187 countries	Instant coffee, baby food, bottled water, ice cream, pet food	By 2025: Source all cocoa for Nestlé confectionery - around 300 000 tons - through the Nestlé Cocoa Plan	Bulgaria, Czech Republic, Egypt, Germany, Hungary, Israel, Italy, Poland, Republic of Serbia, Russia, Spain, Switzerland, Turkey, Ukraine, United Arab Emirates, United Kingdom, Australia, Ghana, Greater China Region, India, Japan, Malaysia, New Zealand, Nigeria, South Africa, Bolivia, Brasil, Canada, Chile, Colombia, Ecuador, Mexico, Peru, U.S., Uruguay, Venezuela	Nestle, Cailler, Smarties, Kit Kat, Crunch, Garoto

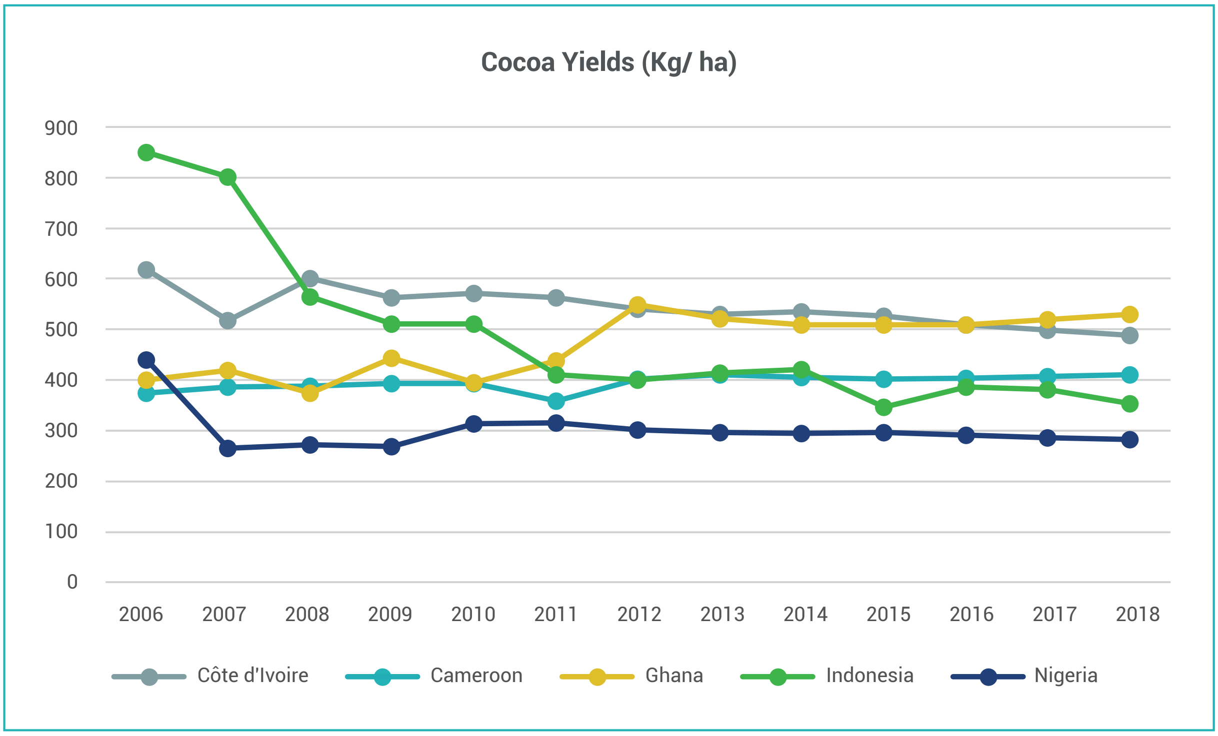
Source: Authors, 2020. Based on the cited sources from the lead firms in the report.

Figure 5. Nigeria Cocoa Bean Production (Tons)



Source: PIND, 2019

Figure 6. Cocoa Yields (Kg/ha)



Source: FAOSTAT, 2020

Figure 7. Country-Level Bulk Cocoa Origin Conditions

<table>
<tr><th rowspan="2">Bulk Cocoa Origins</th><th colspan="5">Country-Level Bulk Cocoa Origin Trends and Conditions</th></tr>
<tr><th>Avg. Yield (Kg/Ha)</th><th>Farm Gate Price as % FOB</th><th>Annual Pest/ Disease Loss</th><th>Annual Soil Fertility Loss</th><th>Other Challenges</th></tr>
<tr><td>Cote d'ivoire</td><td>450
(200-1000)</td><td>40-45%</td><td>24%</td><td>28%</td><td>• Lack of sector support
• High tax rates
• Limited land for further expansion
• High % of aging cocoa trees</td></tr>
<tr><td>Ghana</td><td>400
(200-1000)</td><td>65%</td><td>29%</td><td>25%</td><td>• Limited land for further expansion
• High % of aging cocoa trees</td></tr>
<tr><td>Indonesia</td><td>800
(300-1500)</td><td>84%</td><td>49%</td><td>15%</td><td>• Poorly flavored beans
• Low rates Post-harvest fermentation
• Major losses from Cocoa Pod Borer</td></tr>
<tr><td>Cameroon</td><td>425
(200-1000)</td><td>79%</td><td>50%</td><td>23%</td><td rowspan="2">• Sector neglect in favor of oil and gas industry
• High % of aging cocoa trees
• Major losses from Black Pod</td></tr>
<tr><td>Nigeria</td><td>350
(200-800)</td><td>79%</td><td>50%</td><td>23%</td></tr>
<tr><td>Brazil</td><td>175
(200-1500)</td><td>90%</td><td>65%</td><td>20%</td><td>• Unsolved Witch's Broom infestation
• Declining interest in cocoa farming</td></tr>
</table>

Source: Grinsven, 2009

Table 21. Lead Firms in Nigeria (Detailed)

Name	Address-location (local)	Local/ International	Segment in Value-chain	Capacity (Processing, Export, Grinding in MT), No of Employees and Turn Over
FTN Cocoa	Head office: Lagos	Local with presence in Oyo, Osun and Ogun	Processor. Provides cocoa Powder to local market final manufacturers (Nestle and Promasidor) and exports cocoa liquor, butter and cake. Plans to Increase of factory capacity to 50,000 MT per annum and engage in backward integration to improve availability of beans.	20,000 (MT) / Yr; did 600 MT by mid-year 2018; around 50 employees; Revenue of Naira 602 million. However, facing loses for few years.
Tulip cocoa processing	Ogun State	International Subsidiary of Ecom Agroindustrial	Trader and processor; Cocoa Beans; Cocoa Mass; Cocoa Butter; Cocoa cake; Cocoa Powder; Exports the products to parent company. Pioneer of traceability program with full traceability by 2020. UTZ sustainability programs. Training on GAP; Pioneer of traceability; certification; provides credit. Investment in 2018 to double processing capacity.	13,500MT (will intranational to 30,000MT after recent investment); 200 employees
Nestle Nigeria PLC	Lagos, Nigeria	International	Manufacturer: sources cocoa powder from local grinders and mainly produces cocoa beverages.	Sources around 10,000MT of beans annually; 2,200 employees; US$9 million for cocoa sourcing.
Imit Nigeria limited	Lagos, Nigeria	Local	Chocolate Maker: Consumable bar, Pastes, bulk quantities for raw materials	
Loshes Chocolates	Lagos, Nigeria	Local	Artisanal Bean to bar chocolate maker; single origin craft chocolate local company. Plans to export to UK, EU and Asia in future.	
Kalabari Gecko Chocolate	Sources from Ondo state	local	Bean to bar single origin chocolate company.	
Stanmark Cocoa Procesing Plant	Ondo State, Nigeria	International-Cadbury Nigeria (Mondelez)	cocoa butter; cocoa cake; cocoa powder. Cocoa Powder for local market and cocoa butter for exports through Olam and Aramjaro	12,000MT
Cadbury Nigeria	Lagos Nigeria	Publically listed, established in 1965 with majority shreholding by Mondelez and 25% by local	Food company; key brand: Cadbury Bournvita; Tom-tom (candy); Trebor Buttermint; Tang; Took over Stanmark Cocoa Processing Company in 2013; Investment in processing plant for food production US$50 million.	1,000 employees; US$7 million
Alfa Systems and Commodity	Ondo State, Nigeria		Processor and Exporter of cocoa bean, cocoa butter and cocoa cake	12,000 MT; Export of US$1.24 million (2014)
Cocoa Products (Ile Oluji)	Ondo State, Nigeria	Local, owned by Skye Bank and Bank of Industry	Processor and Exporter of cocoa products: liquor, butter, cake and powder. Supplies to both local producers and exports to foreign markets.	30,000MT; Processed 2000MT in by mid 2018; US$14 million export revenue
COOP Cocoa Company	Akure, Ondo State	Subsidiary of OLAM-International	Processor and Exporter of cocoa products: liquor, butter, cake and powder. Supplies to both local food companies of OLAM and exports to foreign markets.	
Multitrex cocoa limited	Ogun State	Local	Processing and export of cocoa products and local production of cocoa based products. *Not operational till 2018 due to loan default.	65000MT; US$3.64 million

Agro-trader (Plantation Industries Limited)	Ondo State, Nigeria	Local	Processing and export of cocoa products and local sale: butter, liquor, cake, powder (UTZ certified)	15,000MT; Less than 50 employees; US$3 million
Starlink Global and Ideal Limited	Lagos Nigeria;	Local: Warehouses in Ondo, Osun, Cross River and Ekiti	Export/ Marketing of cocoa and cashew. Training on GAP/ certification; Linked with Ecom Dutch, Sucden, Olam, Armajaro Trading	25,000MT Exports; US$13 million
Olam	Lagos with various facilities	International	Exports cocoa, cashew and sesame. Major agribusiness group with involvement across products. 18 processing facilities for various products. Provides training/ inputs/ global sustainability program.	40,000 MT exports; 7,300 employees
Bolawale Enterprises	Lagos, Nigeria with presence in Osun state	Local	Exporter/ Marketing of cocoa; plans to enter into processing of cocoa; Other businesses: cocoa plantation; plans to enter into processing; Traceability program. Also operates a palm processing plan. Markets in Europe, U.S. and Canada. Relationship with Barry Callebaut, Cargill, Carma, KVB (Germany). Provides extension services; inputs; farmer groups for certifications (UTZ).	60,000 MT (25% of total produce generally); 500; US$100 million
Agro Traders	Ondo State, Nigeria	Local	Provides UTZ certified. Also exports other products. Europe is the main export market. Also provides training to farmers to ensure UTZ certification. Cargill one of the main clients.	20,000MT
Ede Cocoa Processing Plant	Osun State	Local with partnership with Golden monkey of China (concession)	Processes cocoa liquor for local and international use	20000MT
Saro Agro Allied	Osun State: Ilkesa, Ikom, lagos	Local	Exports Cocoa; Main partnership with OLAM; Sustainable sourcing; Pioneered cocoa certification in Nigeria with ADM; Focus on UTZ certification through out-growers scheme. Has a "golden cocoa" program; Training on GAP and provision of inputs.	30,000MT
Gbemtan Investment	Ondo State, Nigeria;	Local	Exporter of cocoa beans; also exporting palm. procures from Ondo, Ekiti, Edo, Osun, Oyo and Ogun State	10,000MT; 75 employees; US$9 million
Olatunde International Limited	Ondo State Nigeria	Local	Exporter of cocoa beans	200 Employees
Graceco Limited	Lagos	Local	Producer and exporter of food products, including cocoa powder exports. Major cocoa related brand is Baker's Choice. Plans to expand to become African food producer.	200 employees
Barry Callebaut	Lagos	International	Exporter of raw cocoa beans. Plans to expand sourcing and market in Nigeria. Mainly deals with other exporters.	
Cormart		Local (also partner of international Puratos Group in Nigeria and Barry Callebaut)	Ingredients for bakeries, patisserie and chocolatier for local market. Partnership with Barry Callebaut recently to build capacity around chocolate manufacturing.	

Source: Authors, 2020. Based on the cited sources from the key local lead firms, in the report.

Table 22. Key Organizations Providing Support to Cocoa Value-chain (Detailed)

Organization	Geographical Presence	Key Focus Area
Federal Ministry of Agriculture and Rural Development (FMARD)	Present in 37 states including cocoa producing states	Coordination, policy direction and organization of agricultural sector, including agro-industrial development. Undertakes activities/ projects on agricultural productivity enhancement, value-chain and livelihood development, GAP etc. Has a "Green Alternative" agriculture strategy to promote agricultural export among other objectives with cocoa once of the key crops selected for export development.
State Ministries of Agriculture: Agriculture Development Programs (ADPs) or Agriculture Services/ State agriculture units/ departments (Tree crop units/ produce departments)	All States, mainly Ondo State, Cross River State, Edo, Abia, A/Ibom, Osun	Regulation and policy implementation for promotion of agriculture in the respective states. ADPs, mainly involved in provision of extension services to farmers. Also provide support for inputs, finance etc. Constrained by lack of funding in running extension infrastructure.
Nigeria Export Promotion Council	Head office Abuja with offices across the country.	Regulation, promotion, and monitoring of exports. Services include market information, trade fairs, and trainings among others. Training on cocoa grading and standards; IPM; supply of inputs.
Nigeria Investment Promotion Commission	Head office in Abuja with zonal offices in all regions: Borno, Pleatue, Kano, Enugu, Oyo	Promote and coordinate investments in Nigeria. Helps establishing linkages between domestic companies and foreign companies. Sets up incentives for investment and implement policies to improve business environment.
Quality control/ certification agencies including: National Agency for Food and Drug Administration and Control (NAFDAC) and National Agricultural Quarantine Services (NAQS)	Spread around Nigerian states/ cities, including Abuja, Lagos, Rivers State, Kani State, Borno state, Oyo State, Cross River State, Delta State etc.	Provide quality assurance, phytosanitary/SPS, standard and accreditation certificates for cocoa product exporters including GMP regulations. Implement regulations related to production/ manufacturing of products (including cocoa). Provide training on standards though training activities are limited.
Research Institutes and Universities: Cocoa Research Institute of Nigeria/ Various state universities such as Ekiti State University	Head quarter in Ibadan, Oyo State. 6 sub-stations in major zones of cocoa production	Owns 18 seed gardens with annual potential pod production capacity of 0.5 million, though only 4 gardens are functional. Mainly involved in breeding of new varieties/ production practices/ technology, multiplication activities and propagation of planting material, often at subsidized rated. Also provides training on all aspects from nursery development, production to processing. Provides pods to nursery operators, who provide to farmers. Close coordination with major international partners, research agencies and local organizations. Constrained by lack of funding.
International Group for Genetic Improvement of Cocoa; International Institute of Tropical Agriculture (Nigeria office); University of Reading	Ibadan, Nigeria	IITA is a CGIAR research center which engages in research and training on all aspects of cocoa production. INGENIC which supports information exchange and collaboration on cocoa genetics and improvement of cocoa planting material, and University of Reading which houses the ICQC for safe sharing of cocoa breeding material.
African Cocoa Breeders Working Group	Breeder from four national agencies of Africa, including Nigeria	Research and availability of better planting material.
Donor agencies: USAID, AFDB, GIZ, IFAD, UNIDO, WB, UNICEF, EU	Global	Provision of funding for various agriculture development programs, including training. AFDB: one of the 5 cash crops in its agribusiness promotion strategy. Promoting special agro-industrial processing zones; USAID funding for ACI-I (completed) and II; Markets II initiative engaging 22,000 smallholders; NEXTT (completed)—projects focusing on promoting trade and investment; GIZ Sustainable Smallholder Agribusiness Cocoa Food Link Program trained 27000 smallholders on GAP and Farmer Business Schools; IFAD "LIFE" program for entire Nigeria; World Bank Appeal program (focus on both food and cash crops)

Cocoa Association of Nigeria (CAN)	Akure Ondo state, Nigeria with offices in 14 producing states and Abuja	Body that represents all stakeholder in the cocoa export industry (dominated by LBAs and processors). Objective to promote sustainable development of cocoa industry. Private sector representative of Nigeria in international cocoa organizations. Comprises of all stakeholders. Focuses on collaboration, empowering cocoa farmer, ensure quality meets international standards. Pest and crop management. Provides training on IPM, GAP, and other activities.
Cocoa Farmers Association of Nigeria	Akure Ondo State.	Representative of farmers with 60 members. Provides information on production and marketing, training, farmers interests. Major initiative to increase cocoa yields, production of high-quality certified cocoa, cocoa farmers database digitization (traceability). Seeks to establish Cocoa resource center. Does not coordinate much with CAN.
Cocoa Processors Association	Lagos	Safeguard interests of cocoa processors and promote the processing sector.
Various local farmer organizations, including Agricultural Development Farmers Association Oyo State, State Farmer's Congress (Ondo/ Osun)	Oyo State/ Ondo/ Osun	Bring together farmers for improving production. Provide training and other aggregation services to their members, including training of young agropreneurs; training to farmers on GAP and quality improvement utilizing farmer field schools.
Cocoa Connect	Digital Platform financed by Dutch Ministry of Economic Affairs	Knowledge hub to build capacity in sustainable cocoa.
World Cocoa Foundation	Membership of various lead companies	Three flagship programs: WCF Cocoa Livelihoods Program, WCF ECHOES, and the WCF African Cocoa Initiative. Focus on provision of inputs and planting material; GAP training; extension training; Spray services.
International / local Cocoa Processors, traders and chocolate makers including Ferrero, Ecom Agroindustrial, Yara.	Local firms and global lead players with local representatives	Training on sustainable cocoa production and certifications (Fairtrade, Rainforest Aliance, UTZ); GAPs/ inputs and finance; infrastructure and stores. Generally, work with out-growers or those on certification programs. Tulip working with Cocoa organizations; other social infrastructure under sustainable cocoa sourcing initiative and to build loyalty for securing supply.
Olam	Local subsidiaries/ global firm	Promoting sustainability under CocoaAction; Providing loans (Osun, Ondo and Cross Rive) for Personal Protection Equipment and agrochemical spraying; Installed solar dryers in 28 farming communities in Osun, Cross Rive and Ondo State; Social work in Ondo state with digging 10 boreholes; health education.
Local Buying Agents (individual companies or Cooperatives)	Local in all states	Training on use of inputs in collaboration with agro-chemical processors. First market for producers to sell inputs; provide inputs and credits to farmers.
Major agro-chemical companies (Harvest field industries, Syngenta, Bayer Services, Saro Agrosciences, Jubaili, and their association Croplife	International with local agents in Nigeria. Croplife: Akure Ondo State- Linked with Global Croplife	Training on pest management and use of herbicides and insecticides. Work with agro-dealers, exporters, LBAs or cooperative to distribute inputs to farmers.
Local and International NGOs: (i) Farming world and rural development initiative- NGO; (ii) Oxfam Novib; (iii) Solidaridad; (iv) Technoserve (international NGO)	Cross River State; Abuja; Engu	Training on GAP; provision of inputs; Certified and sustainable cocoa, mainly UTZ. Works closely with private sector companies and other agencies. (Technoserve) Business development and networking services. Training on business development, GAPs and entrepreneurship including access to finance models.
Local microfinance providers such as Financial Diamond Bank; Farmer Development Union (FADU); Life Above Poverty Organization	Lagos; Ondo; Edo (in order)	Financial Services; Microfinance and training on sustainable certified production.

Source: Authors, 2020. Based on the cited sources on the key organizations, in the report.

1.3 INDONESIA IN THE COCOA-CHOCOLATE GLOBAL VALUE CHAIN

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Summary

The Global Cocoa-Chocolate industry a multi-billion-dollar industry that includes cocoa beans and intermediate products to produce chocolate. The industry is driven by the high demand for chocolate products in developed countries and high demand growth, particularly in major emerging economies. The Cocoa-Chocolate GVC is characterized by upstream labor intensity and downstream capital intensity. The upstream segment is dominated by smallholders involved in cocoa production, where the sustainability of the supply of cocoa beans for downstream chocolate products is a major evolving concern. The Cocoa-Chocolate GVC exhibits bipolar governance as Global Lead Firms control high-value functions in the downstream brand chocolate manufacturing and marketing in consumer markets. Simultaneously, midstream trader-grinders dominate the global supply chain of the cocoa ingredients in the processing segment. The control of market power and value creation by the Lead Firms in mid-and downstream segments creates a power asymmetry against fragmented smallholders with low productivity, disorganized cooperatives, and weak technical capacity.

Indonesia is a major cocoa producer, but cocoa exports have stagnated over 2008-18 with product composition significantly shifting to more processed exports primarily due to Indonesia's concerted policy of upgrading functionally into higher value cocoa processing segments i.e., grinding and processing of cocoa beans. This shift allowed exports of upstream cocoa beans to be entirely replaced by increased exports of midstream processed cocoa, primarily, cocoa butter for which it is now commanding unit prices similar to Netherlands and Germany. While Indonesia's significant processed cocoa exports to an advanced cocoa processing hub such as Netherlands highlight its successful end market upgrading but despite penetrating into large and growing Asian markets such as China and India, its share of their Cocoa-Chocolate imports is still relatively low.

Indonesia's upstream cocoa bean production is undertaken by around 1.4 million smallholder farmers with the notable exception of Olam, a Global trader-grinder also setting a successful Corporate Farming example. Partly driven by outsourcing strategies of Global Lead Firms in downstream chocolate manufacturing, the midstream cocoa processing segment is dominated by Global trader-grinders such as Olam, Cargill, Barry Callebaut, Guan Chong, as well as major regional firms such as GB Cocoa. Much like the Global Lead Firms in this segment elsewhere, commodity traders have over time offshored their processing capacity to origin countries such as Indonesia. These offshoring and outsourcing strategies of Global Lead Firms in the Cocoa-Chocolate sector have presented opportunities for upgrading towards midstream cocoa processing in origin countries such as Indonesia.

The downstream chocolate market in Indonesia is dominated by two domestic manufacturers, Delfi and Mayora Indah, with a combined market share of almost 80%. The rest of the market is shared by Global Lead Firms such as Mondelēz, Mars, Ferrero, Nestlé, Lindt, and Hershey's. Due to the need to guard industrial secrets and required high capabilities, Global Lead Firms enter markets such as Indonesia with only an intra-firm coordination strategy, i.e., acquisitions. As a cost-capability play, many cocoa processors use Indonesia as a key and cheaper input supplier to meet their global demand.

Increasing productivity and improved cocoa beans fermentation and drying processes is one of the important trajectories that Indonesia can pursue. However, on-farm productivity is low due to inadequacy of cultivation and postharvest specialized skills and weak warehousing and logistics infrastructure, resulting in low production and poor bean quality. Process upgrading, particularly into certified and FFC cocoa, will provide long-term access to the cocoa market, minimize exposure to price volatility, increase local value addition in downstream production and increase employment and revenue creation for smallholders.

End Market Upgrading can be pursued by enabling Global Lead chocolate manufacturers to locate their plants in Indonesia to serve the growing domestic and regional markets and increase exports of high-value chocolate products with concomitant technology and know-how spillovers in the long term. However, lack of policy incentives, high input costs, particularly sugar, and poor cold chain infrastructure prevent chocolate manufacturers from accessing untapped domestic and growing regional markets. Other transversal challenges include lack of a coherent industrial policy, which results in the security of cocoa bean supply for midstream already facing overcapacity, the inconsistency of chainwide policy incentives, lack of overarching institutional oversight. The availability of accurate data across the value chain is also a concern.

The proposed transversal policy recommendations include setting up a producer group through IsDB that would aim to provide living income to cocoa farmers to help adopt sustainable cocoa production in Member Countries that together account for 65% of global cocoa production. The second recommendation is to formulate an industrial initiative on private sector-led scaling up of Cocoa Sustainability programs and associated on-farm productivity enhancements. IsDB Group could support the capacity building of an overarching institution such as the Indonesian Cocoa Board (DEKAINDO), provide financing support to cooperatives for agricultural inputs, and private sector support for significant value chain gaps.

The third recommendation is to enable investments in Smart Ports with advanced and efficient logistics and storage solutions to support cocoa processing agglomeration and chocolate production clusters. This would help replicate Antwerp's success in ports such as Gerisk in Indonesia and Klang in Malaysia. The fourth recommendation is to develop collaborative R&D facilities among many stakeholders such as producer cooperatives, Global Lead Firms, universities, and the public sector to foster upgrading across the value chain.

The Government could prevent postharvest losses by building farmgate infrastructure for warehousing, bean fermentation, and providing market access through farm to market infrastructure. IsDB could support such postharvest infrastructure as well as support R&D for cocoa varieties. ICD/ITFC can finance programs that link smallholders and grinders with the construction of fermentation and drying &storage facilities.

Indonesia could incentivize locally embedded Global Lead chocolate producers to establish plants in the country using a package of policy incentives. These may include granting EPZ access and tax breaks, fixing the import licensing regime for milk and sugar to reduce key input costs, and enabling investments in cold chain logistics. IsDB Group could provide financial support to the private sector to plug critical value chain gaps through investment, trade finance as well as investment insurance.

1.3.1. The Cocoa-Chocolate Global Value Chain

The Global Cocoa-Chocolate Industry

Why Cocoa-Chocolate industry in Indonesia?

Historically, Indonesia, a major cocoa beans exporter, has been successfully moving into higher value segments from cocoa beans to cocoa butter and other intermediate products due to a strategic policy shift. The country can reap the full potential of its Cocoa-Chocolate GVC positioning by continuing the upgrading trajectory into higher value-added segments. Compared to palm oil and rubber that face sustainability and technology disruptions, and despite the positioning endowments, the potential of Indonesia's participation in Cocoa-Chocolate GVC has not been fully exploited. In this regard, Indonesia can move further in the downstream segment and become a key chocolate maker and exporter in Asia over the longer term. However, its current involvement in global chocolate export is less than 1%.

There is a modest increase in cocoa bean production over the last decade, which has averaged **4.2 million** tons while total trade averaged **3.5 million** tons per annum over 2010-2018. The end of season stock level for cocoa beans, on average, was **1.6 million** tons per annum during the same period.

As the country moves towards downstream segments of the value chain, it possesses the ecosystem and potential to meet increasing regional and global demand for chocolate products in terms of raw material production, infrastructure, and human capital. However, realizing this potential requires ensuring the security of raw material through on-farm productivity enhancements in cocoa beans' quantity and quality. This would also require supportive industrial policies that leverage existing midstream backward linkages to forge stronger downstream forward linkages. Indonesia has successfully enabled private sector-led midstream investments through policy incentives and infrastructure. It is now well-positioned to tap into the expanding consumer markets both at home and in the ASEAN region.

Cocoa Production and Cocoa-Chocolate Trade

Cocoa, native to South America, is one of the most highly traded agricultural commodities globally since it is the main ingredient in chocolate production. The traded value of cocoa beans (HS 1801) remained, on average, US$9.7 billions in 2008-2017 (resourcestrade.earth, 2020). According to ICCO, FFC export accounts for only 6% of total cocoa beans export. According to the global chocolate market overview, an estimated share of FFC chocolate is about 20% worldwide, with considerable variation across countries and regions. Cocoa beans production is based in developing countries located on the Equatorial belt, while manufacturers and consumers are typically in developed countries. Ivory Coast, Ghana, and Indonesia accounted for 67.3% of total global production in 2018 (FAOSTAT, 2020).

There is a modest increase in cocoa bean production over the last decade, which has averaged 4.2 million tons while total trade averaged 3.5 million tons per annum over 2010-2018 (ICCO, 2020a; The World Bank, 2020). The end of season stock level for cocoa beans, on average, was 1.6 million tons per annum during the same period (ICCO, 2020a). The limited increase in cocoa production is due to multiple farm-level factors, but the most important one is a stagnated yield for decades. The cocoa bean global yield, on average, was 463 kg/ha in 1990-2009, while it was 446 kg/ha in 2010-2018 (FAOSTAT, 2020).

In line with rising global demand, the total Cocoa-Chocolate trade (HS 18) exhibits an increasing trend over the years and is valued, on average, US$48 billions per annum during 2015-2018 (TradeMap, 2020).

Global Demand Dynamics in Chocolate Industry End-market

The global demand for chocolate products is rising as disposable incomes rise globally particularly in emerging economies such as China, India, Russia, Brazil and South Africa that constitute the majority of demand increase for confectionary products globally (Hamrick, et. al, 2017).

Growing popularity in specialty chocolate markets has resulted in bringing newcomers and new trends to the industry. There is an increasing demand, particularly for Fine and Flavor Cocoa (FFC) that contains certain high-quality features and an increased segmentation towards premium and artisanal products such as dark chocolate due to their health benefits and specialty (Hamrick, et. al., 2018).

Sustainability and Traceability are Becoming Crucial in the Industry.

Global chocolate manufactures are increasingly demanding certified cocoa beans in regard to (i) sustainability that focuses on more farm-level production and environmental effects and (ii) traceability that considers single-origin chocolate products and social concerns such as child labor, respectively (Hamrick, et. al., 2018). Industry Concentration and Factor Intensity in the Cocoa-Chocolate GVC

The Cocoa-Chocolate GVC is characterized by upstream labor intensity in cocoa bean production and downstream capital intensity, which require investments in roasting, grinding, and pressing equipment (UNCTAD, 2016; World Cocoa Foundation, 2016).

Cocoa-Chocolate value chains have become increasingly horizontally (and vertically) concentrated at the global level following several mergers and acquisitions (UNCTAD, 2016). Due to cocoa supply concerns, many midstream actors have started to integrate upstream activities, including production by various models such as contract farming. Big processors and/or big aggregators are also becoming common in the middle of the value chain.

The industry requires a coherent strategy for sustainable growth built through coordination among farmers, Government institutions, traders, manufacturers, marketers, exporters, etc.

Mapping the Cocoa-Chocolate Global Value Chain

The Cocoa-Chocolate GVC covers both agricultural and manufacturing activities as well as marketing and distribution. These processes can be divided into five main segments as shown in Figure 1; i) Production of cocoa beans ii) Roasting and Grinding iii) Pressing iv) Chocolate Manufacturing and v) Marketing and Distribution (Hamrick, et. al., 2018).

Production of Cocoa Beans: Cocoa is a perennial crop for which good seedlings genetics and adopting best practices are essential for better yields. Production is labor-intensive, and after pods are harvested, they are cut open and the beans removed (swisscontact, 2016). Then, beans are fermented before drying to develop their chocolate flavor and aroma, requiring heating the beans for up to a week. Afterward, the wet cocoa beans are typically dried in sunlight for five to ten days, improving their shelf life.

Roasting and Grinding: During this first mid-stream activity, the outer shell of the beans is removed, and the inner cocoa bean is broken into small pieces called cocoa nibs (Swisscontact, 2016). Grinding is how cocoa nibs melt from the heat generated by this process creating cocoa liquor or paste. Large, multinational processors or grinders primarily undertake these capital-intensive activities.

Pressing: The cocoa liquor is fed into hydraulic presses at a high temperature that separates cocoa liquor into two components; cocoa butter and cocoa cakes (UNCTAD, 2016). The pressing stage requires special and expensive equipment that consumes high levels of energy since it needs to heat and agitate the cocoa liquor. This machine/equipment also requires specialized technicians to operate. Thus, large multinational processors dominate the production of cocoa butter and powder (Hamrick, et. al., 2018).

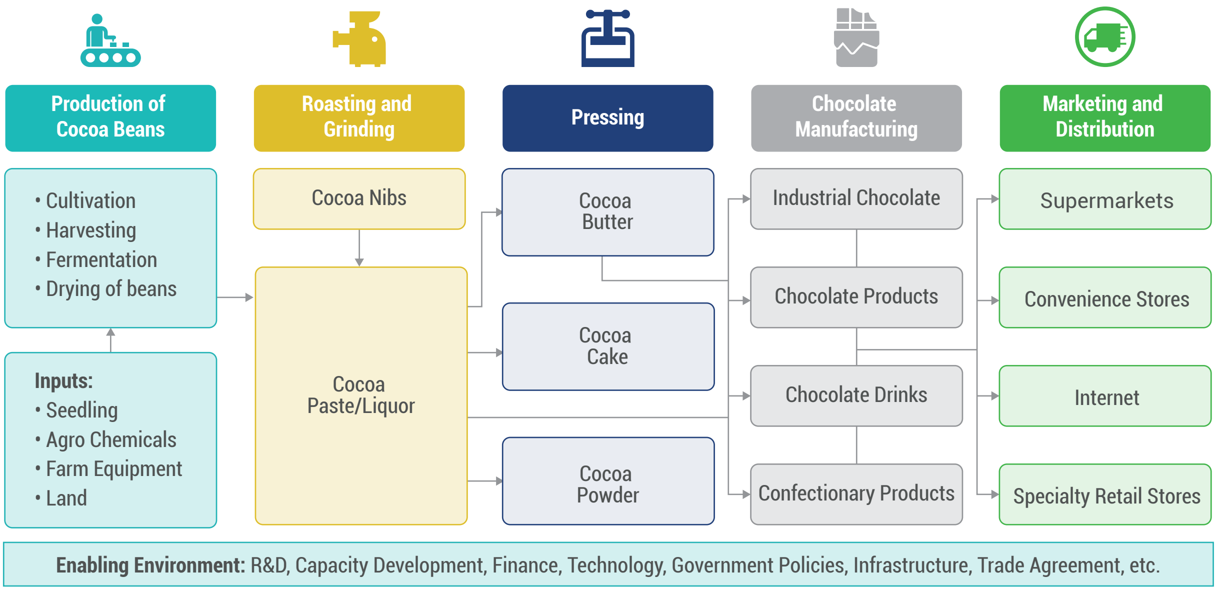
Chocolate Manufacturing: Depending on the type of chocolate being manufactured, a mixture of cocoa butter, cocoa liquor, sugar, milk, and other ingredients are heated and blended (Hamrick, et. al., 2017). This mixture undergoes a refining process till smooth chocolate is obtained, often called industrial chocolate. Chocolate products include chocolate bars, as well as inputs for the production of confectionery items, such as biscuits, cakes, ice cream and others. Cocoa powder is used to produce the chocolate frosting, chocolate-based goodies, and drinks.

Marketing and Distribution: Chocolate products are sold through retail grocery channels, including hypermarkets, supermarkets, specialty retail stores, convenience stores, and increasingly through online shopping (UNCTAD, 2016). Supermarkets dominate sales in most major markets. Overall, a large share of chocolate consumption is based on impulse purchases, gifts, and special occasions (Hamrick, et. al., 2017).

Enabling Environment: Global Supply and Demand in the Cocoa-Chocolate GVC

There are cross-cutting factors across the value chain that affect productivity and value add in each stage of the value chain, such as policy environment, R&D, Finance, Capacity Development, etc. Many countries from both developed and developing countries are involved in Cocoa-Chocolate GVC. Developing countries that have favorable agro-ecological conditions around the equator are typically positioned on the supply side, while developed countries have concentrated on the processing of cocoa beans along with chocolate production, marketing, and distribution of chocolate as the final product. The Netherlands, among developed countries, is a pivotal country in engaging in all value chain segments from import of cocoa beans to processing intermediate products to chocolate manufacturing. Although demand for chocolate end products - and thus cocoa beans - predominantly comes from developed counties, that has started shifting to emerging economies.

Figure 1. Cocoa-Chocolate Global Value Chain



Cocoa bean producers, however, have been striving to upgrade into processing stages and thus increase value addition to the raw material they produce. Côte d'Ivoire, Ghana, Nigeria, and, in recent years, Brazil have started to get involved in more downstream segments of the chain. Interestingly, some of these countries, particularly in the Asian region, such as Malaysia and Indonesia, have increased their cocoa beans imports to support higher midstream exports.

The biggest chocolate exporter is Germany by 17% in 2018, followed by Belgium, Netherlands, Italy, Poland, and U.S. There are no developing countries exporting chocolate except Poland, which highlights an opportunity for them to move towards chocolate production, marketing, and distribution stages of the value chain.

1.3.2. Lead Firms and Governance in Cocoa-Chocolate GVC

At the upstream stages of the coca-chocolate GVC, such as cocoa bean production and fermentation, the industry is characterized by millions of fragmented or scattered smallholders who plant and grow cocoa.

The midstream cocoa processing stages, such as grinding to produce cocoa liquor and pressing to make cocoa butter and powder, are characterized by market consolidation and dominance of global traders, grinders, and chocolate manufacturers. The downstream stages of the GVC that include production and marketing of chocolate is dominated by major global confectionery and chocolate companies (Hamrick, et. al., 2018). According to Barrientos, 2015, this has led to an asymmetrical balance of power within the chain, with smallholders obtaining an ever-decreasing share of this growing industry.

Lead Firms in Downstream Segment of Cocoa-Chocolate GVC: Concentration and Dynamics in the Chocolate End-Market

The downstream segment of the Cocoa-Chocolate GVC is primarily the global chocolate industry, which is around US$113.6 billions as of 2018 has grown with a Compound Annual Growth Rate (CAGR) of 4.2% over 2010-18 (Statista, 2020a). The industry is expected to grow to US$135.6 billions with a CAGR of 3.6% by 2023. For comparison, revenue in the chocolate end-market is 30% of the confectionary end-market revenue of US$380 billions in 2018 (Statista, 2020b).

The global chocolate confectionery market is controlled by six firms that account for 60% of the value created through chocolate products in 2016. Mars Inc. (14.4%), Mondelez International (13.7%), Nestlé (10.2%), Ferrero (9.5%), Hershey Co. (7.2%) and Lindt (5.1%) (Statista, 2020c). The significant market concentration is demonstrated by the fact that the top 10 companies in this part of the value chain together accounted for 70% of the value of the chocolate end-market. Five of the top 10 chocolate manufacturing firms are based in Europe, three in the US, and two in Japan. It is interesting to observe that the top three Lead Firms have mostly chocolate as their key sector of revenue.

As reported in Neilson et. al. (2018), those six largest firms account for an estimated one-quarter of global confectionery sales (KPMG 2014). These firms also own the ten largest selling chocolate brands globally and are responsible for the use of 40% of the world's cocoa (Fountain and Hütz-Adams 2015). This underscores the considerable power that these firms wield over the Cocoa-Chocolate GVC.

Lead firms benefit from their direct access to and control of the chocolate consumer market and the scale economies as their significant production facilities are spread globally. The unparalleled capacity to undertake R&D also gives Lead Firms power over other actors in the Cocoa-Chocolate value chain (Abdulsamad et.al., 2015). For R&D expenditures, factories and countries covered by Global Lead Firms, see Annex 3.

Lead Firms in Midstream Segment of Cocoa-Chocolate GVC: Vertical Integration and Concentration

Apart from manufacturing chocolate products, as part of their sourcing strategies driven by end-product quality, supply chain efficiencies, and scalability considerations, the lead chocolate manufacturing firms integrated vertically over time to undertake midstream activities such as grinding and other cocoa processing. This includes firms such as Mars, Mondelez, Nestle, and Ferrero as of 2008 (Oxfam, 2008). Moreover, the Lead Firms in global agricultural commodity trading such as Cargill, Olam, and ECOM, which traditionally would act as suppliers to chocolate manufacturers, have shifted into grindings, i.e. cocoa processing, most of which is performed at origin and some in destination markets. Illustrious examples are Cargill's acquisition of ADM's chocolate business in 2015 and Fuji Oil's acquisition of Blommer in 2018. The midstream segment is, therefore, now dominated by trader-grinders. This process of consolidation and vertical integration by Lead Firms in Cocoa-Chocolate GVC is depicted in Annex 1.

Some lead chocolate firms still maintain their processing capabilities both at origin or within end-markets (e.g. Mondelez, Nestle, and Ferrero still have grinding capacity as per Barry Callebaut Fiscal Results 2018/19). However, chocolate manufacturers' overall trend is to withdraw from processing and outsource this less profitable segment to specialist cocoa processors (Squicciarini & Swinnen, 2016).

The end-market grindings in Europe, for example, account for only 37% (ICCO, 2020), mainly in Germany, the Netherlands, and others. Grindings of around 1.4 million MT in Europe are carried out by only six companies Barry Callebaut, Cargill, ECOM, Nederland SA, Olam, and Cemoi, according to European Cocoa Association (ECA, 2020). Market concentration is demonstrated by the fact that the top three grinders, Barry Callebaut (1.2 million MT), Olam (0.97 million MT) Cargill (0.8 million MT) have a capacity of almost 2.97 million MT. Altogether, these firms' grindings are 62% of the total grindings of 4.805 million tons carried out in 2018-19 (ICCO, 2020). However, the total grindings in 2018-19 also left a deficit of 107,000 tons against the cocoa production of 4.745 million tons, reflecting a reemergence of cocoa supply security issue.

Table 1: Lead Firms in Downstream End-Market Cocoa-Chocolate GVC

Firm	HQ	Revenue (2018) US$ million	Employees (2019 or Latest Available)	Key Brands	Sales by region
Mars Wrigley	U.S.	18,000	34,000	Mars, Milky Way, M&M's, Skittles, Snickers, and Twix	EMENA>AMERICAS>ASIA
Ferrero Group	Luxembourg / Italy	12,390	36,372	Ferrero Rocher Nutella Raffaello Tic Tac Thorntons Kinder	EMENA>AMERICAS>ASIA
Mondelēz International	U.S.	11,792	80,000	Cadbury, Milka, Côte d'Or, Toblerone	EMENA>AMERICAS>ASIA
Meiji Co Ltd	Japan	9,662	10,673	Meiji Milk Chocolate, Cocoa 86%, Almond Chocolate	ASIA>AMERICAS>EMENA
Hershey Co	U.S.	7,779	16,910	Reese's Peanut Butter, Hershey's Kisses, Milk Chocolate, Almond Joy	AMERICAS>ASIA
Nestlé SA	Switzerland	6,135	291,000	KitKat, MilkyBar, Aero, Smarties	AMERICAS>EMENA>ASIA
C. Lindt & Sprüngli AG	Switzerland	4,374	14,000	Lindor, Excellence	EMENA>AMERICAS>ASIA
Ezaki Glico Co Ltd	Japan	3,327	5,488	Pocky, Pretz	AMERICAS>ASIA
Pladis (UK)	UK	2,816	26,000	Ulker, GODIVA	ASIA>AMERICAS>EMENA
Kellogg's Co	UK	1,890	33,000	CocoPops, Krave	AMERICAS>EMENA>ASIA
Total		78,165	547,443		

Source: ICCO 2018 for Revenue, Firms' websites/Annual Reports for employment & regional sales

Sourcing Strategies

Lead firms in the midstream Cocoa-Chocolate GVC segment have been deploying sourcing strategies to meet objectives such as supply security, sustainability, risk mitigation, operational efficiency, and economies of scale and scope. The broad trend is to shorten the supply chain and bring efficiencies by working directly with farmers or their cooperatives in sourcing cocoa beans.

The key motivation for such sourcing is cutting middleman costs, ensuring the security of supply through long-term contracts, and meeting the market imperative of responsible and sustainable cocoa sourcing. Such an approach aims to provide decent incomes and livelihood support to cocoa farmers and other incentives through capacity building, training, and access to health, education, and finance.

The following typology describes how firms engage in an optimal combination of the approaches that best fits their business model, specialization, and main consumer market:

- Owning cocoa farms to grow their own cocoa beans (GOOC)
- Sourcing directly from farmgate either from the farmers, village collectors, or most frequently farmer cooperatives (COOP)
- Sourcing directly from local wholesalers or trading companies as suppliers (SUPP)
- Ensuring coordination among the various actors in the supply chain (CSCM)

Table 2: Lead Firms in Midstream Processing Cocoa-Chocolate GVC

Rank (By grinding capacity)	Firm	HQ	Revenue (2018)	Employees (2019 or Latest Available)	Key Geographic locations
1	Barry Callebaut	Switzerland	7,300	12,000	EMENA, Asia
2	Cargill	Unites States	114,700	166,000	Americas, EMENA, Asia
3	Olam	Singapore	30,500	74,500	Asia, EMENA, Americas
4	ECOM	Switzerland	7,300	3,000	EMENA, Asia
5	Fuji Oil	Japan	2,700	5,963	Asia, EMENA, Americas
6	Guan Chong	Malaysia	700	180	Asia, Americas
7	Nestlé	Switzerland	6,200	291000	Americas, EMENA, Asia
8	Ferrero	Italy	12,400	36,372	EMENA, Americas, Asia
9	Mondelez	United States	11,800	80,000	EMENA, Americas, Asia
10	Touton	France	1,200	900	EMENA, Asia
11	Sucden	France	5,500	5,400	EMENA, Americas, Asia
	Total		200,300	675,315	

Source: ICCO for chocolate producer revenues, firms' websites/Annual Reports for revenues and employment.

The following chart depicts the sourcing strategies of Lead Firms in the mid-stream Cocoa-Chocolate GVC segment:

Table 3: Sourcing Strategies of Lead Firms in Midstream Cocoa-Chocolate GVC

Firms	GOOC	COOP	SUPP	CSCM
Barry Callebaut		X	X	X
Cargill		X	X	X
Olam	X	X	X	
ECOM		X	X	
Fuji Oil		X	X	
Guan Chong		X	X	
Nestlé		X	X	X
Ferrero		X	X	X
Mondelez		X	X	X
Touton			X	X
Sucden			X	X

Source: Firms' websites/Annual Reports

Fragmented Smallholder Cocoa Production in Upstream Cocoa-Chocolate GVC:

In the cocoa production upstream segment of the value chain, more than 95% of cocoa growers are smallholders having a land area of 1-4 hectares in the cocoa producing equatorial belt (ICCO, 2012). Total employment in the sector reaches approximately 14 million workers worldwide, with three-quarters of that concentrated in Africa (Abdulsamad et al., 2015).

The upstream producers get an ever-decreasing share of the whole GVC because of the low productivity and market structure at the farm level. Another reason is the chocolate industry dynamics where Lead Firms both in cocoa processing and chocolate end-markets control value creation across the GVC (Barrientos, 2015). Low cocoa productivity and concerns about long-term sustainability are significant challenges to meet the rising global demand for cocoa beans (Hamrick et. al., 2018).

Key Features of GVC Governance

The following key characteristics can be noted from the above discussion of Lead Firms and governance in the various segments of the Cocoa-Chocolate GVC:

Power Asymmetry within Cocoa-Chocolate GVC

The power asymmetry in the Cocoa-Chocolate GVC results from control of market power and value creation by the Lead Firms in mid-and downstream segments by global trader-grinders and chocolate confectionery firms. This market power renders fragmented smallholders with low productivity, disorganized cooperatives, and weak technical capacity captive to local collectors and traders ***within the up-and midstream segments.*** At the same time, it also subjugates the producers as rule and price takers of oligopolistic Lead ***Firms across the value chain segments.*** Lower returns have led farmers to switch to other cash crops such as oil palm, thus creating an issue of sustainability of cocoa supply.

Bipolar Governance in Cocoa-Chocolate GVC

As per Gereffi's 1994 classification of governance in GVCs, the Cocoa-Chocolate GVC may be classified as a buyer-driven rather than a producer-driven value chain. The current GVC configuration has evolved from a simpler form, where cocoa was treated as a bulk market tradeable commodity much like coffee, to a stylization where interactions between Lead Firms and their suppliers have ripple effects along all actors across the chain but particularly those further upstream (Gibbon and Ponte, 2008).

This phenomenon has led the major suppliers, i.e., traditional commodity traders and processors such as Cargill and Olam, to gain more market power vis-à-vis the chocolate producers such as Mars, Ferrero, Mondelez, and Barry Callebaut. Such a governance structure is stylized as bi-polar governance, according to Abdulsamad et al., (2015). In the downstream part of the GVC, the Lead Firms control high-value functions in brand chocolate manufacturing and marketing in consumer markets while processors and traders in the upstream part of GVC dominate the global supply chain of cocoa ingredients in the processing segment. Despite the changing sourcing and supply chain management strategies, the control of Cocoa-Chocolate GVC lies with the end-market Lead Firms. This is due to their access and control of the chocolate consumer market, sophisticated global production networks, advanced processing knowledge, investments in R&D, and control of marketing and distributing channels.

Annex 1 presents an activity map of Lead Firms in the GVC and how they have increased their market and bargaining power through transitioning into newer and complementary segments.

Evolving Sourcing Strategies to Meet Rising Demand for Traceable, Certified and FFC Cocoa

In line with evolving consumer tastes for premium chocolate products in end-markets, the market imperative of compliance with environmental and sustainability issues among the Lead Firms, there is a growing demand for cocoa production which is traceable and certified.

Demand for certified and traceable cocoa means that Lead Firms in Cocoa-Chocolate GVC play their 'normalizing' role in the setting process and product standards for upstream producers and changing their sourcing strategies to meet the sustainability and quality requirements.

The Lead Firms in Cocoa-Chocolate GVCs have moved to trade directly with farmer cooperatives. This involves building the cooperative capabilities to meet the required standards, leveraging local trading relationships, and committing to proprietary or third-party sustainability programs and targets as part of their sourcing strategies (Hamrick et. al. 2018). Such proprietary programs include Cocoa for Life by Mars, Nestlé Cocoa Plan, Ferrero's Farming Values for Cocoa, Hershey's Cocoa for Good, and Barry Callebaut's Forever Chocolate Program.

There is also a move towards product differentiation in cocoa sourcing, such as Fine Flavor Cocoa (FFC), a distinct demarcation given by ICCO to cocoa bean exports that convey the product's unique flavor profile suitable for the production of high-end chocolates. Depending on their quality, they can earn over three times the selling price for ordinary or bulk cocoa beans (Hamrick et. al., 2018.). For example, ECOM supports the adoption of FFC varieties in Peruvian farmers to ensure quality control and traceability (Donovan et. al. 2015).

Another aspect of product differentiation is the introduction by many Lead Firms of niche end-products such as the KitKat Cocoa Fruit from Nestlé. The firm claims to be the world's first single-origin 70% dark chocolate naturally sweetened by cocoa pulp. (Nestlé, 2019 Annual Review). Similarly, Barry Callebaut has introduced in 2017 Ruby chocolate made from the Ruby cocoa bean (Barry Callebaut, 2020).

1.3.3. Indonesia and the Cocoa-Chocolate Global Value Chain

Current Participation of Indonesia in the Cocoa-Chocolate GVC

Although Indonesia has strengths as a commodity producer, it has diversified its export for cocoa products. The global share of cocoa beans and other related products (HS18) is relatively small at just 0.7% but has remained stable over 2010-18 while Indonesia's exports have risen from US$158 billions to US$180 billions. As a share of world imports of HS18, Indonesia's cocoa exports have also averaged around 2.5%. However, Indonesia's export share rises to 15% for world imports of cocoa butter (ITC TradeMap).

A study of the demand dynamics of Indonesia's participation in Cocoa GVC reveals that Indonesia has two winners, i.e., 1804: Cocoa butter and 1805 Cocoa Powder. Cocoa butter is currently in a declining sector, given the growth dynamics of world trade in the last four years ((ITC TradeMap). However, the expected rise in demand for chocolate products, which will, in turn, support cocoa butter demand, can enable Indonesia to continue benefitting from cocoa butter exports in the Cocoa-Chocolate GVC in the short to medium term (Annex 2).

Stagnation in Overall Cocoa Exports but Successful Functional Upgrading to Value Added Midstream Cocoa Products

An analysis of Indonesia's cocoa exports shows that the total value has stayed almost constant at around US$1.3 billions from 2008 to 2018. However, exports' composition has changed significantly with more processed cocoa exports and less cocoa bean exports. This is mostly a result of Indonesia's concerted policy of functionally upgrading into cocoa processing. At the same time, persistently declining cocoa bean production in the upstream segment has reduced the country's bean exports. In terms of 4-digit level cocoa exports, the main export products have switched from upstream cocoa beans to midstream products such as cocoa butter, cocoa powder, and cocoa paste products, thus raising the share of midstream processed products from 31% in 2008 to 90% in 2018.

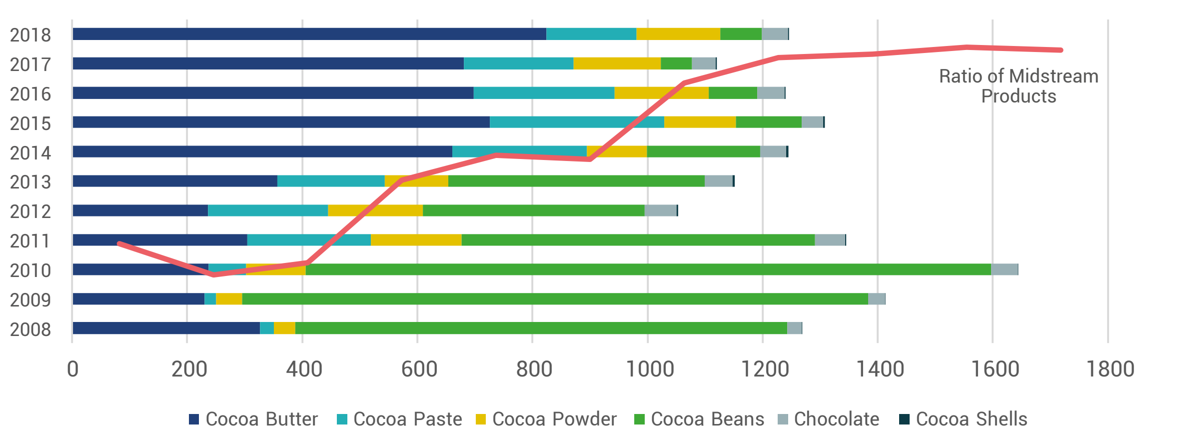
The Government of Indonesia's policy to impose a tax on unprocessed bean exports in 2010 has enabled Indonesia to functionally upgrade into a higher value function i.e. grinding and processing of cocoa beans, allowing exports of cocoa beans to be fully replaced by increased exports of processed cocoa, primarily, cocoa butter, cocoa paste and cocoa powder.

Rising Value and Share of World Imports of Midstream Cocoa Products

Unlike its competitors, such as Malaysia and Ghana, Indonesia has also achieved some success in process upgrading by improving the quality of its processed cocoa products. This is reflected in its higher per unit price for cocoa butter over 2008 to 2018 which is now 90% of unit price for Netherlands and Germany.

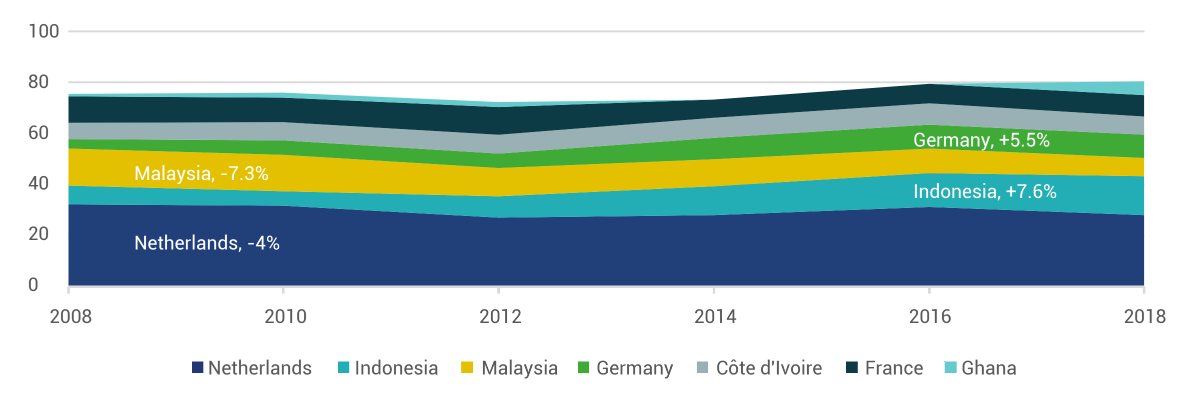
As a result of the successful shift (from cocoa beans to midstream processed products) as well as getting a higher unit price for its main midstream product, i.e., cocoa butter, Indonesia's ratio of midstream products in world imports of the same, has also doubled from 5% in 2008 to 10% in 2018. In cocoa butter exports, Indonesia has gained an additional share of 7.6% of global exports from 2008 to 2018.

Figure 2: Indonesia's Cocoa Exports 2008-18 US$ million



Source: ITC Trademap HS Codes HS1801, 1802,1803,1804,1805,1806 Retrieved on 12 April 2020

Figure 3: Export Share of HS1804 for Top 7 Countries (2008-18)



Source: ITC Trade Map retrieved on 18 April 2020

Among the top seven countries that account for 80% of global cocoa butter exports in 2018, countries with the most significant declines in their global share are Malaysia (-7.3%), Netherlands (-4%), and France (-2%). This signifies that Indonesia has successfully displaced its neighbor and regional competitor in cocoa butter exports. Despite this improvement, the share of chocolate products (1806) has remained particularly low at 0.2%, while Malaysia's exports of chocolate products have tripled during this period to reach 1% of world exports. Such underperformance shows that Indonesia has an opportunity to invest in further downstream activities and finished products.

Some Success in End Market Upgrading but Failure to Capitalize on Growing Asian Export Markets

Indonesia's overall Cocoa-Chocolate GVC exports are destined to a diverse group of countries. The top five export markets are the US, Malaysia, Netherlands, China, and India, accounting for 63% of the country's cocoa exports in 2018 (ITC Trademap, 2018). Since Malaysia has become a significant cocoa processor, its share in total imports has declined over the years. Indonesia's significant processed cocoa exports to an advanced cocoa processing hub such as Netherlands highlights its successful end market upgrading.

Indonesia's exports of cocoa butter are diversified in 29 destination countries, with the top five importers being the US, Netherlands, Germany, Australia, and Canada. However, Indonesia's exports to large potential markets such as China and India are only 4% and 4.5%, respectively.

Although the dominance of the domestic market and regional presence of Indonesian chocolate makers such as Delfi and Mayora Indah, Indonesia's exports of chocolate products in the downstream GVC segment is relatively modest at US$44.5 million (3.6% of its cocoa exports). This reflects the challenges of making significant investments in capabilities and infrastructure to undertake product and end-market upgrading in the GVC to capitalize on the growing regional chocolate markets, particularly China and India.

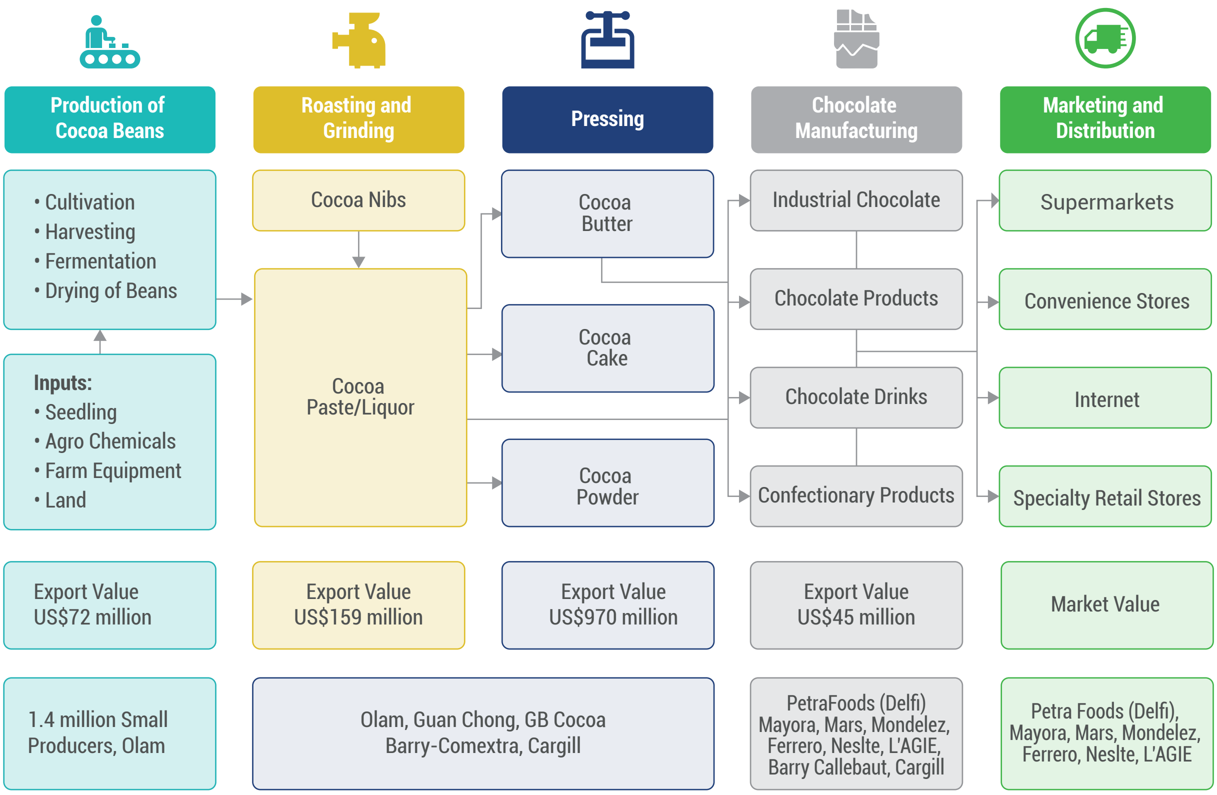
Lead Firms in Indonesia's Participation in Cocoa-Chocolate GVC:

Lead Firms in the Cocoa-Chocolate GVC in Indonesia participate in all value chain segments, from cocoa bean products to marketing and distribution of chocolate products. However, their participation varies according to competitive dynamics, market imperatives, and institutional settings.

Upstream Cocoa Bean Production: Smallholder dominance but a Global Lead Firm sets a successful Corporate Farming example

In the upstream cocoa bean production segment, the sector is dominated as elsewhere in cocoa-growing countries, by around 1.4 million smallholder farmers (Julian Witjaksono, 2016), some

Figure 4: Indonesia's current participation in Cocoa-Chocolate Global Value Chain



Source: ITC Trademap. Firms' Website / Annual Reports small local companies, and only one Global Lead Firm, Singapore based Olam. Global Lead Firms from the mid-and downstream segments do not usually engage in bean production due to its higher cost-capability ratio. Instead, they outsource this to the cheaper labor-intensive smallholder mode of production. However, Olam is an interesting example of a trader-grinder that owns one of Indonesia's largest cocoa plantations, located on Seram Island, which it bought in 2013. Olam is the country's largest exporter of cocoa beans and counts Indonesia among its nine major origin countries (the other in Asia is PNG) (Olam Insights, 2017). Olam Cocoa includes 65,500 Indonesian cocoa farmers across 6 provinces in sustainability programs (Olam, 2019a).

Midstream Cocoa Processing: Strategic Coupling has enabled Rapid Expansion

The midstream cocoa processing segment is dominated by Global trader-grinders such as Olam, Cargill, Barry Callebaut, Guan Chong, as well as major regional firms such as GB Cocoa. Much like the Global Lead Firms in this segment elsewhere, commodity traders have over time offshored their processing capacity to origin countries such as Indonesia. This is coupled with the Global Lead chocolate manufacturing Firms to outsource to the trader-grinders in Indonesia enabled by the standardization of cocoa processing. These offshoring and outsourcing strategies of Global Lead Firms in the Cocoa-Chocolate sector, then, have presented opportunities for functional upgrading towards intermediate cocoa processing in origin countries such as Indonesia (Neilson et. al. 2018a).

The Government used a range of incentivization tools such as waivers on import tariffs for cocoa processing machinery and tax breaks for EPZs. Such incentives also contributed significantly to Global Lead Firms expanding their grinding capacity in Indonesia by opening new factories or purchasing local firms. These factors have led to an increase in grinding capacity up to 800,000 tons/year (Neilson, 2018b). Most midstream firms have strategically located their grinding factories in Gerisk, closer to the Surabaya port, thus reducing transportation costs for processed cocoa exports.

Lead Firms in Downstream Chocolate manufacturing and Marketing in Indonesia:

In 2016, there were estimated to be 33 cocoa processing and downstream firms operating in Indonesia (defined as both cocoa-grinding and chocolate-manufacturing companies) (Neilson et.al, 2018a). If 11 firms involved in the processing are only excluded, around 22 firms are engaged in chocolate production and marketing. Two domestic manufacturers dominate the downstream chocolate manufacturing market in Indonesia, Delfi and Mayora Indah with a combined market share of almost 80% (Yildrimli, 2019). The rest of the market is shared by Global Lead Firms such as Mondelēz, Mars, Ferrero, Nestlé, Lindt, and Hershey's.

Delfi (formerly PetraFoods) is the largest domestic brand in the downstream chocolate manufacturing and marketing segment with over 50% share as of 2020 and leads the market with its Silver Queen chocolate bars (Delfi website 17 April 2020). A key factor in domestic brands' domination is an affordable price and mass marketing through convenience stores (Neilson et. al., 2018a).

Petrafoods was established in Indonesia in the 1950s and has become a successful Southeast Asian brand initially by becoming a distributor for Global Lead Firms. In 2003, it entered the midstream segment and became the largest processor in Indonesia and fourth in the world but later on changed business strategy by selling its processing division to Barry Callebaut for US$860 million in 2013 (Barry Callebaut, 2013). 72% of the firm's net revenue of US$472 million in 2019 was generated from the Indonesian market, while the rest came from the region (Delfi Annual Report 2019).

Mayora Indah is the second largest domestic brand, a diversified confectionery and food products company with a global presence in Asia, EMEA, and the Americas (Mayora Indah, 2020).

The chocolate market in Indonesia was estimated to be US$990 million in 2014, with a high CAGR of 14.8% (Neilson et. al., 2018a). However, Indonesia's annual chocolate consumption per capita is just around 300g (AHK Indonesien, 2019). According to CBI

(CBI.EU, Ministry of Foreign Affairs of Netherlands, 2020a), the world average chocolate consumption was 0.9 kilo per capita per year in 2017, with Switzerland being the highest at 10.5 kilos per capita per year, followed by Germany at 9.2 kilos per capita per year. Indonesian chocolate consumption is half that of Malaysia. This eliminates any doubt that it is due to regional preference and shows vast untapped potential due to rising incomes. Despite being a large and growing chocolate market, Global branded chocolate manufacturers have not established chocolate factories in Indonesia.

Due to the need to guard industrial secrets and required high capabilities, Global Lead Firms enter markets such as Indonesia with only an intra-firm coordination strategy, i.e., acquisitions. Moreover, the high costs of key ingredients such as milk and sugar (mainly due to an import licensing regime) and low quality of Indonesia infrastructure, particularly in cold-chain storage and distribution, have disincentivized firms from establishing chocolate manufacturing facilities (Neilson, et.al., 2018a). On the other hand, most Global Lead chocolate manufacturing firms have located their chocolate factories in Malaysia. The often-cited reasons are strategic location to access Asian markets, a qualified workforce, and high-quality supply chain infrastructure.

For example, Hershey's has its second-largest chocolate factory in Johor, Malaysia, which opened in 2015 with an investment of US$250 million to serve the increasing demand when its factory in China reached maximum capacity (Nieburg, 2013). Accordingly, as a cost-capability play, many cocoa processors use Indonesia as a key and cheaper input supplier to meet their global demand. A key exception is Industrial chocolate manufacturing by Barry Callebaut, which has established a long term supply contract with GarudaFoods and has established two chocolate manufacturing facilities in Bandung (located within GarudaFoods' facility) and Gerisk in addition to its two cocoa grinding facilities. In this segment, Indonesia has thus lost out due to unfavorable trade policies and unreliable infrastructure.

Table 4: Lead Firms and Governance in Cocoa GVC in Indonesia

Primary GVC Segment	Lead Firm	HQ	Revenue (2018, US$ million)	Employees Indonesia 2019	Key Locations in Indonesia	Key Markets
Upstream, Midstream	Olam	Singapore	30,479*	1,400	Sumatra (Aceh, Medan, Lampung), Java (Bandung, Surabaya), Sulawesi (Makassar, Palu, Mamuju,) and Maluku (Ambon, Seram)	Global
Midstream	Barry Callebaut	Switzerland	7,300*	550	Gerisk, Bandung Makassar	Global
Midstream	Guan Chong	Malaysia	550	180*	Batam Indonesia	Indonesia, Asia
Midstream	PT Cargill	U.S.	3,040	1,600	Gresik, East Javar, Makassar, South Sulawesi	Global
Midstream	GB Cocoa	Singapore	327*	600*	Gerisk, East Java	Indonesia, Singapore, Malaysia, Americas (50 countries)
Downstream	Delfi (Petra Foods)	Singapore (Indonesian Origin)	427	5,970	East & West Java	Indonesia, Philippines, Singapore and Malaysia (10 countries)
Downstream	Mayora Indah	Indonesia	1,800	8,680	Tangerand, West Java Balaraja, Banten	Indonesia, Japan, China, Russia and Nigeria (50 countries)
Downstream	Garuda Food	Indonesia	562	10,076	East & West Java	Indonesia (20 countries)
Downstream (Distribution Only)	PT Mars	U.S.	18,000*	300	Makassar, South Sulawesi, Bandung, West Java	Global
Downstream (Distribution Only)	PT Nestlé	Switzerland	6,200*	3,400	West Java	Global

*(*Global Revenue / Employees) Source: Firms' websites / Annual Reports*

1.3.4. Evidence of Indonesia's Upgrading in the Cocoa-Chocolate Global Value Chain

Evolution of Upgrading and Policy Implications on Cocoa-Chocolate GVC in Indonesia

After Côte d'Ivoire and Ghana, Indonesia is the third-largest cocoa producer, and therefore, it is a strategically important source of cocoa beans for the global chocolate industry. Since the country has favorable climate conditions, cocoa beans are produced in the entire country. Nevertheless, 70% of production comes from Sulawesi island (Rikolto, 2020).

Cocoa bean production registered an increasing trend over the years, reaching its peak volume in 2010 of 845,000 MT (FAOSTAT, 2020). A major factor driving this production increase termed 'Cocoa Boom' was the expansion of cocoa production in Sulawesi island to a large extent through forest conversion that provided enhanced soil fertility and soil moisture, reduced levels of pests, diseases, and weeds compared with mature cocoa fields (Neilson and McKenzie, 2016).

Successful Upgrading into Midstream Processing Through Coordinated Government Policy:

To upgrade into cocoa processing, the Government of Indonesia introduced a series of policy measures, starting with a tax on cocoa bean exports by 5-15% in 2010. The Government also encouraged global trader-grinders to build cocoa processing plants in Indonesia by providing various incentives and tax exemptions. After implementing such policies over five years, the export of cocoa beans significantly declined while export of intermediate products obtained from processing of beans such as cocoa paste, cocoa butter, and cocoa powder substantially increased from 115,000 tons in 2006 to 483,000 tons in 2019 (ICCO, 2020).

As seen from Figure 5, Indonesia has moved from cocoa beans export to intermediate cocoa products, including cocoa paste (1803), cocoa butter (1804), cocoa powder (1805), and chocolate (1806). The export of cocoa beans from Indonesia decreased from US$855 million in 2008 to US$72 million in 2018. Cocoa butter has the highest export value of US$824 million in 2018, followed by a cocoa paste of US$157 million and cocoa powder of US$146 million (ITC Trademap, 2020).

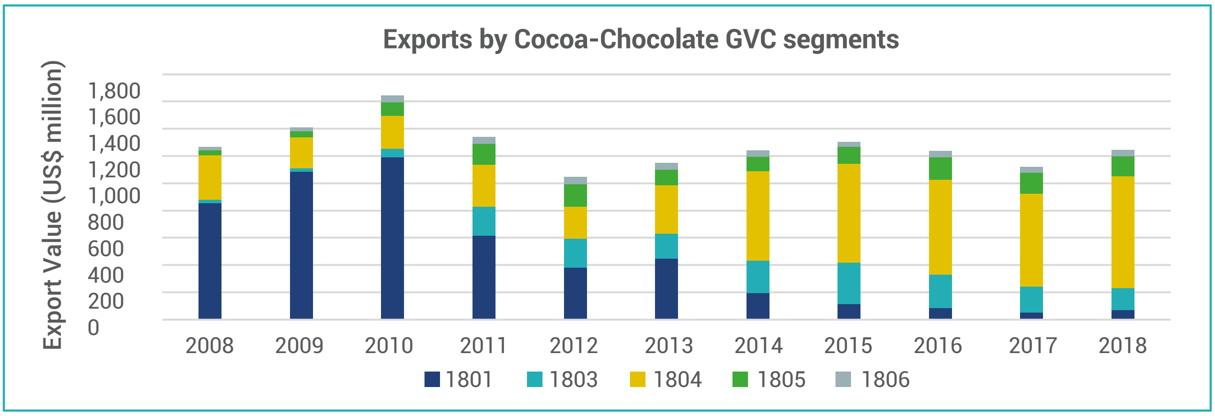
Over the time, Indonesia has also been able to successfully undertake upgrading by accessing and expanding into critical new markets such as the Netherlands, a major cocoa processing hub, and China and India, which can be potentially large consumer markets for Indonesia's exports. Altogether penetrating such end markets demonstrates strong GVC integration.

Indonesia has successfully penetrated India's market as its share in India's import of cocoa products has increased from 6.5% in 2008 to 25% in 2018, thus becoming its top supplier. Given the size and growth potential of the Indian market, such market penetration can be valuable if sustained.

Simultaneously, the rising middle class in Indonesia also presents domestic market opportunities for downstream chocolate products. Indonesia's imports of manufactured chocolate products have increased five times over 2009-2018 from US$21.6 million to US$102.4 million, most of it coming from Asian countries such as India, Malaysia, Singapore, Australia, and China (ITC Trademap, 2018).

Indonesia's success story of upgrading is an outcome of two main policy interventions in addition to export tax on cocoa beans. i) The Government of Indonesia identified cocoa processing as one of the priority areas to promote cocoa downstream stages and thus introduced tax incentives to attract local and foreign investments. As a result, Global Lead Firms in the sector such as Cargill, Barry Callebaut, etc. have invested in downstream processing segments. ii) The Government of Indonesia also established Special Economic Zone (SEZ) in Sulawesi in 2014, located in a strategic location closer to a major port. Companies in SEZ received tax exemptions for cocoa processing and other agri-products processing besides benefiting from essential infrastructure for operations (Hamrick, et. al., 2017).

Figure 5. Indonesia's Exports by Cocoa-Chocolate GVC Segments



Source: Trade Map based on HS codes 1801, 1803, 1804, 1805, 1806. Retrieved on April 20, 2020.

Limited Success in Upstream Cocoa Bean Production

Another set of government policies has concentrated on increasing productivity and production at the farm level. The new forest conversion led to the cocoa boom until 2010, chemicals for pest and disease management, and synthetic fertilizers have been intensively used in Sulawesi's cocoa farms. That has caused depletion of soil nutrients and degradation that has been one of the main causes of low yield and cocoa pod borer outbreak (Neilson and McKenzie, 2016).

The Government also started implementing the National Cocoa Rehabilitation Program in 2014 to increase productivity and production and reduce cocoa bean imports. The Program did not only cover planting new seedlings that took 3-5 years to reach maturity but also encouraged farmers to adopt new farming techniques, distribute free fertilizer, and invest in irrigation systems. Although the Government allocated a substantial budget (US$100 million per year during the initial phase) and effort, results have not been satisfactory because of the distribution of poor-quality planting material and the absence of well-trained technical support (Neilson and McKenzie, 2016).

The Government of Indonesia has also pushed large processors and chocolate manufacturers to engage with farmers through various programs to increase productivity at the farm level. Indeed, some of these grinders and chocolate manufacturers have demonstrated a commitment to cocoa beans supply through multiple programs such as Cargill's Cocoa Promise program, Olam International's Grow Cocoa, Nestle's Cocoa Plan, Mondelez' Cocoa Life, etc. One of the most effective business-oriented farmer outreach programs was the one implemented by Mars Inc with a specialized NGO, Rikolto. The company has established Cocoa Development Centres (CDCs) responsible for identifying potential cocoa doctors living within cocoa communities to set Cocoa Village Clinics as business-oriented spokes (Neilson and McKenzie, 2016).

Indonesia's Cocoa-Chocolate industry evolution, along with major policies and upgrading trajectories, are summarized in the following table:

Table 5. Indonesia Cocoa-Chocolate Industry Evolution

Time Period	Policy/Program Initiative	Description	Key Actors	Impact	Upgrading
Before 1980s	No real policy application	State-owned plantations	-Ministry of Agriculture (MOA)	Very low cocoa production	-
1980s	Introduction and expansion of cocoa production in Sulawesi	Process of forest conversion	-MOA	Cocoa boom	Process upgrading
1980s	Introduction of farm practices that led farmers to use intensive chemicals for production	Shift away from land-extensive production systems towards intensified production	-MOA, Private Organizations	Soil fertility declined that led to low yield with struck of pest and diseases	Process upgrading
1990s	Cocoa Sustainability Partnership	Supporting sustainable cocoa production in Sulawesi	-MOA, -Intl. Agencies (e.g. USAID), NGOs (e.g. VECO Indonesia, Mercy Corps), Private Sector (e.g. Ford Foundation)	Increase in cocoa production	Process upgrading
2000s	National Cocoa Rehabilitation Program	Improving productivity and production	-MOA, Ministry of Economic Affairs, Ministry of Industry	Despite tangible achievements, results not satisfactory	Process upgrading Functional upgrading Product upgrading
2000s	Tax on exported cocoa beans by 5-15% along with tax exemptions and establishing special economic zone	Supporting mid and downstream segments of cocoa sector	-MOA, Ministry of Economic Affairs, Cargill, Barry Callebaut	Decline in export of cocoa beans but increase in export of processed cocoa products	Functional Upgrading
2010s	Sustainable Certification Program	Encouraging private sector involvement at farm level in Sulawesi	-Mars, Mondelēz, Nestlé, Hershey's, Cargill, Barry Callebaut, Olam	Knowledge exchange that contributed to improving cocoa sustainability	Process upgrading Product Upgrading

Source: (Neilson and *McKenzie, 2016; Mercyta Jorsvinna and Nugraha, 2019)*

Sustainability Initiatives of Global Lead Firms

The low productivity of the Indonesian cocoa goes hand in hand with the low quality of much of its cocoa. Cocoa quality standards are set by "ISO 2451 Cocoa Beans – Specification and Quality Requirements," which covers everything from size and color to moisture content and preparation and classification of cocoa beans. However, Indonesia's cocoa often does not reach those standards, and hence Indonesian cocoa beans often need to be mixed with imported cocoa beans from Ghana or the Côte d'Ivoire to produce chocolate (Mercyta Jorsvinna and Nugraha, 2019).

One of the most effective means to reach quality standards of cocoa beans is to obtain industry-recognized certification programs. In 2009, Mars announced its commitment to source 100 percent sustainable cocoa by 2020, later Hershey and Ferrero made the same commitment. Based on such obligations, the number of Indonesian cocoa farmers involved in certification is expected to rise significantly. This presents an excellent opportunity for all industry stakeholders to produce beans meeting cocoa quality standards that will bring higher prices for farmers. At the same time, it will provide beans at high quality for processors. The investments for cocoa products and programs for sustainable cocoa production by major mid and downstream companies are summarized in Annex 4.

1.3.5. Key Challenges in Indonesia's Participation in Cocoa-Chocolate GVC

Low Upstream Productivity due to Human Capital and Infrastructure Constraints

The biggest challenge facing the Government of Indonesia in process upgrading is low cocoa yield. As mentioned earlier, the cocoa yield in the country has a persistent declining trend. Although institutions such as the Indonesian Coffee and Cocoa Research Institute have developed several new varieties, Indonesia has not been able to counter low yield and declining production, which is expected to worsen by the adverse impact of climate change in the long term. Even a conservative estimated plantation area of 1 million hectares gives the yield of only 200kg/hectare for 2018-19, which is far below the global average of 446 kg/ha over 2010-2018 (FAOSTAT 2020).

Therefore, the industry has to focus on more basic agricultural research to generate new varieties with a high yield which are resistant to diseases and drought through R&D. The best way to realize this ambition is to bring mid and down-stream processors into research programs through innovative models as realized through know-how diffusion of GAPs to farmers under sustainability programs.

Human Capital Constraints: Farmers lack know-how and incentives for quality bean cultivation methods and postharvest bean fermentation and drying processes. Most cocoa bean production smallholders do not have access to extension agents or specialized skills such as agronomists. Producers also lack technical advice for cocoa bean fermentation, drying, quality control /grading, and warehouse management. This decreases the productivity and quality of beans, thus reducing farmer incomes. It leads to lower value-added in upstream production and lowers export revenues.

Upstream Infrastructure: Smallholders do not have warehousing facilities for bean fermentation & drying/storage, thus causing postharvest losses and preventing value addition. Plantations lack efficient farm to market logistics infrastructure such as rural roads and connectivity to ports creating a market access issue. Both of these factors reduce the bargaining power of framers vis-à-vis local collectors and traders

Access to Finance and Risk Management Instruments: According to Swiss Contact, 2015, only 10% of farmers in their A2F Program in Indonesia had access to traditional loans, and only 32% were financially included. Lack of access to finance results in lower yields, distressed sales leading to low productivity and lower-quality output, and loss of power of producers vis-a-vis other chain actors. UNCTAD, 2016 argues that a range of instruments can be deployed, such as credit guarantees by the Government, risk insurance by the public, private, and producer cooperatives, forward sales, and contract farming.

Although various Government policy initiatives aimed at supporting local cocoa beans production, they seem to be counterproductive in the absence of supportive policies for enabling the environment, such as infrastructure development for fermentation/storage facilities and widescale private sector-led technical assistance initiatives on GAPs.

Lack of Bean Quality and International Certifications and Standards

The low quality of Indonesian cocoa beans owing to sub-par fermentation, drying, and storage processes, affects the quality of all processed products, thus necessitating imports of intermediates for the food processing sector (primarily from Singapore and Malaysia) despite increased domestic grindings (Nielsen et. al., 2018). This highlights the pressing need for an integrated process upgrading strategy.

Most cocoa producers lack international certification standards such as ISO 2451. According to ICCO, 2019, only 1% of cocoa beans produced in Indonesia are FFC classified. This is in contrast with 90-100% for many countries in South America. Sustainability Programs by Global Lead Firms may include certifications reaching only a small fraction of growers (around 300,000 out of 1.4 million).

Domestic Production Deficit Creating Challenges in Utilizing Enhanced Processing Capacity

Declining domestic bean production has also led to a deficit of domestic availability of cocoa beans for grinding. The surplus in the cocoa bean trade balance of US$1billions in 2009 was

flipped into a deficit of US$457 million by 2018, as shown in Annex 5. This clearly indicates that although moving up the value chain is aspirational for exporting countries; policy shifts have to be carefully calibrated for the effects across the GVC. Such policies can only be sustainable if there is a security of raw material supply, i.e., cocoa beans.

Coordination Failure Among All Chain Actors

Over Capacity in Midstream leading to loss of competitiveness across the Cocoa-Chocolate GVC: Successful functional upgrading into midstream grinding yet cocoa production is reduced to a quarter thus creating overcapacity is evidence of lack of chain-wide strategic oversight. As a direct response to the export tariff policy, several lead firms reorganized their internal structure through opening new processing facilities or acquiring existing local firms.

Against the 800,000 MT per year installed grinding capacity in Indonesia, its total cocoa bean production was only 200,000 tons/year in 2018/19 (ICCO, 2020). This has led to grinding overcapacity and a deficit of cocoa beans, making Indonesia a net cocoa importer, especially West African beans (Cocoa Barometer, 2018). The deficit of 240,000 metric tons of cocoa beans in 2018 was met by imports from Ecuador, Malaysia, and African countries such as Côte d'Ivoire Nigeria, and Cameroon (ITC Trademap, 2018).

Inconsistency of Chainwide Policy Incentives: A total of 17.5% combined tariffs on cocoa bean imports from outside ASEAN leads to considerable loss of cost competitiveness for the midstream segment (Kontan, 4 September 2019). Grinders also lack incentives to support domestic cocoa bean production by providing technical assistance to farmers, e.g., through a conditional reduction in import duties on a sliding scale similar to the copper industry.

Processed cocoa exports are also subject to an import duty of 4.2% in the EU (EC, Market Access Database, 2020). In regional competitors such as Malaysia, actual grindings are rising much faster, helped in part by a 10% duty on processed cocoa imports (Malaysia's grindings have increased 38%, from 236,000MT to 326,000MT, while in Indonesia, the increase was just 10% over 2018-19, ICCO, 2020). Lack of oversight of such regional competitive dynamic can result in unexpected outcomes in other parts of the value chain.

Data Accuracy is a Challenge for Coherent Industrial Policy: Availability of accurate data is a significant problem as cocoa bean production numbers reported by the Ministry of Agriculture are usually three times more than industry figures and ICCO. This prevents accurate diagnostics of industry-wide challenges and the development of coherent industrial policy.

Lack of Overarching Institutional Oversight: Although Indonesia does have an overarching Cocoa Board bringing together industry associations from different value chain segments, a lack of mandate and capacity constraints, mean that persistent upstream production decline has led to issues of security of supply. This indicates a failure of coordination among all chain actors.

Severe Constraints in Downstream Manufacturing

Despite the success of the tariff in encouraging investment in cocoa grinding, severe constraints such as unfavorable policies and poor infrastructure remain in the Indonesian food processing and chocolate manufacturing sectors, which have resulted in limited growth further downstream into functional upgrading (Neilson et. al., 2018).

The following table summarizes the critical challenges for Indonesia's participation and upgrading in Cocoa-Chocolate GVC:

Table 6. Key Challenges in Indonesia's Participation in Cocoa-Chocolate GVC

Challenges	Description and Relevance
1. Human Capital: Farm productivity is low due to the inadequacy of on-farm and specialized postharvest skills	• Farmers lack know-how and incentives for quality bean cultivation methods and postharvest bean fermentation and drying processes, decreasing productivity and beans' quality, thus reducing farmer incomes.
2. Certifications & Standards: Cocoa producers lack formal participation in a structured certification program	• Most cocoa producers lack international certification standards, and only 1% of Indonesia's cocoa exports are classified as FFC. • Sustainability Programs reach only a small fraction of growers driven by the selected sourcing strategies of Global Lead Firms (around 300,000 or 20% of 1.4 million). • Expanding the scale, regional coverage, and scope of certifications is therefore desirable for process upgrading as well as upstream & downstream product upgrading.
3. Upstream Infrastructure: Lack of farmgate infrastructure and poor logistics prevents adequate market access	• Smallholders do not have warehousing facilities for bean fermentation & drying/ storage, thus causing postharvest losses and preventing on-farm value addition. • Plantations lack efficient farm to market logistics infrastructure such as rural roads and connectivity to ports creating a market access issue. · Both of the above factors reduce farmers' bargaining power vis-à-vis local collectors and traders who possess such facilities and market access.
4. Downstream Infrastructure & Enabling Environment: Lack of incentives and poor cold chain infrastructure prevents chocolate manufacturers from accessing the untapped domestic market	• The Government does not offer a competitive incentive policy for attracting Global Lead chocolate manufacturing firms to locate their production in Indonesia, allowing technology and knowledge spillovers and enabling end market upgrading into high growth chocolate consuming markets in the region such as China India. Malaysia has zero tariffs on all cocoa product exports, including chocolate, and zero sales tax except 10% on chocolate. • Inefficient cold chain storage and logistics is a problem in Indonesia, preventing participation in downstream chocolate manufacturing and distribution
5. Access to Finance and Risk Management Instruments: Lack of access to finance leads to lower productivity and loss of power by producers	• According to Swiss Contact, 2015, only 10% of farmers in their A2F Program in Indonesia had access to traditional loans, and only 32% were financially included. Lack of access to finance leads to poor input use like low-quality seedlings, fertilizer and thus results in lower yields, distress sales leading to low productivity and lower quality output as well as a loss of power of producers vis-a-vis other chain actors.
6. Coordination Failure among all Chain Actors: Lack of chain-wide strategic and institutional oversight	• Successful functional upgrading into midstream grinding yet cocoa production is reduced to a quarter, thus creating security of supply as well as midstream overcapacity is evidence of lack of chain-wide strategic oversight. • Availability of accurate data is a significant problem as cocoa bean production numbers reported by the Ministry of Agriculture are regarded as inaccurate by industry actors • A lack of mandate and capacity constraints means that overarching institutions such as Indonesia Cocoa Board cannot ensure institutional oversight of industrial policies and initiatives. Overall, there is a failure of coordination among all chain actors.

1.3.6. Impact of COVID-19 On Cocoa-Chocolate GVC

The COVID-19 pandemic is expected to disrupt the global food supply chains in an unprecedented way. While the scope and disruptions are likely to differ from country to country and product to product, all countries are likely to feel the adverse effects of this crisis.

Demand for Chocolate is expected to stabilize after a temporary shock: Although cocoa is not a staple food and chocolate might not be an essential food item, it is a source of indulgence and comfort that consumers look for in times of uncertainty. The demand for end-product chocolate and its use in food and beverage products is expected to remain inclusive and may bounce after a temporary short-term shock. The price of cocoa and global grindings took a hit in Q2 but have since bounced back (Financial Times, 2020; ICOO, 2020b). This is because main chocolate consuming countries, mainly in Europe and North America, though at the center of the COVID-19 pandemic, are gradually easing lockdowns. According to National Confectionery Association of the US, chocolate consumption in the U.S. has grown by 5.5% overall but through grocery channels by 17.9% over March to August 2020 (Myers, 2020). The large and growing emerging economies are somewhat less affected. Demand would also be supported by the fact that chocolate's retail channels, i.e., supermarkets and grocery stores, remain open due to their essential nature. However, chocolate demand that is tied to the hospitality and tourism industries, i.e., in restaurants and cafes, would continue to experience a significant slowdown for the short term. However, broadly there is an adjustment to the consumer needs with a shift towards grocery and online sales channels.

Supply-side disruptions are less likely from logistics and more from medium to long term impacts on Cocoa Growers: Although shipping experts predict a 20% reduction in container traffic, dry bulk, food, and agricultural commodities are less affected. The resumption of shipping from Asian countries will also ease the supply chain disruptions. Mid- and downstream processing companies in cocoa-chocolate value chains have had to temporarily shut down their production lines to protect employees while managing business disruptions in the supply chain. That might affect the production of intermediate and final cocoa products in the short to medium term.

As for cocoa bean production, major producer countries in West Africa, Latin America, and Asia are taking critical steps to protect their citizens, including growers, from the virus. Although bean production is currently less affected, cocoa-growing communities are particularly at risk because they cannot easily access clean water, health care, and social safety nets and thus could reduce production or switch crops. Thus, supply chain disruptions in these countries could lead to major cocoa shortages in the medium and long term. The fine flavor cocoa segment is more prone to the immediate effects of the COVID-19 crisis since some of the Latin American countries are reportedly experiencing strict curfew regulations that affect cocoa farmers' mobility.

Supply security of cocoa beans may need significant Scaling up of Sustainability Programs: In addition to the critical relief and policy support, the Global Lead Firms in Cocoa-Chocolate GVC in collaboration with governments could significantly scale up their sustainability programs to increase coverage and scope to ensure sustainable cocoa supply.

1.3.7. Policy Recommendations

Transversal and General Recommendations

National or IsDB Member Country Level Producer/Policy Group for Sustainable Cocoa Production

To provide living income/wage to cocoa farmers to help adopt sustainable cocoa production in Member Countries, IsDB can either develop a policy forum to facilitate sharing of sustainable cocoa production policies through a Reverse Linkage or a Regional Project. The Project can share GAPs for upstream cocoa production and ensure harmonization of minimum premiums paid to farmers above market price. IsDB may initiate the Regional Value Chain Program for cocoa in Member Countries in West Africa and Asia similar to its Rice Regional Value Chain Program for 10 Member Countries in West Africa.

Industrial Initiative on Private sector-led Scaling up of Cocoa Sustainability

In terms of National level policy coordination for sustainable cocoa production and upstream process upgrading, the private sector incentive structure needs to be set right for the Global Lead Firms. This would support a living income for cocoa farmers to continue to find growing cocoa profitable rather than switching to other valuable crops. Given the ineffectiveness of previous Government policies, this initiative needs to be led and managed by the private sector that can simply build on the Global Lead Firms' sustainability initiatives. **The Government can set a framework for public-private producer partnership with Global Lead Firms which** already have an interface with selected farmers for their sustainability programs with the following elements:

- Enable cooperatives to play the role of farmer business organizations;
- Incentivize Global Lead Firms through a framework that applies a sliding scale on import tariffs whereby grinders that meet specific criteria would benefit from reduced cocoa bean import tariffs and reduced tariffs on processed cocoa exports. The requirements may include reaching out to a target number of farmers, paying a sustainable price, engaging in GAP programs with producers, and establishing R&D operations.
- Coordinate an industry-wide progress with adequate private sector representation and input, possibly through an existing forum such as the Indonesia Cocoa Board (DEKAINDO) or creating a new entity.

The policy shift would incentivize the private sector actors such as producers and Global lead Firms to:

i. scale-up sustainability initiatives to a much wider coverage as all private sector actors would find it more profitable to participate;
ii. Enable cooperatives acting as farmer business organizations to coordinate sales through contractual relationships with Global Lead buyers.
iii. Increase upstream cocoa bean quality by ensuring uptake of applicable standards and certifications at scale by Global Lead Firms.

Consolidating and mapping sourcing by downstream actors allows the Government to handle producers' captive relations to local traders or collectors. Successful implementation of such a policy can neutralize some of the power asymmetries within the Cocoa-Chocolate GVC, which is currently pitched against the cocoa producer.

The Government of Indonesia could also bring the private sector into the upstream stage with innovative models and direct its agriculture support schemes towards private sector participation to ensure large scale contract farming for cocoa production.

IsDB Group can play a role in building the capacity of an overarching institution such as DEKAINDO, or a new entity to deliver on its enhanced mandate by leveraging its experience from other Member Countries. ICD/ITFC can provide financing support to cooperatives for agricultural inputs and potential private sector investments and trade where there are major value chain gaps.

Development of University-Industry Research and Development Initiatives to Support Process/Product Upgrading

To undertake process /product upgrading across value chain segments, **the Cocoa-Chocolate industry may consider establishing or scaling up collaborative R&D Facilities among a multitude of stakeholders such as cocoa producer cooperatives, Global Lead Firms, and universities. A good example is launching an integrated Cocoa Industry Competency Development Center in Batang Regency,** Central Java, a collaboration between the Ministry of Industry, University of Gadjah Majah (UGM), the local government smallholder farmers. IsDB can help the country through the Reverse Linkage program where expertise in cocoa R&D and other productivity improving activities can be transferred from competent centers and governments.

Investments in Smart Ports to Support Chocolate Production Clusters

Antwerp's port became a major port for cocoa trading and second largest in Europe due to the historical development of chocolate as an industry in Belgium and later as proximity to the major European consumer markets. 99% of cocoa entering Antwerp is sourced directly from producing countries that must comply with sustainability and certifications requirements (CBI.EU, 2020b). To cater to Belgium's evolving chocolate market, transformative innovations were undertaken by the major industrial players for midstream processing and product marketing. This is evidenced by the introduction of pralines and its unique packaging. A conducive policy environment supported the growth to keep production costs lower (Garrone, Pieters & Swinnen, 2016).

The Antwerp Port Authority, with support from the Government of Belgium, continues to undertake significant infrastructure investments in the port facilities for storage and logistics, including connectivity by rail and road with all European markets. Further, the Port Authority of Antwerp continuously harnesses advanced technologies such as blockchain-based container traffic management and AI image recognition to make Antwerp a smart port. That is why Belgium is a major exporter of midstream and downstream products (Antwerp Port Authority, 2020).

IsDB Member Countries such as Indonesia and Malaysia can replicate Antwerp's success by leveraging the proximity to growing chocolate markets of Asia. This can be achieved by government coordinated private sector-led investments in advanced midstream and downstream manufacturing capacity, coupled with the development of smart ports that enable advanced and efficient logistics and storage solutions. This can be achieved by creating a high-powered autonomous authority similar to Antwerp in ports such as Gerisk in Indonesia and Klang in Malaysia. The policy environment can support cocoa processing agglomeration and the development of chocolate production clusters close to the docks.

Recommendations Specific to Upgrading Trajectories

Farmgate and Market Access Infrastructure for Sustainability of Cocoa Production

Since infrastructure is a critical bottleneck in upstream cocoa production, the Government could adopt a more coherent policy to prevent postharvest losses resulting from lack of farmgate infrastructure and poor logistics, preventing farmers from accessing and participating in markets efficiently. Areas of intervention may include building fermentation, warehousing, and transportation facilities to optimize bean quality in line with international certification standards such as ISO 2451. IsDB can explore providing financing or technical assistance for developing warehousing infrastructure for fermentation and drying, logistics, farm to market infrastructure, and support R&D for cocoa varieties.

IsDB has ongoing programs to support community-driven development, which could be reoriented to include building such farmgate warehousing and farm to market logistics infrastructure. ICD/ITFC can finance programs that link smallholders and grinders with the construction of fermentation infrastructure.

Creating the Enabling Environment for Global Lead Firms to Establish in-country Manufacturing: Upgrading into Asian Markets

Just as the midstream grinders were successfully incentivized through a package of tax exemptions and other measures, Indonesia can also continue this upgrading journey by continuing to move further downstream into chocolate production for the growing regional market thus enabling end market upgrading. Leveraging the success of domestic chocolate brands, Delfi Mayora Indah and GarudaFoods, Indonesia should incentivize Global Lead Firms in chocolate production to invest in cold chain infrastructure to enable domestic value addition by leveraging firstly domestic and then regional chocolate consumption growth. This can be achieved through favorable industrial policies by attracting the locally embedded Global Lead chocolate producers to establish chocolate manufacturing facilities using a package of incentives. These may include EPZ and tax breaks, as well as fixing the import licensing regime for milk and sugar to reduce key input costs. Combined with a growing domestic and potential regional market, this will allow the country to increase domestic value addition.

Once a critical mass of 2-3 Global Lead Firms have in-country manufacturing facilities, this will create the necessary ecosystem for sophisticated knowledge and technology spillovers, thus strengthening the requisite backward and forward linkages. Successful implementation of such as policy in Malaysia and Singapore can be replicated here to create the necessary enabling environment. The domestic market's evolving consumer tastes have given rise to single origin premium brands such as Pod Chocolate Bali. Coupled with such trends, the diffusion of premium chocolate branding knowledge of Global Lead Firms can upgrade Indonesian chocolate products to scale up penetration into high growth Asian markets. Indonesia can also leverage its palm oil and coffee value chains experience. IsDB Group can be instrumental in helping the country in this regard by providing financing to Government institutions and financial support to private sector for investment, trade finance, and investment insurance.

Investments in R&D to Increase Intra-firm Efficiencies and Inter-firm linkages

Since the cocoa butter price is quoted as a ratio of the cocoa bean price, Indonesia has been able to command higher prices for its cocoa butter partly because 40% of its exports are destined to the U.S. market, where prices are higher than Europe. However, apart from the premium over Côte d'Ivoire in exports to Europe, Indonesia has been able to extract a premium even above Malaysia compared to its cocoa butter exports to the US. Since the same Global Lead trader-grinders are active in both Côte d'Ivoire and Indonesia, the price premium reflects intrinsic quality differentials in Indonesian products and better-structured relationships with higher-end buyers in end markets.

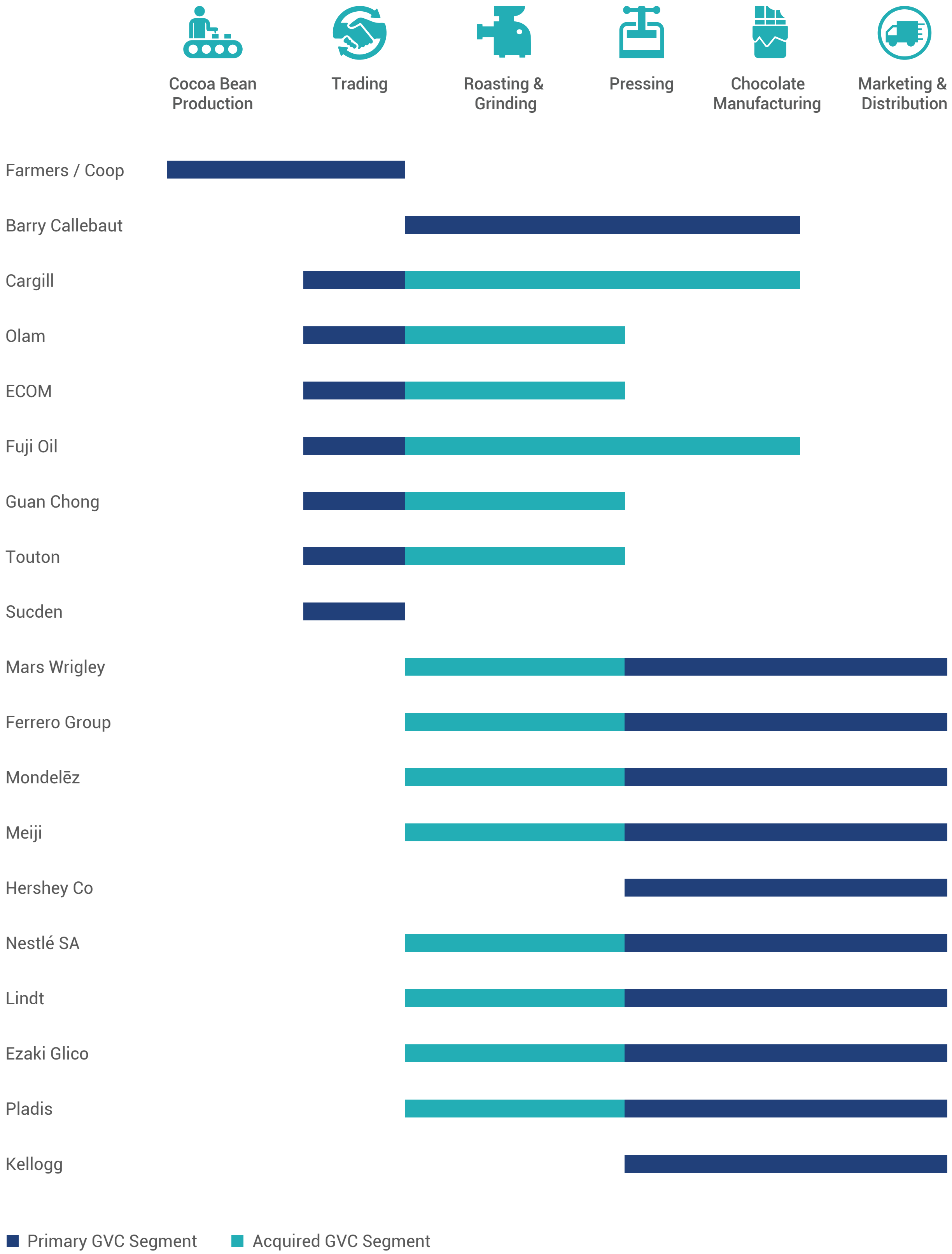
IsDB Member Countries that wish to replicate the Indonesian success in upgrading may support higher investments in R&D, advanced processing techniques, and quality certification. More importantly, policies must support increased intra-firm efficiencies and inter-firm linkages.

The following Table presents the correspondence between recommended policy actions, desired upgrading trajectory, and potential IsDB intervention:

Table 7: Recommended Policy Actions for Upgrading and Potential IsDB Interventions

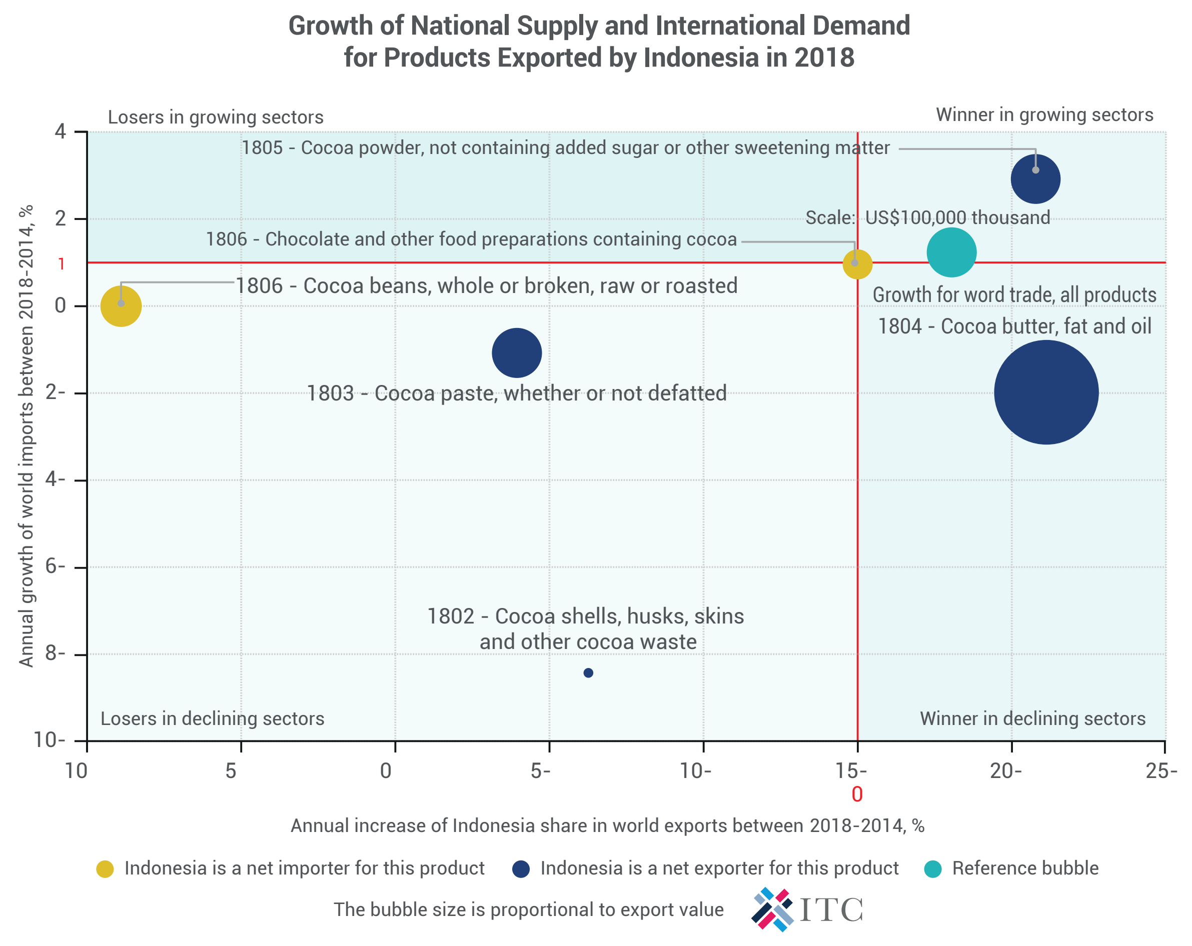
Policy	Upgrading Opportunity	Key Actors	IsDB Intervention
a) National or IsDB Member Country Level Producer/Policy Group for Sustainable Cocoa Production	Transversal	- Member Country Governments - Cocoa Boards - Global Lead Firms - Cooperatives - Ministry of Planning (BAPPENAS)	- Reverse Linkage on Cocoa Sustainability - Cocoa Regional Value Chain Program - Producers Forum
b) Industrial Initiative on Private sector-led Scaling up of Cocoa Sustainability	Transversal	- Global Lead Firms - Cooperatives - Cocoa Board /Cocoa Associations - Ministry of Industry	- Capacity Building of DEKAINDO - Financing Support to Cooperatives for Agricultural Inputs - ICD financial support for private sector investment
c) University-Industry Research and Development	Transversal	- Lead Firms - Cooperatives - Cocoa Board /Cocoa Associations - Universities/ R&D	- TA on R&D Center
d) Farmgate and Market Access Infrastructure	Upstream Process / Product Upgrading	- Lead Firms - Cooperatives - Cocoa-Chocolate Industry Associations - Ministry of Agriculture - Ministry of Transport	- Financing for Farmgate Infrastructure (Warehousing / Equipment) - Financing Support for Logistics Infrastructure (Farm to Market Roads, Ports, etc.) - RL / Training on GAPs
	End Market Upgrading	- Lead Firms - Cocoa Associations	- ITFC's trade finance for cocoa exporters
e) Creating the Enabling Environment for End Market Upgrading	Downstream Process /Product Upgrading	- Lead Firms - Cocoa-Chocolate Industry Associations	- ICD Investments in the Private Sector - ITFC's trade finance for chocolate exporters
	End Market Upgrading	- Lead Firms - Ministry of Energy - Ministry of Transport	- Financing Support for Cold Chain Logistics Infrastructure - Energy infrastructure in Rural Areas

Annex 1. Vertical Integration by Lead Firms in Cocoa-Chocolate GVC



Source: Firms' websites/Annual Reports

Annex 2: International Demand Dynamics of Indonesia's Cocoa Exports 2018



Source ITC retrieved on 26 March 2020

Annex 3: The Global Presence and R&D of Lead Firms in Cocoa-Chocolate GVC

Lead Firm	R&D Expenditure for all sectors incl. chocolate 2019 (US$ million)	No. of Factories	Countries
Nestlé	1,644	429	187
Barry Callebaut	1,419	62	140
Mondelez	351	150	50
Mars	NA	53	180
Ferrero	NA	23	55

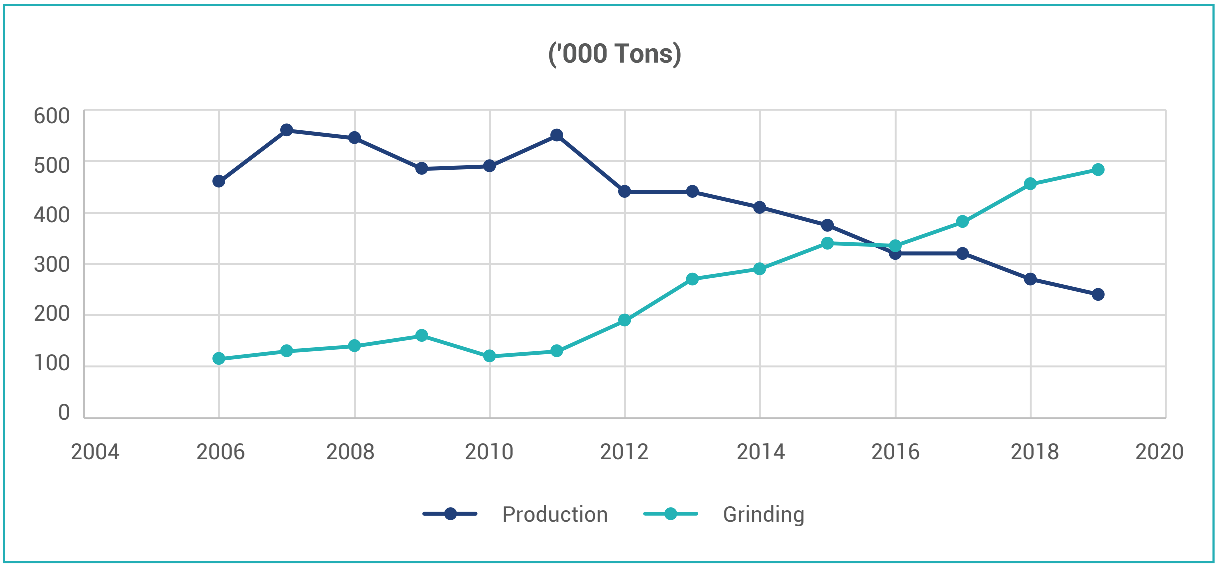
Source: Firms' Annual Reports 2018-19

Annex 4: Investments and Programs by Major Lead Firms in Indonesia

Lead Firm	Program	Year	Capacity (000 tons)	Investment Amount (US$ million)	Number of Beneficiary Farmers
Olam	Cocoa Compass	2016	60	61	65,500
Cargill	Cocoa Promise	2014	70	100	56,000
Barry Callebaut	Cocoa Horizons	2013	30	33	60,000
Mars	Sustainable Cocoa	2005-2010	-	-	58,000
Mondelez	Cocoa Life	2012-2022	-	60	50,000
Nestle Cocoa Plan 2009-2013			-	104	10,000
Olam Acquisition of BT Cocoa (85%)		2019	120	90	-
JB Foods Acquisition of Jebe Cocoa (80%)		2014	60	23	-

Source: Firms' websites/Annual Reports

Annex 5: Domestic Production and Demand Surplus/Deficit of Indonesian Cocoa Beans



Source: International Cocoa Organization Monthly Cocoa Market February 2020

Chapter 2

THE GLOBAL AUTOMOTIVE VALUE CHAINS

2.1 THE EVOLVING GLOBAL AUTOMOTIVE VALUE CHAINS

2.2 TRANSFORMING THE TURKISH AUTOMOTIVE INDUSTRY INTO A GLOBAL POWERHOUSE

2.3 INDONESIA IN THE AUTOMOTIVE GLOBAL VALUE CHAIN

2.1 THE EVOLVING GLOBAL AUTOMOTIVE VALUE CHAIN

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**The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of the Islamic Development Bank Group*

Abstract: The global automotive value chain is set to evolve at a faster pace given the COVID-19 pandemic. The trends prior to the pandemic from a value added perspective is broken down into value chain stages in a novel method while investigating the extend of impact by categorizing top-15 producing countries into domestically or externally driven value added, breaking down into tier suppliers and production length vulnerability. The study argues that the domestically driven production locations will be least vulnerable to shocks, while externally driven countries will be most vulnerable. It also suggests that countries such as France, Turkey and Czech Republic will be vulnerable due to value added derived from tier 2 suppliers while countries with longer production length such as China, Japan and Korea are more vulnerable to supply side shocks.

Keywords: Global Value Chain, Automotive, Value Added, COVID-19

2.1.1. Introduction

Prior to the COVID-19 outbreak since early 2020, the global automotive industry was already at a stage of disruption. With the automotive global production seeing 8 years of continuous growth after the Global Financial Crisis (GFC), the production peaked in 2017 with 97.4[1] million units. Since then, there have been several consolidations in the entire industry shifting towards new trends such as the production of electric vehicles (EV) that is more of a reality than concept, supported by strong policy shifts in the major automotive markets. The consequence of these shifts is about to entirely effect the complex and efficiently organized global automotive value chains that may directly impact the entire chain of suppliers and the Original Equipment Manufacturers (OEMs) which are mainly transnational corporations operating globally.

The COVID-19 global pandemic has accelerated some of the major trends that were shifting in the industry. Since the outbreak, the entire industry, like many other industries were challenged by the supply and demand shocks. On the supply side, the disruptions in the efficiently built just-in-time system practiced in the industry caused a huge blow in production. It was exacerbated further by closures and lockdowns of plants that spread across the globe. Although some of these lockdowns have been lifted and the plants are operating across the globe, the output and future output might be weakened with the less efficient value chain setup.

Along the entire global automotive value chain, the disruption caused some smaller and medium sized suppliers to experience huge drop in revenue and working capital challenges. Compared to other industries, the interdependence and longer production length of the global automotive industry poses a deeper waning risk that is coupled with a lower global demand may entirely shift the industry towards EV adoption. EV adoption, once a very costly proposition, may as well be an option as EV production would naturally change the type of supplier base as most of the mechanical parts in the internal combustion engines (ICE) would not be needed in the production of EVs. It may gradually wipe out some of the existing smaller and medium sized suppliers that are already facing challenging conditions. At the same time, it also promotes other new trends such as connectivity, autonomous, shared services and electrification that are entirely driven by technology companies that are strong both in hardware and software.

> The COVID-19 global pandemic has accelerated some of the major trends that were shifting in the industry. Since the outbreak, the entire industry, like many other industries were challenged by the supply and demand shocks. On the supply side, the disruptions in the efficiently built just-in-time system practiced in the industry caused a huge blow in production.

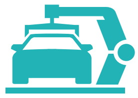
The consequence of EV adoption at a global level may entirely change the outlook for the multiple layers of suppliers in the entire global automotive value chain. OEMs are expected to move toward higher levels of modularity with EVs (Christensen, 2011). With higher modularity in production, the entire supplier-buyer relationship may change to a more loose supplier relationship and increase substitutability that form modular supply chains (MacDuffie, 2013).

These changes require a deeper understanding to the impact on the global automotive industry particularly vehicle producing countries where most of the economic acitivities from the global automotive value chain contribute towards the economy. The use of trade data to examine the patterns of trade in the automotive industry does not precisely capture the underlying value added that are complex within the global automotive value chain. The breakdown of the value added by supplier types and the extent of which countries derive the value added domestically or externally could provide some guidance on the evolving global automotive value chains. At the same time, the breakdown and types of value added dependency by producing countries will enable a better investigation on the potential vulnerability of the value chain and impact to the industry. Firstly, it would enable to identify the externally driven value added for vehicle producing countries, in which are more vulnerable compared to domestically driven value added. Since the outbreak of COVID-19, stimulus packages and policy tools for industry recoveries have been concentrated at domestic level only and countries can revive the local industry which may recover the source of value added derived domestically. For an externally driven value added, there is less control on the producing country to recover its externally driven value added as it requires multiple bilateral or global approach.

With a weaker demand that showed a downward trend since 2018 as shown in Figure 1, the recovery of the global automotive industry with the ongoing pandemic may seem more challenging as the global automotive markets depend on certain large markets for profitability and these larger markets such as China, United States, Germany and Turkey have shown weakened production since 2017. As profitability is squeezed along the entire value chain, from OEMs to the suppliers, the global value chain perspective with a decomposition of the value added in the top producing countries may shed a better understanding on the distribution of value added from the automotive industry that is internally or domestically gained against externally gained. Countries that the value added is externally driven may take a longer time to recover as uncertainties in the global market is not controllable, while countries with internally driven value added may recover faster as domestic demand can be controlled by certain policy tools or recovery package.

1. OICA Production Statistics http://www.oica.net/production-statistics/

Figure 1 Global Production of Cars (2019 Production Statistics, OICA)



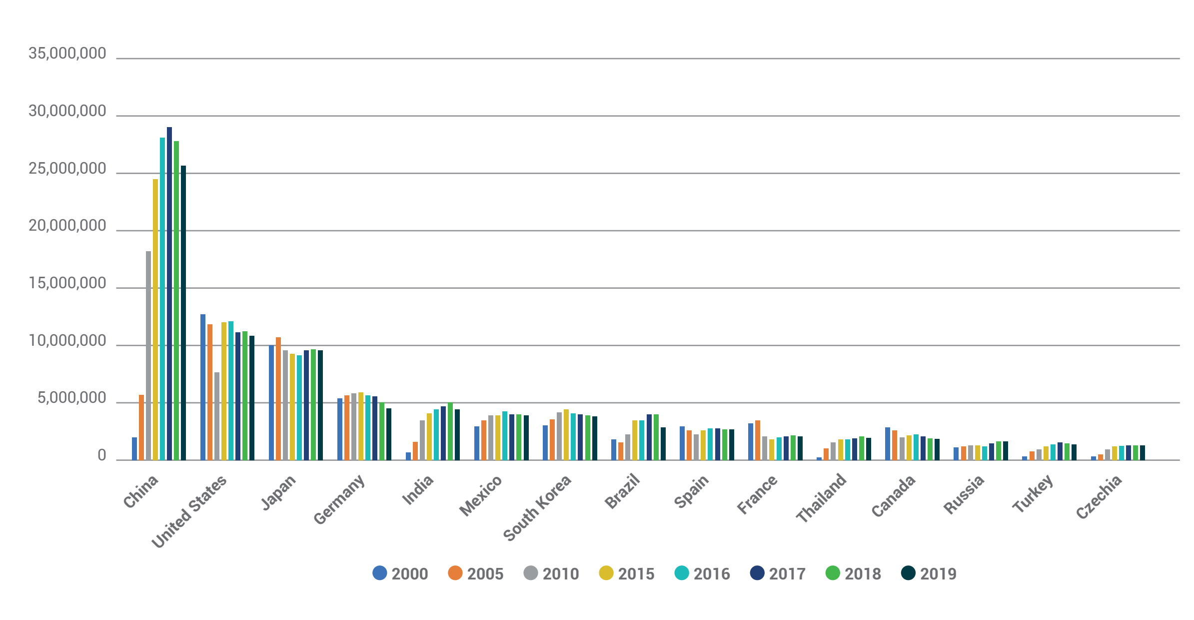
Global Car Production

2000	2005	2010	2015	2016	2017	2018	2019
58,374,160	66,482,439	77,629,127	90,780,583	95,057,929	97,302,534	95,634,593	91,786,861

The top 15 countries producing cars are shown in Figure 2. China tops the list with production of over 25 million units since 2016. For the period between 2000 and 2005, China was still behind Germany and Japan in terms of production, however, since 2010, China's production skyrocketed and up to 2019, topped the list, despite a sharp decline from 2017 onwards. The production of the United States, Japan and Germany follow the global trend and levels of production have been maintained over the years with some fluctuations in a few years. For the next set of countries, India's remarkable increase in production level since 2010 earned the country the fourth place in 2019 surpassing Mexico and South Korea which production stagnated since 2016. Brazil also showed a huge spike in production since 2010, surpassing more traditional carmakers, France and Spain. However, Brazil recorded a decline in production in 2019. Spain has maintained its production level since 2015 while France recorded a sharp decline in production from 2005 to 2010. Thailand, Russia, Turkey and Czech Republic are newcomers to the top 15 list with a steady increase in production levels since 2005.

This study aims to investigate the evolving global automotive industry from a global value chain framework using decomposition of value-added data and production length which is aimed at understanding the evolving structure of the suppliers and OEMs in the global top 15 automotive producing countries. It first would structure the value added for the automotive industry in the selected countries into internal or external distribution. This decomposition is broken to OEM, Tier 1 and Tier 2 suppliers that may allow better understanding of the evolving global automotive value chain. The production length at intra-industry level would also indicate the degree of vulnerability of producing countries in a financial crisis.

Figure 2 : Breakdown of Unit of Cars Produce by Top-15 Producing Countries, 2000-2019 in Number of Units



Source:2019 Production Statistics, OICA

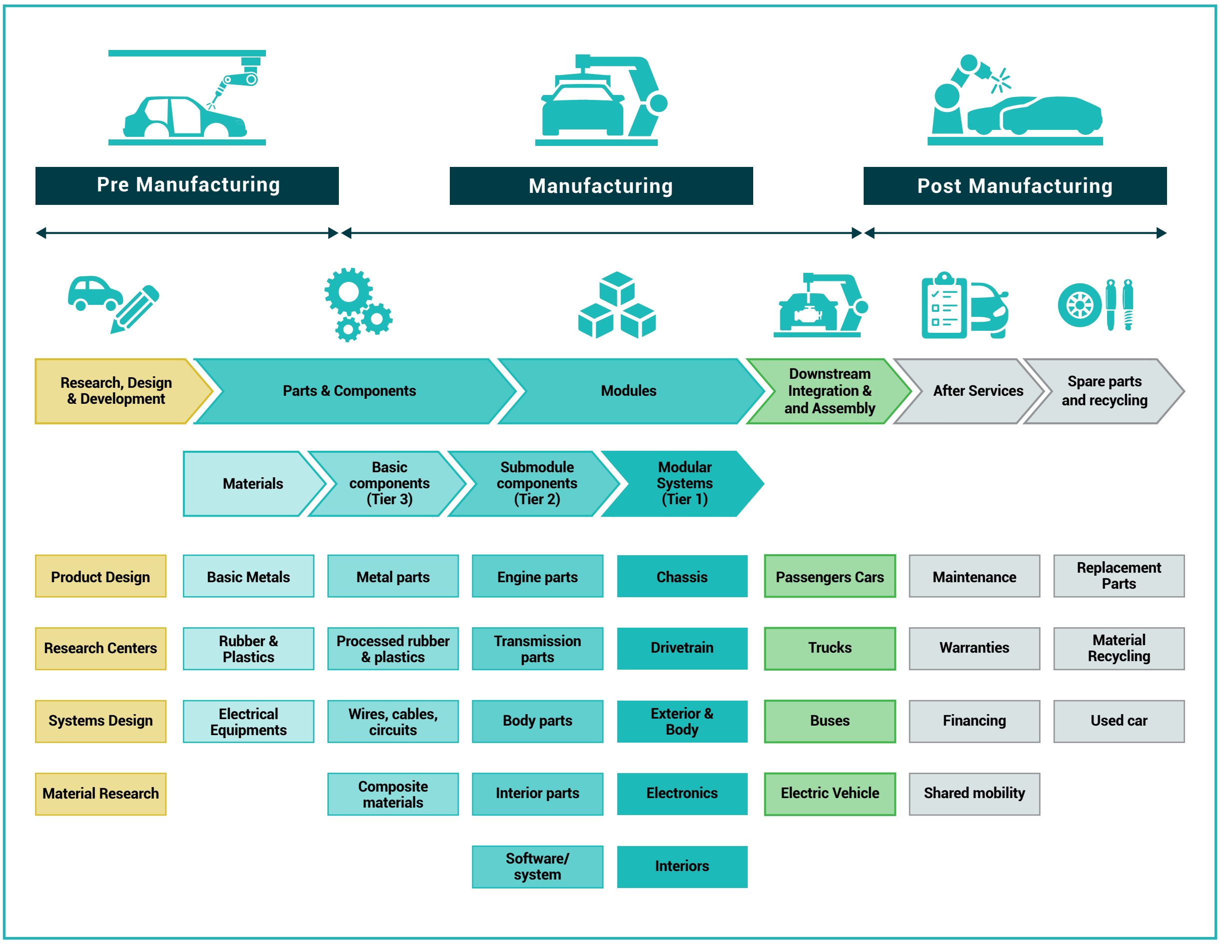
2.1.2. The Global Automotive Value Chain

The global automotive value chain stretches from the production of raw materials, various levels of specialized suppliers, final car producers also known as OEM and all after sales activities and services related to the automotive industry. The global automotive value chain can be argued as the most efficient and competitive manufacturing industry as over the years, the industry underwent major historical shifts in supply and demand. As an efficiency seeking industry, suppliers along the entire value chain of automotive supply thousands of parts and components within a complex, multi layered supplier types organized to produce vehicles in the most productive and efficient way.

The entire global automotive value chain can be described from pre manufacturing, manufacturing and post manufacturing activities. As shown in Figure 3, pre manufacturing activities that support the entire value chain mainly involves research, design and development. These activities usually support the entire manufacturing chains as the development process for a new car is extremely complex and involves thousands of parts developed by specialized suppliers in the value chain and regulated strictly by industry standards. Activities such as product and material development also require a coherent integration approach. Research, design and product development in the automotive industry today are closely coordinated between OEMs and suppliers as the development cost are high and the need for product integration. OEMs since the 1980s established close ties with suppliers which contributed to reduce the development time and cost for new product development (Cusumano & Takeishi, 1991). This close coordination between OEMs and suppliers also gave birth to many specialized design and development companies that provide flexibility and economies of scale through specialization.

For the manufacturing activities, the carmaker or OEMs depend on several network of suppliers to supply parts, components and modules to integrate into a product. OEMs typically either manage an external supplier through contractual agreements in different forms of collaboration or own some of the suppliers as a subsidiary company. Regardless of the governance relationship, the flow of product typically moves in a very structured manner organized in tiered approach. The parts and components that build a module before it is integrated by OEMs are organized within materials (basic metals, rubber, plastics, electric equipment), basic components (metal parts, processed rubber and plastic parts, wires, cables, circuits and composite

Figure 3 : The Mapping of the Global Automotive Value Chain



Source: Author

materials), submodule components (engines and parts, transmission parts, body and interior parts and software) and finally modular systems (chassis, drivetrain, exterior and body, electronics and interior modules). This modular system or in a more traditional manufacturing process called subassembly systems or components are inputs that are used by OEMs to integrate and assemble a vehicle. Based on the complexity of the parts, components and modules in the manufacturing process, the automotive industry is organized in a tiered approach as shown in Figure 3, with tier 3 comprising of basic components, tier 2 comprising of submodule components and tier 1 comprising of modular systems. Humphrey et. al (2003) suggest the emergence of tier 0.5 between OEMs and tier-1 suppliers, whereby some of the tier 0.5 activities are outsourced by by the OEMs to tier-1 suppliers (Humphrey & Memedovic, 2003).

Although the terminology tier 0.5 has been widely used to characterize the evolving relationship between the OEMs and tier 1 suppliers as system integrators, this study categorizes tier 1 and tier 0.5 as both tier 1 because statistically both tiers are considered producing intermediate goods. The firms that are in tier 1 are technically suppliers to the OEMs and are in various global location, close to the final assembly plant of the OEMs. Tier 1 supplier require design and innovation capabilities with strong capital and investments. Some of the top tier 1 suppliers are sometimes larger firms with higher profitability than OEMs. The top five tier 1 suppliers in 2018 are Robert Bosch, Denso, Magna International, Continental AG and ZF Friedrichshafen AG with a total sale of US$109 billions in 2018. (Automotive News, 2019)

The tier-2 suppliers comprise of firms that supply submodule component and parts to tier-1 suppliers. Tier-2 suppliers range from transnational and domestic firms that focus on specialized parts or components. The common characteristic of a tier 2 firm is high volume, low margin firms that depend closely on purchases from tier-1 suppliers. Tier 3 suppliers are firms that supply basic products and require only minimal engineering or technological capability. Most of the tier-3 suppliers are domestically located and both tier 2 and tier 3 suppliers are small and medium sized firms. Veloso et al (2000) broke down the three tiers into three tiers based on growth strategy. Tier 3 suppliers have the lowest value added with build to print design, while tier 2 have a medium value added with a grey box design and tier 1 have the highest value added with black box design (Veloso & Kumar, 2002). Empirical findings have also strongly suggested that higher tier firms capture greater value than lower tier firms and value creation depends mostly on capital intensity (Pavlínek & Ženka, 2016).

In a complex global automotive value chain, the tier supplier's relationship is governed differently and there are four modes of exchange as proposed by Bensaou (1999). Bensaou breaks down the buyer- supplier relationship into market exchanges, captive buyer ties, strategic partnership and captive supplier ties. Market exchanges is a relationship used for highly standardized products based on mature technologies that require minimal development effort and expertise from the supplier. Captive buyer ties are described as the supplier controlling certain proprietary technology and benefit from strong bargaining power over the OEMs. Both market exchanges and captive buyer ties may not contribute to higher value added activities as innovation and knowledge diffusion is not key between these relationship. Many outsourced car producing countries may typically have these relationships and it may reflect well on the type of car models produced in the country. Turkey for example over the past 30 years have developed its local supplier base, however, the models of cars produced in Turkey which are smaller sized compact cars (Hamid & Sow, 2020), with minimal development effort and replication of mature parts and components only requires a supplier base that has market exchange and some captive buyer ties.

On the other hand, car brand owners usually have a different relationship with suppliers in their home country. For instance, countries like Germany, Japan and the United States are also markets to new products and technology given the higher income status of these countries, whereby new car models with high capital investment are usually developed in a mature home market before production moves to other markets. The supplier relationship that can be characterized in these countries are strategic partnerships and captive supplier ties. Strategic partnership requires the suppliers to exchange highly customized and complex components and systems that necessitate both parties, OEM and suppliers to be interdependent in developing and implementing a particular component or system. It requires the suppliers and OEM to have extensive coordination to handle the technological complexity and knowledge diffusion and innovation that contributes to higher value-added activity which is present in this type of relationship. Captive supplier relationship requires investments and commitment from suppliers to invest and develop a complex subsystem on a new technology that is owned by the supplier, however, the supplier depends on the commercialization of the OEM. Captive supplier relationship is another mode where higher value added activity is present. In many newer car models, the adoption of modularity has also shaped the supplier relationship into a more complex level. Modularity which the design of the car is decomposed into different parts or modules are characterized by independence across and interdependence within their defined boundaries (Campagnolo & Camuffo, 2010). In essence the concept of modularity can be broken down into three main features which are: they are separable from the rest of the product; they are isolable as self-contained, semi-autonomous chunks; and they are re-combinable with other component (Cabigiosu, 2013). The concept of modularity also changes the supplier relations while newer concepts like platform sharing due to the modularity concept has enabled many OEMs to collaborate to minimize cost. These trends are growing as almost all carmakers are beginning to enter the Electric Vehicle (EV) space which although production numbers are considerably low, policies by governments to introduce EV and the huge investments by carmakers in the development of EVs may entirely squeeze the profitability of the existing tier suppliers, while encouraging newer suppliers to emerge. EVs are expected to reduce the number of parts and components in a car as mechanical parts in an internal combustion engine (ICE) will be replaced with electrical and electronic parts. EVs will also integrate other emerging technologies such as autonomous driving and more advanced use of softwares and frequent updates that require closer intergration with software and service companies. The interchange from ICE to EVs will replace the existing tier suppliers by first effecting the profitability of the suppliers that can be analyzed from a producing country perspective in terms of value added contribution. In the longer term, EVs production is expected to be more modular and apply new technologies with dedicated platforms (Cabigiosu, 2013). This would entirely change the global automotive manufacturing landscape.

> Captive supplier relationship is another mode where higher value added activity is present. In many newer car models, the adoption of modularity has also shaped the supplier relationship into a more complex level

Although all modes of relationship may exist in one country, the value added contributed by the industry in a country may reflect the type of supplier relationships that exist in a car producing country. Another emerging trend observed is the link between the types of models produced in one location and its impact on value added. There have been some studies focusing on value creation at the supplier tiers level that suggest economic effects of the automotive industry largely depend on its capital intensity and that mostly foreign-owned higher tier firms generate and capture greater value than lower tier firms, which include the vast majority of domestic suppliers (Pavlínek & Ženka, 2016). Besides the model types, the market profile in terms of market size, income levels and tax policies may also contribute to better understanding on the industry value add in a car producing country.

On a global scale, the automotive value chain is one of the highest global trading industries with a total trade reaching US$1.92 trillion in 2019 as shown in Figure 4. In 1990, the trade value was only around US$169 million globally and it increased to US$1.14 trillion in 2007 and gradually climbed to US$1.92 trillion in 2019. Despite the decrease in units of car produced globally since 2018, the CAGR between 2017 to 2019 was positive with 2%. Breaking down the total trade into value chain stage, as data allowed at HS6 level, final products by OEMs, tier-1 and tier-2 (including tier-3) suppliers shows an interesting trend. Tier-2 and below suppliers that supply submodule components and parts recorded US$48 million trade with a percentage of 29% of total trade in 1990. This value increased to nearly 10 fold in 2007 with US$457 million representing 40% of total trade. The percentage of tier-2 and below trade increased to 46% in 2018 with a sudden sharp decline to 30% in 2019. Among the supplies from tier 2 and below, parts and components of the body system are highest traded, followed by parts and components of drive train, electrical systems and combination of body system and drive train.

Figure 4 : Breakdown of Value Chain Stage in Total Global Automotive Trade

Value Chain Stage & Sector	Value (US$ billions)					Share of Auto-Related World Trade (%)					CAGR (%)
	1990	2007	2012	2018	2019	1990	2007	2012	2018	2019	2018-2019
Total	**169**	**1144**	**1280**	**1472**	**1920**						**2%**
Submodule Components - Tier 2 or below	**48**	**457**	**568**	**676**	**572**	**29**	**40**	**44**	**46**	**30**	**-1%**
Of the Body system	19	175	217	257	215	11	15	17	17	11	-1%
Of the Drive train	13	114	150	180	159	8	10	12	12	8	-1%
Electrical systems	7	76	102	146	121	4	7	8	10	6	-2%
Of the Body system or Drive train	10	93	99	93	78	6	8	8	6	4	-1%
Modular System - Tier 1	**10**	**69**	**69**	**76**	**71**	**6**	**6**	**5**	**5**	**4**	**-1%**
Body system	1	3	4	4	3	1	0	0	0	0	-2%
Drive train	9	66	65	73	68	5	6	5	5	4	-1%
Final Products (Passenger Vehicles) - OEM exports	**111**	**618**	**643**	**720**	**1277**	**65**	**54**	**50**	**49**	**67**	**5%**

Source: Author using UN Comtrade data.

In the modular system or tier-1 supplier breakdown, the total trade value was US$10 billons in 1990 and climbed slowly to US$76 billions in 2018 before also experiencing a decline to US$71 billions in 2019. Overall, tier-1 supplier breakdown only accounts to around 4 to 6% of the total automotive trade, which is understandable as modular systems and heavier components and parts that are fixed is less efficient to be traded cross border. Most of the trade mainly comes from the drive train. The final product trade which are passenger vehicles that we can categorize as OEM exports recorded US$111 billions trade in 1990 and climbed to US$720 billions in 2018 before a sharp increase to US$1.277 trillion in 2019. The marked increase in 2019 entirely changed the existing trend since in 2000s to 2018 where the breakdown of OEM exports was in the range of 45-55%. In 2019, the breakdown of OEM exports as shown in Figure 5 jumped to 67%, a level which is similar to 1990.

The changing trade pattern by value chain stage especially in 2019 is an important change that needs more understanding. Despite the decline in production of cars globally since 2017, there was an increase of US$557 billions trade of final product vehicles or OEM exports. While suppliers in tier-2 and below might be squeezed by the OEMs due to the decline in global demand and increasing capital requirements for development of EVs, OEMs exports increasing by US$557 billions is a sign of structural change in the global automotive value chain.

Figure 5: Breakdown of Global Automotive Export Types in %, 1990-2019

Source: Author

2.1.3. The Changing Landscape of the Global Automotive Value Chain: A Value Added Analysis

a. Domestically or Externally Driven Value Add

The global automotive value chain involves several transnational corporations which are involved in different stages of production. The value added derived from the activities of these transnational corporations cannot be computed just by using trade data. While OEMs that own brands in the automotive industry still dominantly lead the assemblies of cars, external suppliers have increased their share of the total value of finished vehicles to 75-80% (Frigant, 2011). However, the external suppliers do not necessarily increase their share of value add in the process of production. OEMs that are lead firms still maintain crucial knowledge and high value-added activities in their home countries (Sturgeon & Van Biesebroeck, 2011) while squeezing the value either by shifting production cost to lower cost locations or squeezing profitability.

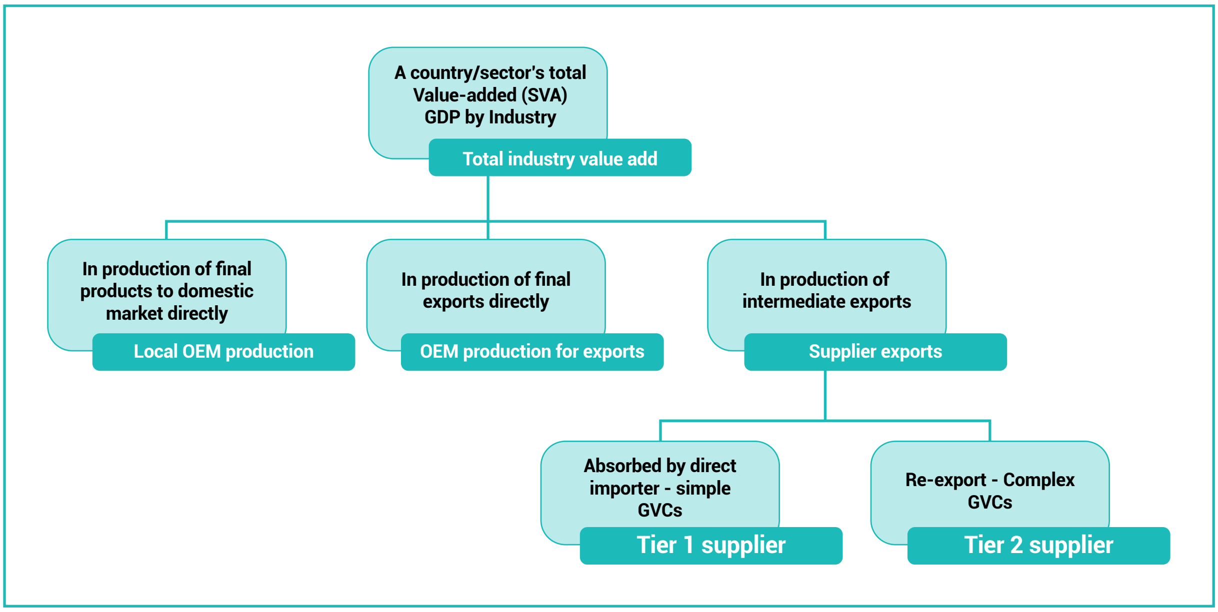
Many of the lead firms in the automotive industry are from the top automotive producing countries and the value add captured by the industry, whether domestically or foreign driven has not been well analyzed. The use of Gross Value Added (GVA) which is decomposed by industry may be the best indicator to quantify value added at industry level. GVA includes the pretax profits, wages and consumption of fixed capital. The emergence of more precise use of input-output tables in a global value chain context by Wang et. al (2017) expands the use of the input-output table by using a decomposition framework that classifies factor content into domestic and cross borders production. Value added creation therefore can be systematically decomposed to domestically or externally (foreign) driven, while the breakdown of intermediate and final demand goods also provide clarity on the value chain stage.

To understand the characteristics of changes in the automotive global value chain, the top 15 global automotive production countries which represent around 87% of the global car production is investigated using the input-output table to determine if the value add is domestically or externally driven. Based on the decomposition of the value add, the suppliers of tier 1, tier 2 and OEMs are broken down by country and trend.

The study undertakes a decomposition of production activities from a producer's perspective (based on forward industrial linkages). Using the methods from Wang et al. (2017), the study decomposes the total production activities at the economy- and industry-levels into pure domestic demand, traditional trade, simple GVC activities, and complex GVC activities. Pure domestic demand is the value added that does not involve cross border trade. Traditional trade is value added that is embodied in final product exports. The embodied domestic factor content crosses borders for direct consumption. The simple and complex GVC activities are defined as value added that is embodied in exports of intermediate goods and services and it is part of the cross-country production sharing activities (Wang, Wei, Yu, & Zhu, 2017). Simple GVC activities are value added that crosses borders for production only once. The value added that is exported is used by a direct importing country to produce final products that are absorbed in the country. Complex GVC activities are value-added embodied in intermediate exports that is used by partner country to produce exports (intermediate or final) for other countries. In this case, the value-added crosses border at least twice.

Using the Asian Development Bank Multi Regional Input Output Database, 2018 (ADB MRIO), decomposing the value added for the automotive industry under Transport Equipment (c15) breaks down the value added into domestic, final goods exports and intermediate goods exports. Expanding from Wang et al. (2017), the study decomposes the country/sector's value added in the perspective of the automotive industry as shown in Figure 6.

Figure 6 :Decomposition of the Country/Sector's Value Added in the Perspective of the Automotive Industry



Source: Author with adoption from original decomposition by Wang et. al

In the perspective of the automotive industry the sector's value add represents total industry value add, in this case, the classification of c15 of ADB MRIO was used. The first level of decomposition of the value add in production of final products to domestic market directly in this case can be defined as the local OEM production that is consumed locally. This decomposition represents final goods and the next decomposition is in the production of final exports directly which represents the final exports of OEM production of a final good. In both these decompositions, local OEM setup in a country represent best the set of data described. Depending on local consumption or exports, the final goods which in this case is an automotive product is either locally consumed or exported.

The third decomposition of value added in the context of automotive industry is in the production of intermediate exports or can be regarded as supplier exports. The supplier exports can be broken down further into tier 1 suppliers (absorbed by direct importer-simple GVC) or tier 2 suppliers (re-export – complex GVC). Although the production of suppliers is not entirely for exports, the intermediate production for domestic market is absorbed locally by the Local OEM production. The simple GVC as defined by Wang et. al (2017) is in the production of intermediate goods absorbed by the importing country. In the case of automotive industry, the intermediate goods are produced by suppliers and the supplier that supplies of exports for the production of a final demand product are tier 1 suppliers. The complex GVC that represent intermediate exports that are re-exported before absorbed in final demand representing tier 2 suppliers that usually need another level of processing in the value chain before producing the final product.

The complex GVC that represent intermediate exports that are re-exported before absorbed in final demand representing tier 2 suppliers that usually need another level of processing in the value chain before producing the final product.

When the GDP is decomposed to sectoral value add, the results show that the global automotive industry value added increased from US$523 billions in year 2000 to US$1.236 trillion in 2017. Although there was stark increase in the industrial value added which more than doubled during the period of 2000 to 2017, the composition of the type of value added as broken down in Figure 7 did not change much. Most of the industrial value added consist of an average 55% domestic value add (domestically driven) that is produced and consumed domestically, 29% value add that is exported as final goods while 16% of the value add are for intermediate goods exports. It is also interesting to observe that during the decline of the industrial value added value in 2009 due to the Global Financial Crisis, the composition of value add that are domestically produced and consumed (domestically driven) increased from 49% in 2008 to 55% in 2009. This may suggest that the industry took a shift since 2009 in terms of the type of value add contributed by the sector. The decline of both value add in final goods exports and value add in intermediate goods exports suggest that the industry overall moved some value added activities from externally to domestically driven.

Figure 7: Top-15 Producing Countries Value Added Breakdown in US$ thousand

Source: Author

Figure 8: Table of VA Type Breakdown from 2000-2017

VA Type/Years	2000	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
VA Domestic (OEM domestic)	58	49	49	55	54	54	55	55	55	57	58	57
VA Final Goods Exports (OEM exports)	28	34	33	30	30	29	29	28	29	27	27	27
VA Intermediate Goods Exports (Tier Suppliers)	14	17	18	15	16	17	17	17	16	16	16	16

Source: Author

Figure 9: Breakdown of Domestically Driven Value Added by Top 15 Producing Countries in %, 2000-2017

	2000	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
China	83	71	73	81	79	80	81	83	83	84	85	85
Germany	30	22	22	25	25	25	22	21	20	20	19	16
U.S.	75	70	67	67	69	68	68	68	69	70	71	71
Japan	54	39	42	49	46	46	45	38	33	34	38	33
India	87	84	79	80	78	79	78	73	71	75	76	76
Mexico	40	30	33	33	37	42	33	36	38	27	35	33
Korea	53	42	31	28	30	30	29	28	31	30	33	32
Brazil	69	78	80	85	78	78	77	73	80	79	79	81
Spain	40	37	41	38	32	29	30	27	24	24	23	16
France	27	20	18	20	19	20	16	15	14	12	12	11
Thailand	77	56	59	61	63	61	63	71	63	62	63	60
Canada	4	6	20	29	25	27	23	25	20	21	23	22
Russia	70	83	84	82	86	85	85	85	82	82	83	84
Turkey	48	2	2	5	11	5	5	2	2	4	9	2
Czech Republic	35	16	16	16	17	14	12	10	8	7	6	4

Source: Author

At the country level, the changes in value added breakdown shows more precise shifts in a few countries. Germany which its industry value added came from local OEM production at 30% in 2000 declined to 16% in 2017. Such decline was also apparent for countries like Japan, where local OEM production contributed 54% of its value add in 2000 and declined to 33% in 2017, Korea, from 53% to 32%, Mexico, from 40% to 33%, Spain, from 40% to 16% and France from 27% to 11%. A bigger decline was noticeable in countries like Turkey, from 48% to 2 % and Czech Republic from 35% to 4%. Overall, these countries have shown a strong trend towards externally driven value add and depend on value added activities from their exports.

A few countries with larger market showed an increasing domestic value add trend. China recorded 85% domestically driven value add in 2017 followed by Brazil with 81%, U.S. with 71%, Russia with 84% and India with 76%. The increase and the size of the domestically driven value add shows that the producing countries in the bigger market are more dependent on domestic market for value add compared to exports. Only small percentage of the value add is from exports.

b. Global Value Chain Participation Index

To further understand the decomposed value added data that is externally driven, the top 15 producing countries is examined using Wang et al. (2017). As a first step, the data is broken down into final and intermediate use to differentiate between domestic and foreign value-added. According to Wang et al (2017), GVC activities are those activities in which value-added crosses national borders for production. It is the sum of value-added embodied in intermediate goods for export or import. GVC production activities can be further decomposed into simple and complex GVC activities. Simple GVCs involve domestic value-added crossing national borders for production only once, while complex GVCs involve domestic value-added crossing national borders for production at least twice.

This approach allows a better measurement of GVC production activity in a country and the different types of value-added creation activities at the sectoral level and its relationship with a country's overall GDP growth can be analyzed using this decomposition.

Figure 10: Breakdown of Countries with Domestically or Externally Driven Value Add Comparison of Year 2000 and 2017

	2000		2017		Majority value add type, >50%
	Domestic	Exports	Domestic	Exports	
China	83	17	85	15	Domestically driven
Germany	30	70	16	84	Externally driven
U.S.	75	25	71	29	Domestically driven
Japan	54	46	33	67	Externally driven
India	87	13	76	24	Domestically driven
Mexico	40	60	33	67	Externally driven
Korea	53	47	32	68	Externally driven
Brazil	69	31	81	19	Domestically driven
Spain	40	60	16	84	Externally driven
France	27	73	11	89	Externally driven
Thailand	77	23	60	40	Domestically driven
Canada	4	96	22	78	Externally driven
Russia	70	30	84	16	Domestically driven
Turkey	48	52	2	98	Externally driven
Czech Republic	35	65	4	96	Externally driven

Source: Author

The results from these breakdowns shows a shift in the industry from year 2000 to 2017. Despite the notion that the main OEMs keep the higher value added activities in the home country, key OEM brands from producing countries like Germany, Japan, France and Korea are capturing value add more from exports and the value add is more externally driven. A further investigation using the GVC Participation Index will provide clarity on the types of externally driven value add.

Therefore, participation in GVCs is measured at the sector level based on forward linkages through exports of domestic value-added embodied in intermediate exports used by direct importers for domestic consumption, which is referred as simple GVCs and exports of domestic value-added in intermediate exports used by direct importers to produce exports to third-party economies, referred as complex GVCs.

Figure 11: Simple and Complex GVC Index for Top-15 Producing Countries, 2000-2017

	2000	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
GVC Participation Index	0.159	0.199	0.203	0.185	0.193	0.196	0.200	0.207	0.209	0.211	0.206	0.209
GVC Simple – Tier 1	0.094	0.110	0.114	0.105	0.107	0.106	0.110	0.114	0.114	0.115	0.112	0.112
GVC Complex – Tier 2	0.064	0.089	0.089	0.079	0.086	0.090	0.090	0.093	0.095	0.096	0.094	0.097

Source: Author

The results of the GVC participation index for the top 15 producing countries shows an upward trend. The GVC participation index was at 0.159 in year 2000 and increased to 0.209 in year 2017. Although there we no major trend change between 2007 to 2012, a smaller decline was observed in 2009 to 2011. The decline from 0.203 in 2008 to 0.185 in 2009 may suggest that the Global Financial Crisis had an impact on the value add of both tier 1 and tier 2 suppliers in the automotive industry. The simple and complex GVC participation index showed similar trend as the GVC participation index as shown in Figure 11.

Among the top 15 producing countries, it was observed that countries that are externally driven for value add have different extent of simple and complex GVC participation index. Although the trend generally showed an increasing level of GVC participation, some countries showed higher simple GVC participation index, which represents higher tier 1 intermediate exports compared to complex GVC participation index. As shown in Figures 17,19 and 20, France, Turkey and Czech Republic have higher complex GVC participation index, which means the value added captured by these countries were largely from tier 2 suppliers. Japan, Mexico, Korea and Canada on the other hand have higher simple GVC participation index, which means the value added captured by these countries is largely from tier 1 suppliers. Other countries such as Germany and Spain have an equal distribution of simple and complex GVC.

Consequently, the results of the value-added breakdown for tier-1 and tier-2 supplier in Figure 11 provides a different narrative compared to the total global trade value of tier-1 and tier-2 suppliers as shown in Figure 4. Even though global automotive trade of tier-2 supplier products were substantially higher at 40-46% between 2007 and 2018 and only 5-6% for tier-1 suppliers, value add from tier-1 suppliers export remained higher than tier-2 supplier exports. This will be even more interesting with the recent drop of tier-2 exports in 2019 to 30% of total global automotive trade while final OEM exports increased substantially from 49% to 67% from 2018 to 2019.

The smaller value add contribution despite a higher trade volume for tier-2 supplier may suggest that the decline in trade for tier-2 as experienced in 2019 is a sign that the value added from exports of tier-2 will be smaller, while tier-1 suppliers still maintain the trade volume and value add. Tier-1 suppliers have mostly moved to most of the production sites and adopted localized production and the radical change in modularization may also result in greater trade for final product instead of components and parts from tier-2 and below suppliers.

As a result, countries which are highly dependent on value added trade of tier-2 and below products will be highly affected as most carmakers are expected to integrate the entire value chain in certain locations. The integral part of localized production is the globalized customer base for the top carmakers and depend largely on the size of the market. The governance structure in the value chain between the tier-1 and tier-2 suppliers are more of a market exchange relationship. The lack of binding relationship between the tier-1 and tier-2 supplier leaves the tier-2 suppliers more vulnerable to any demand shock experienced in the automotive industry. With limited working capital in comparison to tier-1 suppliers, a demand downturn will strongly squeeze the profitability and price for tier-2 suppliers. This is even more alarming in the move towards EV adoption whereby most tier-2 suppliers that are focused on mechanical parts that support the ICE, may gradually disappear and only a few strong suppliers will survive.

c. Global Automotive Value Chain Production Length and Vulnerabilities

In addition to the value-added decomposition, the study further examines the production length of the automotive industry among the top 15 producing countries from a backward linkage perspective. Production length is examined by calculating the backward linkage average production length for all countries from the automotive industry. Although there could be input from other industries to the automotive industry, the analysis here is focused at only capturing the automotive industry to understand production length patterns for automotive suppliers.

Since the outbreak of COVID-19 in early 2020, the debate on global value chains have been on efficiency against resilience. In a pre-crisis world, the global value chains in any industry were organized in the most efficient way to maximize output. However, the pandemic strongly called for building a more inclusive value chain or at least finding the right balance between efficiency and resilience. Longer production chains which involve multiple cross-border trade that are interdependent is more time consuming and require larger inventories to be cost effective. This poses a higher level of vulnerability to disruptions in the production chain especially financial shocks that may affect the availability of credit and working capital. Bruno et. al (2018) and Arslan et. al (2018) showed strong evidence that longer production chains are particularly sensitive to changes in financial conditions and production chains shorten in response to tightening financial conditions. Both studies indicate that long production chains are more vulnerable to shocks.

By examining the top 15 global automotive producing countries, the production length was calculated using Wang et. al (2017) and focused on intra-industry production relationship. Using Transport Equipment (c15) for the 15 countries, the backward linkage production length from the global Transport Equipment classification was calculated for all countries. This calculation represents the intra-industry production relationship that may reflect the transactions of suppliers in the automotive industry which are mainly transnational corporations. The production length shows the number of times the input for a product moves cross border before it is used in a country.

The average production length for the 15 countries generally show a declining trend overall with an average production length of 3.895 in year 2000 to 3.728 in 2017 as shown in Figure 12. This means that the automotive industry from a production location perspective show that the sourcing of input products in the automotive industry crosses lesser borders and products are less complex.

Figure 12: Average Production Length for Top-15 Car Producing Countries, 2000-2017

	2000	2010	2011	2012	2013	2014	2015	2016	2017
Average Production Length for top-15 countries	3.895	3.791	3.774	3.737	3.721	3.713	3.736	3.754	3.728

Source: Author

However, breaking down the production length by country shows a different trend. As shown in Figure 13, some countries have considerably longer production length while others have shorter production length. The trend from year 2000 to 2017 also may paint a different picture by country.

As shown in Figure 13 below, the study breaks down the production length into three different categories, which are marked in red for the length of 4.0 and above, yellow for 3.5 to 4.0 and red for 3.5 and below to differentiate the level of vulnerability of each country, especially from suppliers perspective.

Figure 13: Backward Linkage Production Length for Top-15 Countries, 2000-2017

	2000	2010	2011	2012	2013	2014	2015	2016	2017
Brazil	3.668	3.513	3.674	3.472	3.453	3.453	3.518	3.543	3.528
Canada	3.664	3.655	3.609	3.569	3.498	3.540	3.566	3.557	3.586
China	4.722	4.767	4.719	4.750	4.797	4.751	4.744	4.763	4.838
Czech Rep	3.965	3.794	3.811	3.759	3.766	3.775	3.796	3.762	3.782
Germany	3.353	3.361	3.358	3.338	3.273	3.253	3.300	3.313	3.243
Spain	3.723	3.488	3.549	3.471	3.395	3.421	3.464	3.460	3.453
France	3.390	3.409	3.395	3.350	3.361	3.365	3.372	3.367	3.352
India	4.002	3.600	3.620	3.577	3.663	3.600	3.607	3.835	3.672
Japan	4.617	4.435	4.451	4.376	4.271	4.238	4.245	4.307	4.198
Korea	4.370	4.286	4.146	4.316	4.301	4.260	4.270	4.294	4.210
Mexico	3.989	3.754	3.787	3.729	3.726	3.740	3.782	3.750	3.732
Russia	3.691	3.519	3.550	3.484	3.482	3.388	3.414	3.378	3.360
Turkey	3.897	3.492	3.425	3.364	3.344	3.356	3.381	3.377	3.387
U.S.	3.685	3.567	3.597	3.524	3.537	3.596	3.574	3.569	3.605
Thailand	3.695	4.218	3.917	3.981	3.955	3.956	4.005	4.033	3.974

Source: Author

China is seen as the most vulnerable country given its longer production length that has also been increasing in trend. This is followed by Korea and Japan with significantly high production length above 4.0 although showing a declining trend. Germany, France and Turkey are the least vulnerable countries as the automotive industry recorded a production length below 3.5 consistently with a generally declining trend. Other countries have shown a moderate production length with a declining trend. Countries in Asia seem to have a longer production length compared to other regions.

2.1.4 Results and Conclusion

With the above findings, it can be summarized that the evolving global automotive value chain will first have largest impact and vulnerabilities in different production locations based on the value added type, either domestic or external, GVC participation that analyzes further the extent of external value added type by the type of supplier. The production length on the other hand predicts the level of vulnerability based on the emerging trend of backward linkage production length. The top-15 producing countries or locations are facing different challenges in the evolving global automotive value chain, especially given the exacerbated disruption in the face of COVID-19 global pandemic.

Larger population countries such as Brazil, China, India, Russia, United States and Thailand have a larger proportion of value added that is domestically driven. In the case of economic crisis and recovery, these countries are less susceptible to external effects as experienced by the global trade disruptions during the COVID-19 pandemic. Countries with domestically driven value added also have better control of domestic policies that can promote recovery of the industry compared to externally driven countries. However, among the domestically driven countries, China faces higher vulnerability due to its longer backward linkage production length.

Countries that have externally driven value added are either tier 1 or tier 2 biased while some countries recorded a balanced distribution. Given the trends of tier 1 and tier 2 suppliers in the global automotive value chain, countries with higher dependence on tier 2 suppliers are at a larger risk of losing the externally driven value added. Czech Republic, France and Turkey recorded higher dependence on tier 2 value added. Among these 3 countries, Czech Republic is the only country with a moderate level of production length compared to France and Turkey which both recorded a lower level of production length. This would mean that even though France and Turkey might be effected by the changes in the global automotive value chain and risk losing the value added from tier 2 suppliers in the countries given that their profitability will be squeezed, the backward linkage production length in these two countries are relatively lower, suggesting that the production location might not as be effected as much compared to Czech Republic.

From the perspective of production length, the countries that are most vulnerable are China, Japan and Korea. The production length in these countries have been growing as during a time of crisis, the backward linkage value chains of these countries are the most vulnerable and may increase in cost. Countries with lower production length are the least vulnerable in an economic crisis or shock and the countries in this category are Germany, France and Turkey. Other countries investigated in this study recorded a moderate level of production length. The results are summarized in Figure 14 below.

Figure 14 : The Summary of Results for Top-15 Producing Countries

	Value Added	GVC Participation	Production Length
Brazil	Domestic	-	Moderate
Canada	External	Tier 1	Moderate
China	Domestic	-	High
Czech Rep	External	Tier 2	Moderate
Germany	External	Balanced	Low
Spain	External	Balanced	Moderate
France	External	Tier 2	Low
India	Domestic	-	Moderate
Japan	External	Tier 1	High
Korea	External	Tier 1	High
Mexico	External	Tier 1	Moderate
Russia	Domestic	Balanced	Moderate
Turkey	External	Tier 2	Low
U.S.	Domestic	-	Moderate
Thailand	Domestic	-	Moderate

Source: Author

The COVID-19 global pandemic has accelerated some major disruptions in the global automotive industry. The understanding of the value added analysis for the top-15 countries allows to shape, in a more detailed manner, the different automotive production locations at a global level and where its value added is derived from while linking it with the emerging trends in the industry. The first impact of output cuts due to weakening demand will remain a major issue until total economic recovery. The knock-on effect will be felt worse for production locations that are externally driven compared to domestically driven. Externally driven production locations have a higher risk of closure especially for the strategic changes of the OEMs. This is already taking place with some permanent closures of plants in some countries while huge layoffs were also announced especially in Germany and France. Carmakers may also struggle to maintain its cost competitiveness in their external markets and it is expected that more OEMs will move to domestically driven production location such as China, Brazil, India, Russia, United States and Thailand.

Besides the move of production, production locations for tier 1 will also undergo some consolidation. Given the concept of modularity and move towards EVs, tier 1 companies that are strongly investing in research and development have a higher chance of survival. Some production locations that depend on tier 1 suppliers that are tied to certain OEM production facility may face huge risk of survival if they do not quickly transform to the changing needs of OEMs and invest in research and development. Many of such tier 1 companies located in Mexico are highly in risk of the changing needs of OEMs and output cuts.

Production locations of tier 2 suppliers are expected to be worst hit by the pandemic. Even before the COVID-19 pandemic, the tier 2 suppliers were already facing a major decline in value added trade suggesting that their profitability have been squeezed despite growth in trade volume. Although globally, all tier 2 suppliers are affected even worse since the pandemic, countries that have an externally driven value add that is derived from tier-2 suppliers such as Czech Republic, France and Turkey will face the worst situation with output cuts. Most of the tier 2 suppliers are local companies that can be categorized as small and medium enterprises are already facing huge working capital challenges and risk of survival since the overall decline in automotive output.

The strongest and most balanced country in the study was Germany. Although Germany was categorized as the externally driven country, the production length of Germany is the lowest globally. However, this might change with the moving of some OEMs to other production locations. This is already been evidenced with many plans of closures and lay offs in Germany. The production length of German carmakers moving out of Germany might have some consequences on the cost and vulnerability of the carmakers to shocks. The shortest production length might turn into longer production length if the suppliers and OEMs move to China for example. These moves are more of a market seeking move rather than efficiency seeking move. Will this be a more efficient or inclusive value chain setup for the carmakers? These OEMs should rethink and consider the time, cost and effort required to build capacity in a new location as well as the risk of longer production length. Unless the OEMs are open to sharing knowledge and assist a top bottom support to local suppliers in a new governance structure, the OEMs might fail entirely to build any level of resilience and be more vulnerable to shocks in the new location.

Producing countries from Asia such as China, Korea and Japan are more vulnerable to cost increase especially in a financial shock. The longer production length that suggests more frequent cross border movement will make these countries vulnerable to financial and economic shocks compared to countries like Germany, France, United States or Mexico. China, Korea and Japan is also expected to have greater supply side vulnerabilities due to the longer production length. Both value added of Korea and Japan are externally driven, which makes them even more vulnerable to shocks from the demand side. Although Japan and Korea can be described as countries with the most efficient automotive value chain setup with the lowest cost and OEMs that operate in multiple locations, they are also the least inclusive countries in terms of shocks due to this setup.

The COVID-19 pandemic has thrown this question to the global economy, especially in the automotive industry, where the setup has been the most efficient setup. The most efficient setup is the most vulnerable setup as well in a crisis. Building resilience requires a more diversified approach that goes beyond market or efficiency seeking. Carmakers that have invested largely in the current setup of the global automotive value chain are in the race for the next trends especially in the production of EVs, relocating and reshoring activities. However, the swift decisions without a proper understanding of the value-added decomposition and production length vulnerability may leave them without answers to the question of resilience or efficiency from a global value chain perspective.

Despite the emerging trends of the global automotive value chains that may become shorter with shorter production length, emergence of new production hubs based on market seeking activities and the entire consolidation of suppliers and move towards EVs, in the short to medium terms, there is no middle ground between resilience and efficiency unless, these new emerging trends consider a new governance system in the supplier-buyer relationship in the global automotive value chain. The consequence of these evolving global automotive value chain will have a huge impact on the global economy. There are also huge opportunities for new suppliers and emergence of new carmakers that may gradually overtake some of the traditional carmakers if they are able to find the right balance between resilience and efficiency. The evolving global automotive value chain is still at this critical juncture and the future of the industry lies on how quickly can the industry adopt and swiftly find the balance between resilience and efficiency.

Annexes

Figure 15: Breakdown of Value Add Creation from Tier 1 and Tier 2 Suppliers of Japan *(Source: Author)*

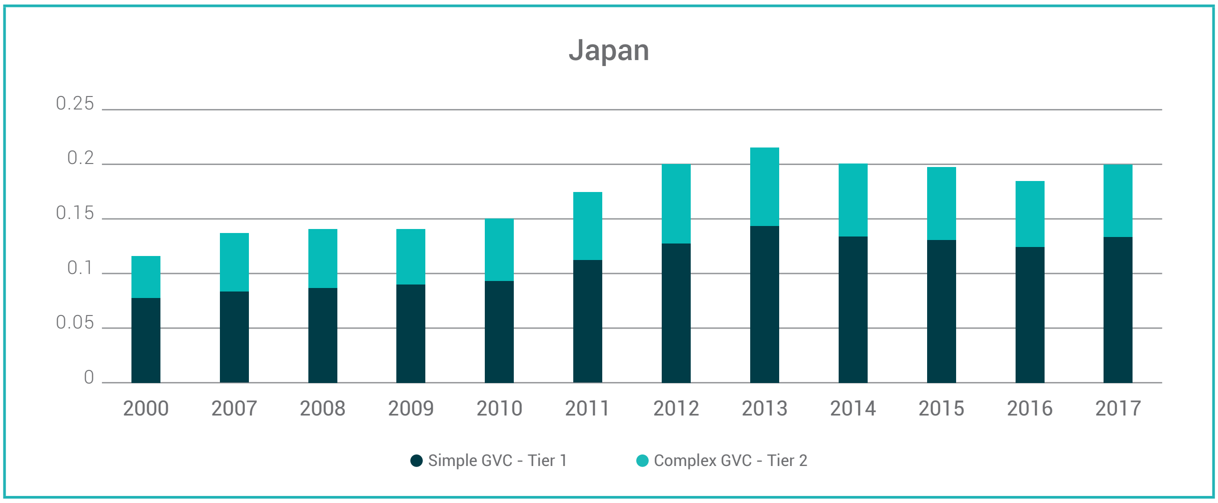


Figure 16: Breakdown of Value Add Creation from Tier 1 and Tier 2 Suppliers of Germany *(Source: Author)*

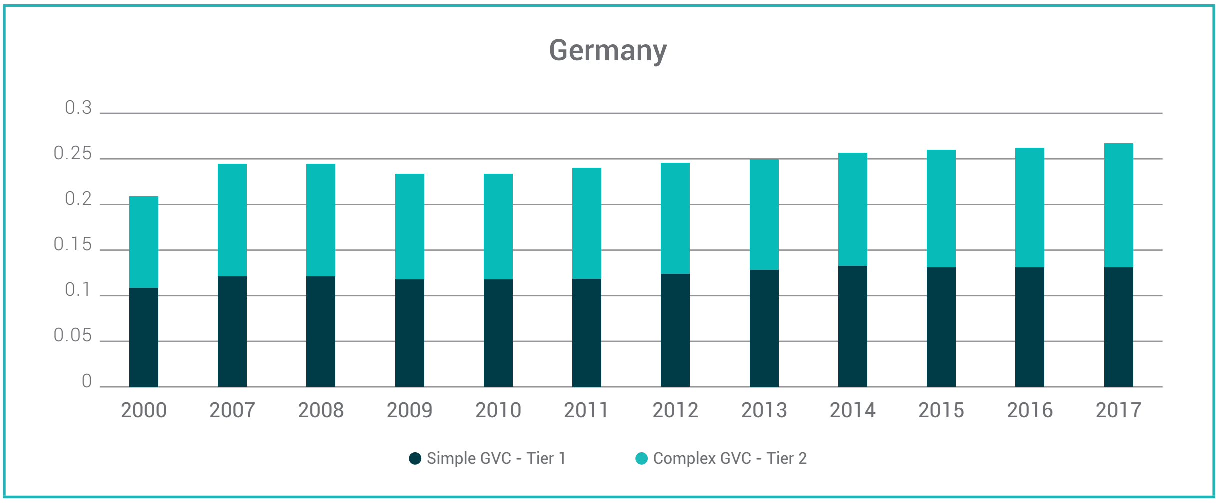


Figure 17: Breakdown of Value Add Creation from Tier 1 and Tier 2 Suppliers of Mexico *(Source: Author)*

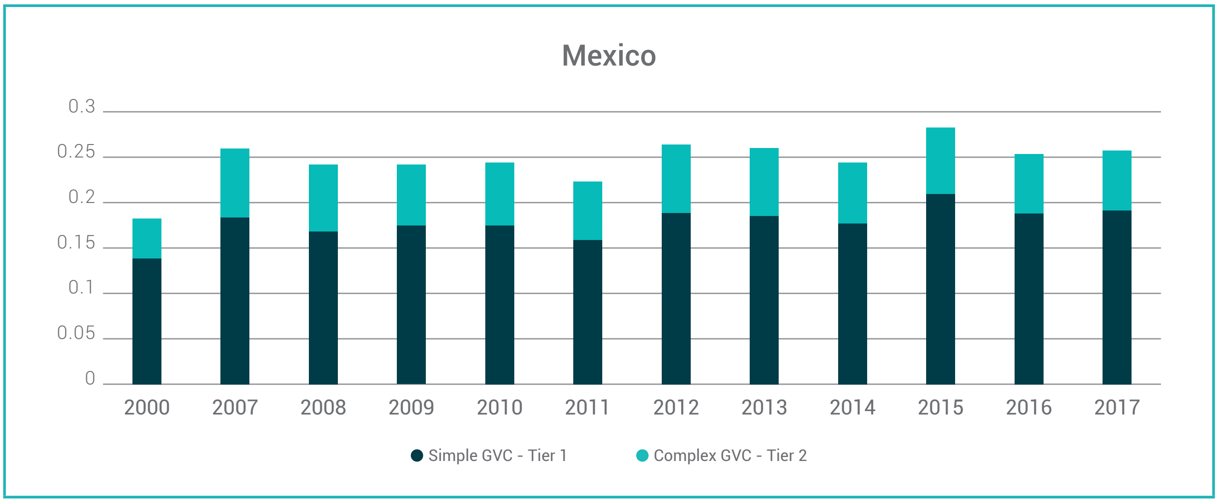


Figure 18: **Breakdown of Value Add Creation from Tier 1 and Tier 2 Suppliers of Korea** *(Source: Author)*

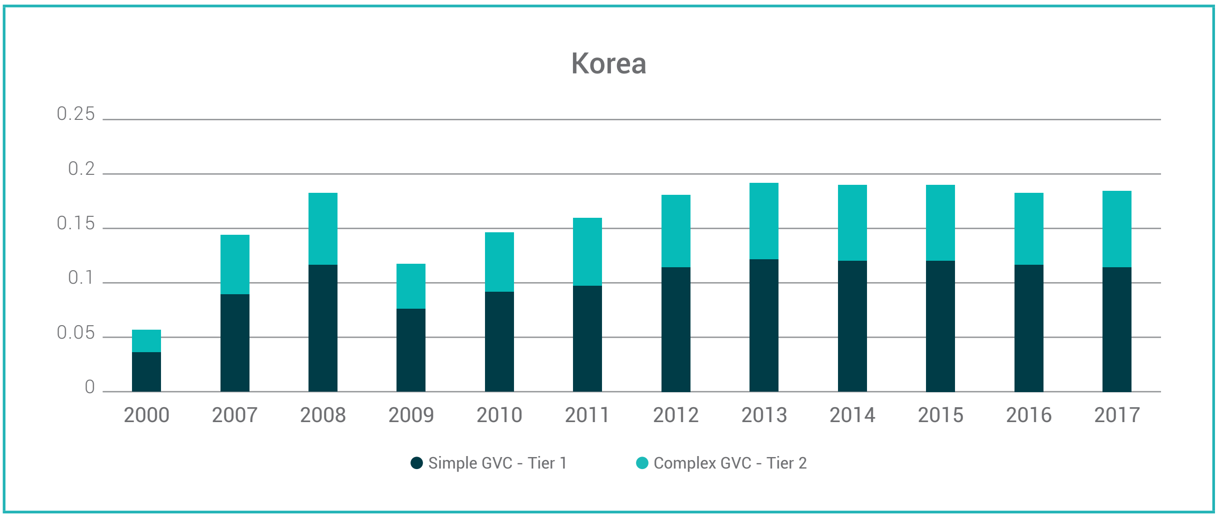


Figure 19: **Breakdown of Value Add Creation from Tier 1 and Tier 2 Suppliers of Spain** *(Source: Author)*

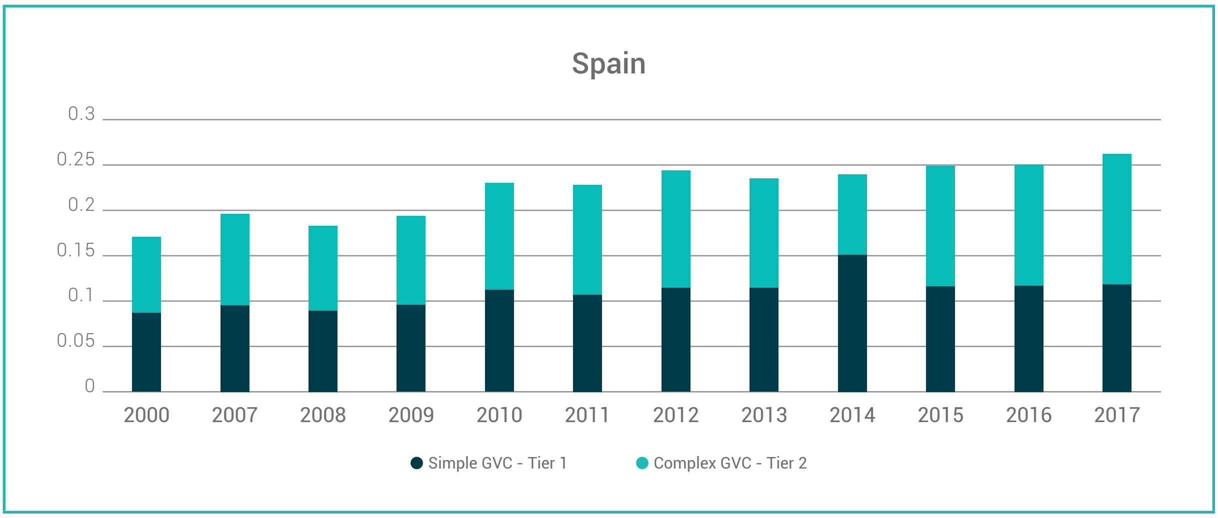


Figure 20: **Breakdown of Value Add Creation from Tier 1 and Tier 2 Suppliers of France** *(Source: Author)*

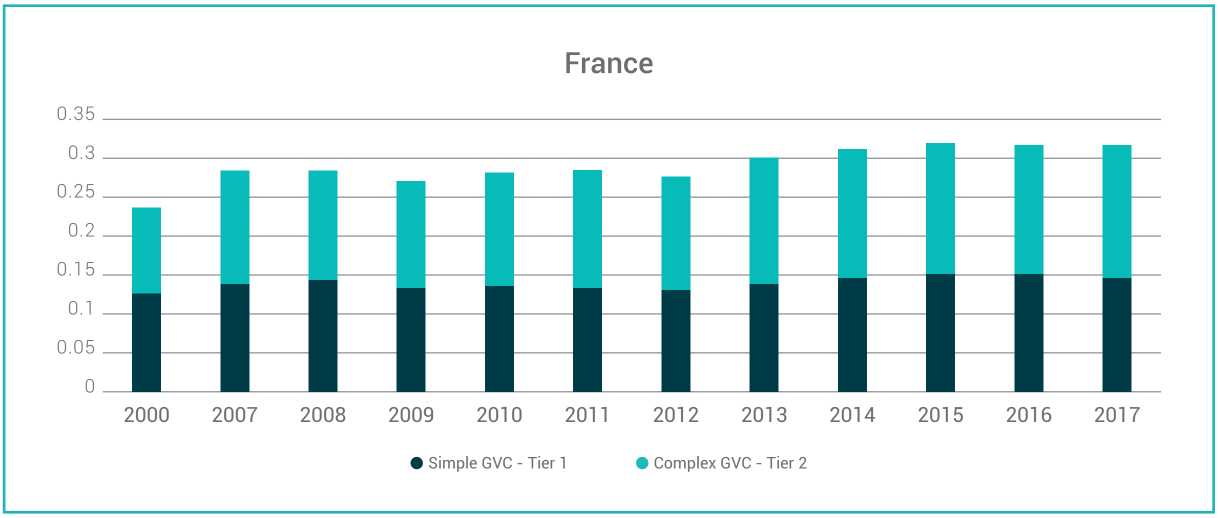


Figure 21: Breakdown of Value Add Creation from Tier 1 and Tier 2 Suppliers of Canada *(Source: Author)*

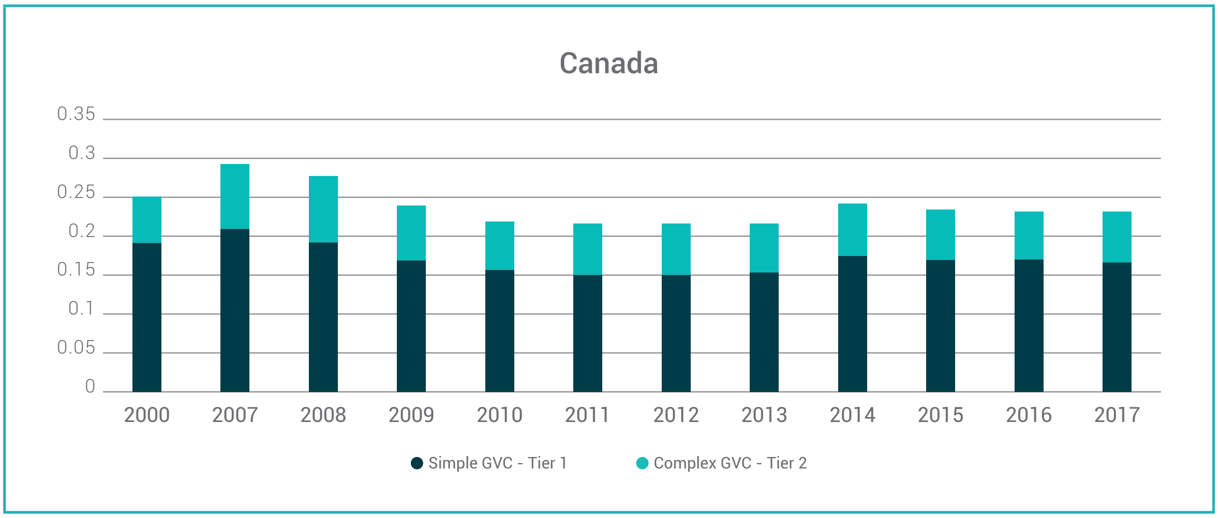


Figure 22: Breakdown of Value Add Creation from Tier 1 and Tier 2 Suppliers of Turkey *(Source: Author)*

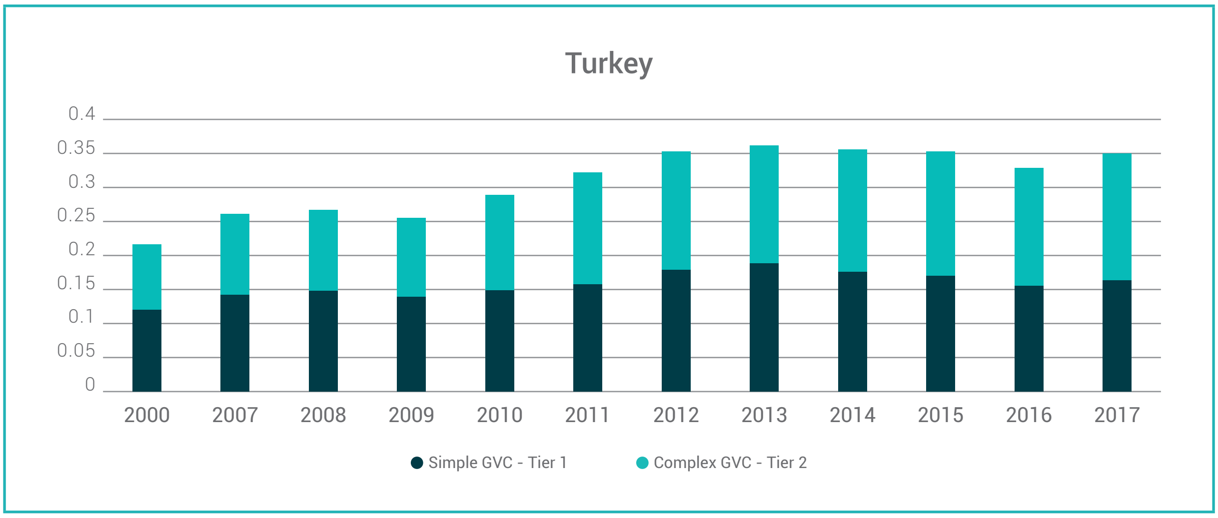
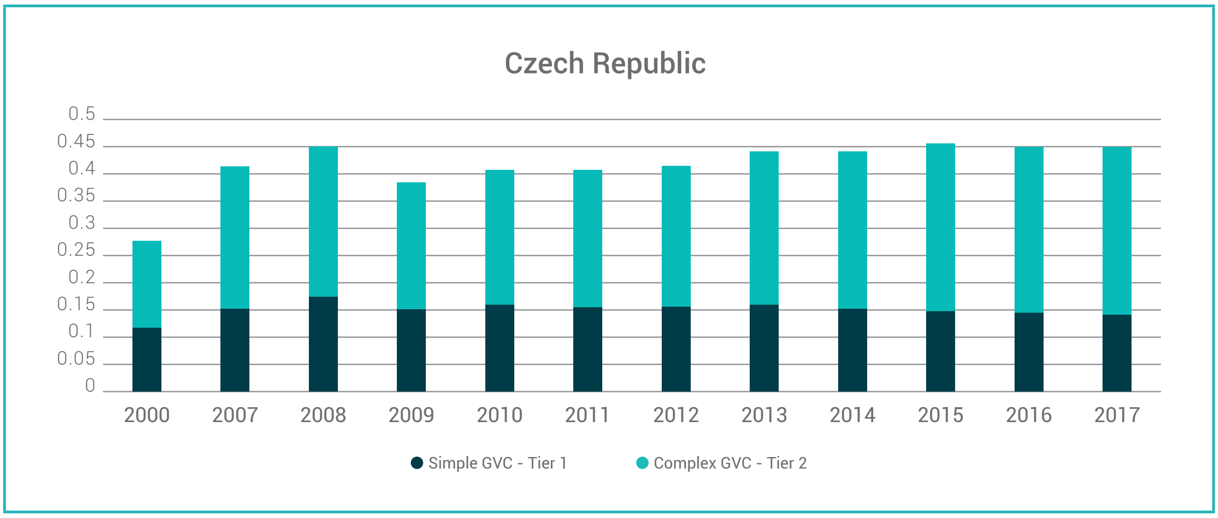
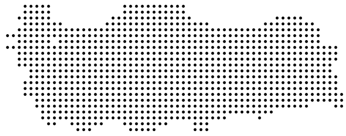


Figure 23: Breakdown of Value Add Creation from Tier 1 and Tier 2 Suppliers of Czech Republic *(Source: Author)*



Preliminary Global Value Chain Analysis for Turkey



2.2 TRANSFORMING THE TURKISH AUTOMOTIVE INDUSTRY INTO A GLOBAL POWERHOUSE

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Summary

In Turkey's pursuit to integrate into the Global Value Chain (GVC), the automotive industry is one of the priority sector selected in the 11th Development Plan. As the industry globally is quite matured in terms of manufacturing and productivity given the diverse large automotive value chain that is fragmented regionally and globally, the automotive industry in Turkey is at a juncture facing three overarching challenges unique for the country and industry; advancement into new technologies, increasing productivity to support higher value add and shifting or diversifying products and markets.

The position of Turkey is quite crucial at this moment and this study breaks down the challenges into "the trilemma of the Turkey's automotive industry" and sets some key potential areas and options for the country to increase its global competitiveness in the automotive industry. These fresh new insights may provide a strong policy guidance that focuses on firm level analysis and the expansion of a GVC analysis may be crucial as an input for the 11th Development Plan.

Among the key preliminary GVC analysis outcome for the automotive industry are as follows:

- Turkey needs to carefully consider its policy options in the automotive industry based on the global value chain lenses of global firms and the emerging new trends in the automotive industry;
- The breakthrough of a local EV brand could be the right solution to the challenges faced by Turkey, however, the key challenge would be to address battery manufacturing capability;
- Turkey's automotive industry is focused on passenger vehicles exports with "Big Four" challenge – four main OEMs producing the most cars and the increasingly widening gap between the four export markets concentration;
- The current production capacity for passenger vehicle are only in smaller car segments (segment A, B and C) while competing countries have moved into producing either luxury vehicles or other segments. The trickle-down effect of the final demand has impacted the type and level of technology adopted by the tier-2 and tier-3 suppliers;
- A model was built to calculate the feasibility of absorbing EV battery supply by expanding the battery manufacturing capacity. The model estimates huge savings to the Turkish economy while providing comparative advantage in the global EV race that would take the automotive industry of Turkey to the next level as a global powerhouse.

2.2.1 Introduction

From a global standpoint, Turkey's automotive industry can be categorized as an integral part of country's manufacturing sector and currently contributes around 4% to the GDP. Turkey is the 14th largest automotive manufacturer in the world supported by recent production growth of almost 14%. The motor vehicle production of the country soared to 1,695,731 units in 2017 which is quite outstanding given that many other countries in the region were having a decline in production.

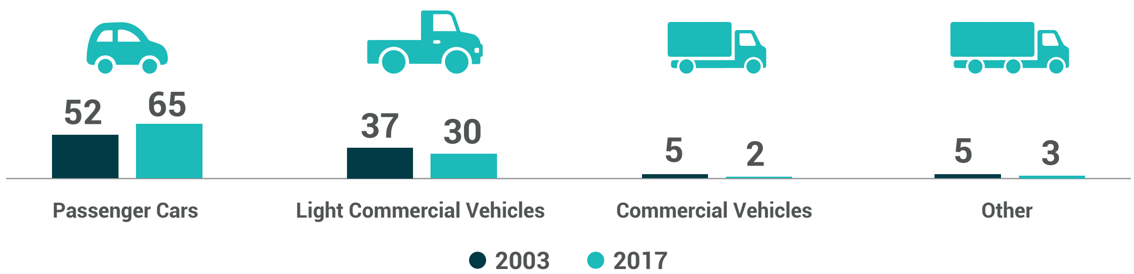
The industry in general is export-oriented given its strong participation and integration in the Global Value Chain (GVC). The surge in automotive production at a global level was first driven by the signing of the Customs Union agreement with the European Union (EU) followed by a new export oriented investments for passenger vehicles as well as components and parts. While the share of the automotive sector in manufacturing production value is 9 percent, the share in value added is 7.6 percent and in employment is around 4.5 percent. When the supplier industries such as subsectors of fabricated metal products, plastics and rubbers are included, the share of the production value is estimated to approach 15 percent. The rate of value added / production value for the automotive industry is 18.5%, which is lower than the average rate of the manufacturing industry.

The amount of investment in the automotive industry was around US$15 billions between the years 2000-2018. Partly due to these investments, the production capacity of the automotive industry increased from 800 thousand units to 2 million units.

Between 2005 and 2018, automotive production increased due to strong external demand. Domestic demand also supported the increase in production. In terms of vehicle types, the passenger vehicles are around 65% of the total production, an increase from 52% in 2003. This is followed by light commercial vehicles (LCVs) with 30% in 2017 which has decreased from 37% in 2003.

The number of passenger cars per 1000 inhabitants in Turkey was 145 in 2017 while it was around 500 for the EU. In the next 10 years, this number is expected to reach 200-250. Share of electric vehicles in motor vehicle sales will increase due to global technological transformation. It is expected that the exports of motor vehicles will increase in the next 10 years. However, the composition of products will be dependent on the adaptation of Turkey to technological transformation. One option is the concentration in conventional products importing old technologies. Other option is to attract new technology investments.

Figure 1: Production Distribution by Vehicles Type %



Source: Automotive Manufacturers Association, Turkey

2.2.2. Quantitative Analysis of the Automotive Industry in Turkey

Natural Potential

(Natural potential, dynamic potential and surplus and spillover potential are part of IsDB's quantitative GVC methododology[1])

The automotive industry in Turkey is one of the industries that has maintained a steady revealed comparative advantage (RCA). As shown in Figure 2 below, the product item HS87 has shown an increasing trend in general, except for the years between 2007 and 2013 given the global financial crisis and its post effects. The RCA recovered after 2015 and has shown a steady increase in trend.

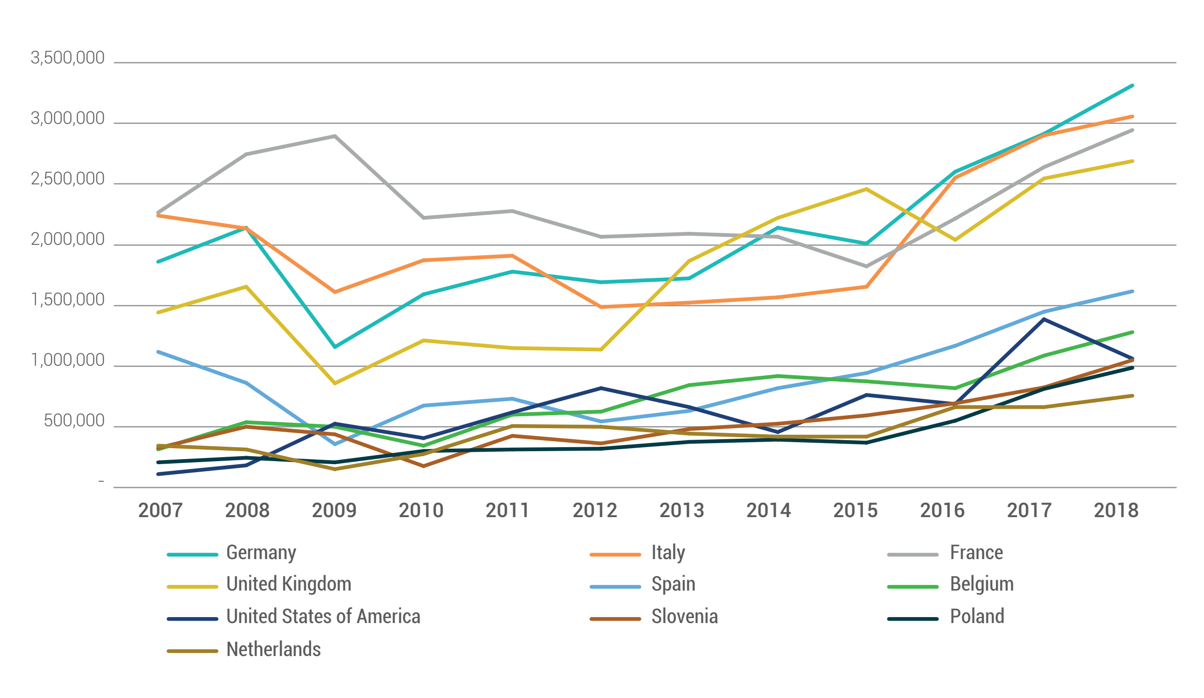
Breaking down Turkey's export by countries shows that there are two main group of countries that dominate the top 10 export destinations. The first group are the top 4 countries which are Germany, Italy, France and United Kingdom. All four countries recorded a gradual increase in export value since 2015 as shown in Figure 3 below. Germany is positioned as the main export destination with US$3.31 billions in 2018. The second group of countries are United States of America, Spain, Belgium, Slovenia, Poland and Netherlands. All these countries recorded a steady increase in export value since 2009 except the United States of America, whereby the export value decreased around US$300 million from 2017 to 2018.

Figure 2: RCA of the Transport Equipment Industry, Balassa Index, 2003-2018

Source: Authors using UN Comtrade data

1 M. F. S. Hamid, K. I. W. Kane, A. E. Demirhan and A. Khodary, Making Markets Work for Development through Global Value Chains, Islamic Development Bank, 2019

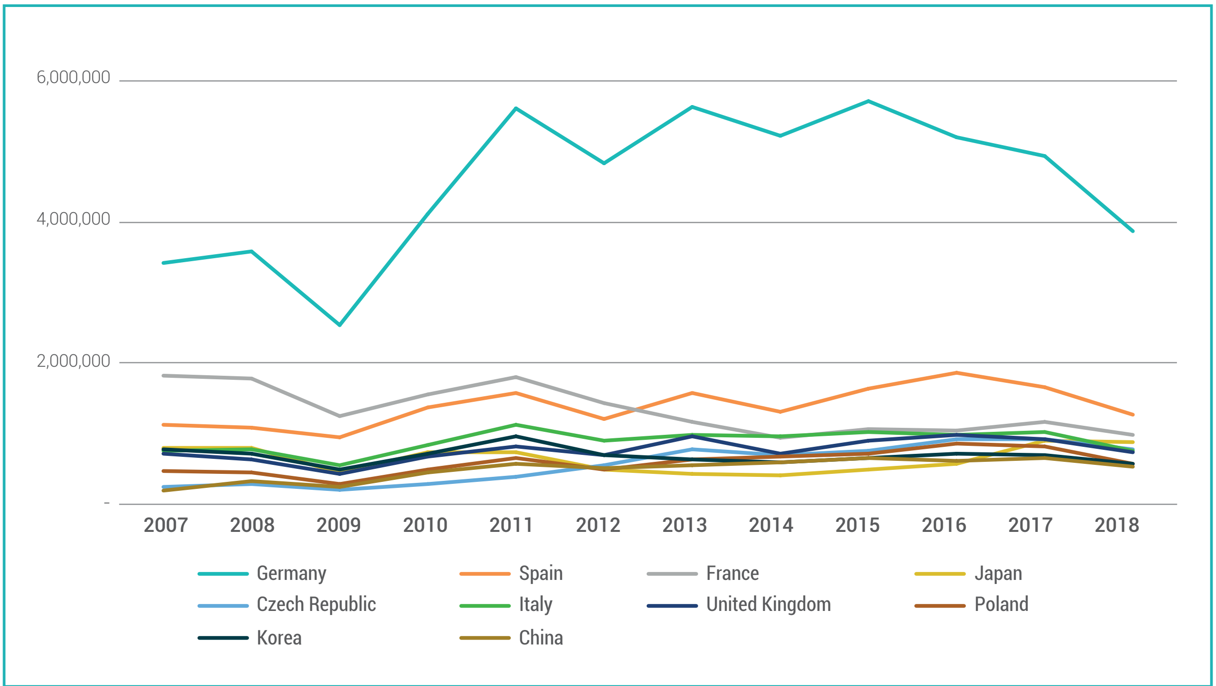
Figure 3: Turkey's Exports HS87, Vehicles (US$ thousand)



Source: Authors using UN Comtrade data

In terms of imports (as shown in Figure 4), Germany dominates imports of products in HS87 between 2007 and 2018 recording on average over US$4 billions imports. This is followed by France and Spain, while imports from Japan grew rapidly since 2014 from US$404 million to US$881 million in 2018.

Figure 4: Turkey's Imports of HS87, Vehicles (US$ thousand)



Source: Authors using UN Comtrade data

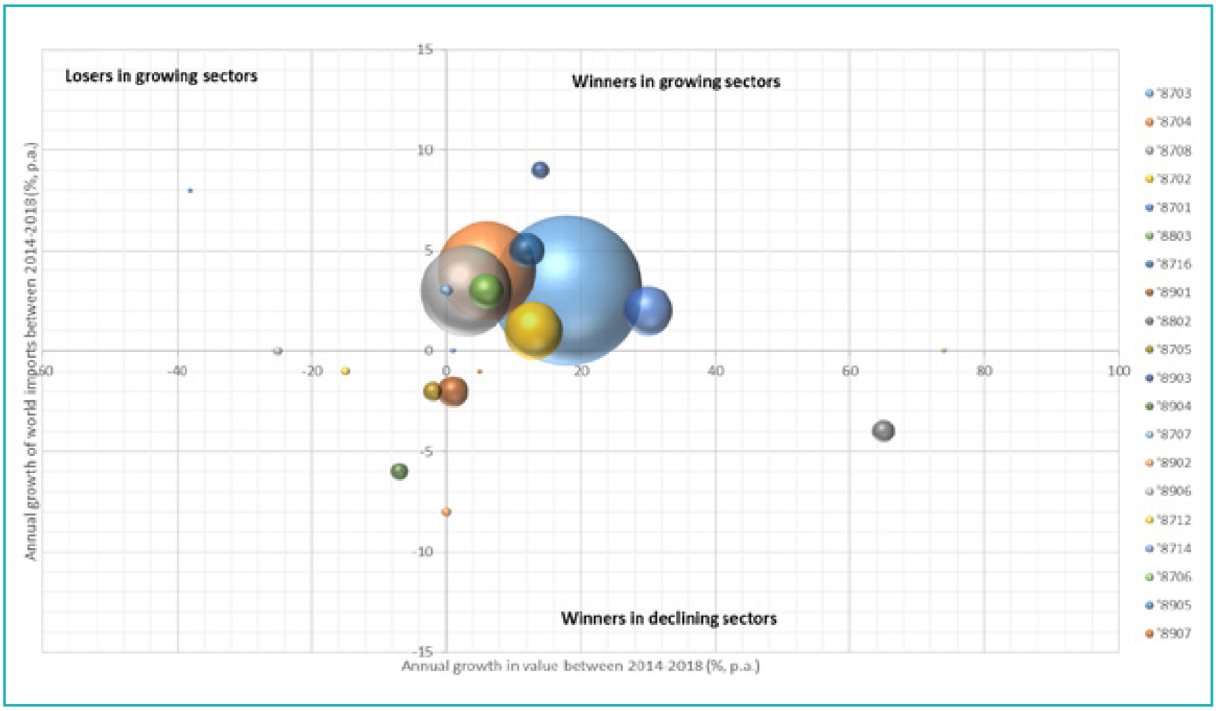
Dynamic Potential: Product Champion Index

(Natural potential, dynamic potential and surplus and spillover potential are part of IsDB's quantitative GVC methododology[2])

By breaking down the exports data at HS4 level for the automotive industry, the Product Champion Index (PCI) was calculated and ranked according to the 6 indicators. The results are presented for PCI Static Supply, PCI Dynamic Demand and PCI Market Access. These indices reflect the potential product champions in the industry that could guide policymakers to integrate these products in the GVC. In a snapshot, the bubble chart (figure 5) shows that the bulk of exports from the automotive industry are winners in a growing sector, whereby, the country exports have shown growth trajectory in tandem with global growth in demand for these products. These are products of HS8703, HS8704, HS8708 and HS8702. Although there are some products that are losers in declining sectors, the value of exports from these products are comparatively lower than the other products.

Using IsDB's methodology, the PCI index broken into three types does not vary considerably at the HS4 level. Product HS8703, which is mainly passenger vehicles, ranks first for all three indicators with some variation in ranking for other products. The top ten products are shown in Table 1 below; these are the highest potential products based on the three PCI indicators.

Figure 5: Quadrants of HS4 Level Product for HS87



Source: Authors

2 M. F. S. Hamid, K. I. W. Kane, A. E. Demirhan and A. Khodary, Making Markets Work for Development through Global Value Chains, Islamic Development Bank, 2019

Table 1: PCI Index IsDB Methodology - Ranking of HS87 Products

Hs Code	Product	PCI Static Supply	PCI Dynamic Demand	PCI Market Access
'8703	Motor cars and other motor vehicles principally designed for the transport of persons, incl. ...	0.331	0.291	0.028
'8708	Parts and accessories for tractors, motor vehicles for the transport of ten or more persons, ...	0.164	0.144	-0.078
'8704	Motor vehicles for the transport of goods, incl. chassis with engine and cab	0.156	0.165	-0.059
'8716	Trailers and semi-trailers; other vehicles, not mechanically propelled (excluding railway and ...	0.092	0.155	-0.036
'8701	Tractors (other than tractors of heading 8709)	0.060	0.109	-0.117
'8706	Chassis fitted with engines, for tractors, motor vehicles for the transport of ten or more ...	0.043	0.138	-0.242
'8702	Motor vehicles for the transport of >= 10 persons, incl. driver	0.033	0.047	-0.110
'8707	Bodies, incl. cabs, for tractors, motor vehicles for the transport of ten or more persons, ...	-0.027	0.004	-0.229
'8714	Parts and accessories for motorcycles and bicycles and for carriages for disabled persons, ...	-0.058	-0.058	-0.198
'8705	Special purpose motor vehicles (other than those principally designed for the transport of ...	-0.087	-0.112	-0.184

Source: Authors

Table 2 below gives a more detailed breakdown of the products for PCI. Although some products in the top 10 are ranked higher based on export size, these products do not necessarily be a product champion. Products such as HS8706 (Chassis for tractors/large vehicles) ranked 18, HS8707 (bodies for tractors/large vehicle) ranked 13 and HS8714 (parts and accessories for motorcycles and bicycles to carry disabled people) ranked 17 were among the non-top ten export products that made it into the top ten PCI products for the automotive industry.

The top ten products also vary in terms of Turkey's ranking for the products in world exports. Among the top ten PCI products, HS8704 (Motor vehicles for transport of goods) and HS8702 (Motor vehicles for the transport of more than 10) were among the top ten ranking in the world for Turkey, with HS8704 ranked in the ninth position and HS8702 ranked in the third position.

From the perspective of static supply which ranks the importance of export value and growth trend in the value of export, HS8703 (Passenger Vehicle) recorded a high growth values as well as maintained high export value, ensuring the product category to have highest PCI value. For PCI static supply, four products also showed a remarkably high growth in export rate which are HS8706 (Chassis for tractors and large vehicles) with a 74% growth rate, HS 8701 (Tractors) with 30% growth, HS8702 (Large motor vehicles) with 13% and HS8716 (Trailers) with 12%. The large increase in exports for these products in the past 5 years shows the supply capability of the industry for these products.

The dynamic demand PCI which focuses on the global demand of the product ranks the product from the perspective of global import growth and opportunity for import substitution which is investigated using trade balance as an indicator. Among the top 10 PCI products, HS8716 (Trailers) recorded highest global import growth, reflecting the increase in demand for this product category with 5% growth rate. HS8708 (parts for tractors and large vehicles) and HS8714 (parts and accessories for motorcycles and bicycles to carry disabled people) both showed a high potential to fulfill the domestic demand as both product categories recorded a trade deficit of US$1.4 billions for HS8708 and US$100 million for HS8714.

In terms of PCI market access, two indicators that are ranked on top are the market distance which is the proxy for the transportation of the exported product, while market concentration index using Herfindahl-Hirschman Index (HHI) indicates the number of markets that are already accessed for the particular product category for Turkey. The closer the value is to one, shows that the export market is only concentrated in one country and the lower the value shows more markets are penetrated. As for the transportation cost using the average distance, product HS8703 (Passenger vehicle) with an average of 2,578km, HS8716 (Trailers) and HS8705 (Special Purpose

Vehicles) have the shortest distance of all, reflecting the lower cost for transportation as a benefit for export. In terms of market concentration, product HS8706 (chassis for tractors and large vehicles) is most concentrated with 0.89 while HS8705 (Special Purpose Vehicles) is least concentrated with 0.04.

In summary, the PCI index shows the top 10 products where the automotive industry of Turkey can be globally competitive taking into account static supply, dynamic demand and market access indicators. These products will be selected in the next stage for further analysis.

Table 2: PCI Key Indicators Using IsDB Methodology

HS	PRODUCTS	RANKINGS		STATIC SUPPLY		DYNAMIC DEMAND		MARKET ACCESS	
hs4 code	Product	Rank by size	Ranking in world exports	Value exported in 2016 (US$ thousand)	Annual growth in value between 2012-2016 (%, p.a.)	Annual growth of world imports between 2012-2016 (%, p.a.)	Trade balance 2016 (US$ thousand)	Average distance of importing countries (km)	Concentration of importing countries
'8703	Motor cars and other motor vehicles principally designed for the transport of persons, incl. ...	1	14	12,441,971	18	3	6,536,031	2,578	0.07
'8708	Parts and accessories for tractors, motor vehicles for the transport of ten or more persons, ...	3	22	4,533,407	3	3	(1,433,774)	3,015	0.08
'8704	Motor vehicles for the transport of goods, incl. chassis with engine and cab	2	9	5,309,800	6	4	4,426,244	2,988	0.10
'8716	Trailers and semi-trailers; other vehicles, not mechanically propelled (excluding railway and ...	7	11	641,921	12	5	453,781	2,363	0.14
'8701	Tractors (other than tractors of heading 8709)	5	13	1,338,240	30	2	876,481	3,369	0.14
'8706	Chassis fitted with engines, for tractors, motor vehicles for the transport of ten or more ...	18	24	12,165	74	0	6,477	2,997	0.89
'8702	Motor vehicles for the transport of >= 10 persons, incl. driver	4	3	1,792,443	13	1	1,735,854	2,618	0.08
'8707	Bodies, incl. cabs, for tractors, motor vehicles for the transport of ten or more persons, ...	13	20	80,536	0	3	69,234	4,384	0.17
'8714	Parts and accessories for motorcycles and bicycles and for carriages for disabled persons, ...	17	38	13,920	1	0	(105,034)	3,078	0.10
'8705	Special purpose motor vehicles (other than those principally designed for the transport of ...	10	11	191,070	-2	-2	98,895	2,245	0.04

Source: Authors using UN Comtrade data

Surplus and Spillover Potential

(Natural potential, dynamic potential and surplus and spillover potential are part of IsDB's quantitative GVC methododology[3])

Surplus and spillover potential aims to analyze the value added in industries by taking into account the interlinkages of industries. The figure below depicts the breakdown of output for domestic and international uses. Almost 42% of gross output of transport equipment (US$21.6 billions) was exported (export revenue US$9.14 billions). Of the exported product, 60% were final products and 40% were intermediate goods.

To what extent domestic (or foreign) sources are used can be found by checking the decomposition of exports into its domestic and foreign sources. Domestic value added indicates the share of domestic supplier industries in total export whereas foreign value added indicates the share of foreign supplier firms (imports) in total exports. The domestic value added in the transport equipment industry in Turkey is around US$5.38 billions. In other words, almost 59% of automotive exports is based on domestic value added. Foreign value added in total export in automotive industry is US$3.8 billions. The share of domestic value added in the exports of third countries is around US$1.27 billions. Around 13.9% of automotive exports from Turkey are involved in third countries exports.

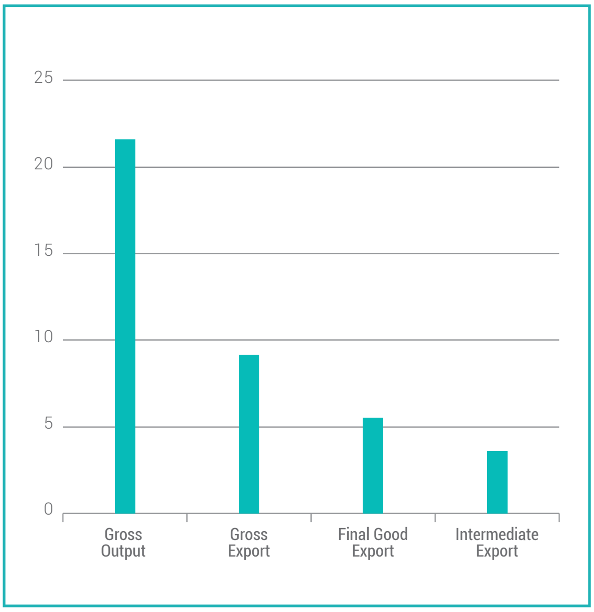
The current engagement of Turkey in GVCs can be quantified and evaluated by two indexes proposed by Koopman, et al., (2014) and IsDB (2019): i) The GVC position index identifies the role of a country as upstream or downstream position, and ii) The GVC participation index that summarizes the importance of the global value chain for the country for which it is calculated (Koopmans, et al., 2011). It measures the participation degree to GVCs by the sum of the shares of foreign value added in exports and domestic value added in third countries exports in total export. The GVC position index uses the difference between these shares in logarithmic form.

High values of GVC participation index signal high integration into GVCs. The GVC participation index was calculated as 55%. In other words, 55% of the automotive exports is related to either foreign value added or domestic value added in third countries exports. Turkish automotive industry ranks 6th among other manufacturing industries in terms of GVC participation.

Two types of upstreamness can be distinguished (Koopmans, et al., 2014): The first, natural resource exporters whose goods are used by other countries to produce intermediate goods exports, and the second, intermediate goods exporters to be used by other countries in their production. Those countries with high upstreamness, other than natural resource exporters, tend to be generally specialized in skill- and design- intensive goods. Koopman, et al., (2014) remarks that advanced countries export relatively more upstream components and a part of this value added embedded in these export activities returns to advanced countries in imports from other countries. Downstreamness generally defines a user position in a GVC. Positive values of GVC position index define upstream positions whereas negative values define downstream positions.

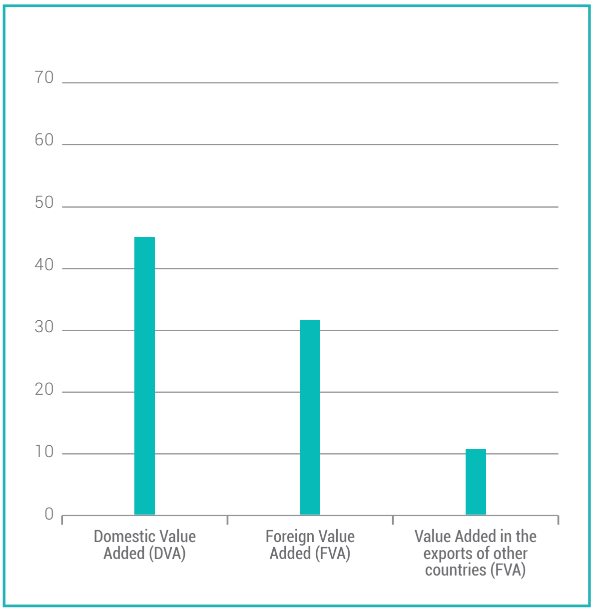
GVC position of automotive industry was calculated as -0.22. In other words, the share of foreign value added in exports is greater than the share of exports in third countries exports. This puts Turkish automotive industry into downstream position.

Figure 6: Breakdown of Output and Export of Transport Equipment, US$ billions



Source: Authors

Figure 7: The Share of Value Added in the Gross Export of Transport Equipment, %



Source: Authors

3 M. F. S. Hamid, K. I. W. Kane, A. E. Demirhan and A. Khodary, Making Markets Work for Development through Global Value Chains, Islamic Development Bank, 2019

2.2.3. The Global Automotive Industry

Key Trends

The automotive industry global production has peaked ("peak car") but it remains one of the largest manufacturing industries, as production is still significant. After reaching 97.4 million units in 2017, vehicle production levelled off at 96 million in 2018. Nevertheless, global production trend varies by region. The automotive trend is negative for production hubs in Europe such as Germany, and in Asia such as China. However, in U.S. and African market the industry remains robust. Global auto exports remain strong: over the last decade, finished passenger vehicle exports reached US$976 billions in 2018 from US$729 billions in 2012.

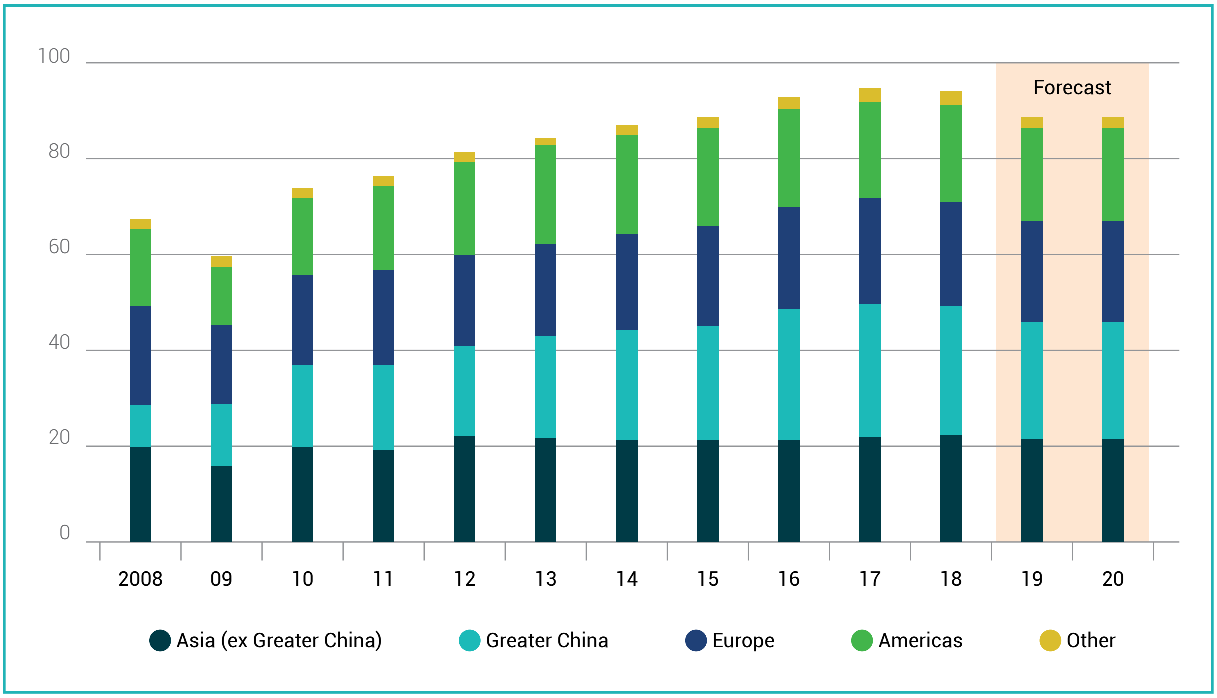
"Peak car" diminishes the appeal of investing in vehicle sharing and ride hailing apps while pushing autonomous driving vehicles far more off in the future. As global car production is set to fall in 2020 and rivaling competition from the likes of Uber, Lyft and Didi Chuxing, many carmakers that invested heavily in ridesharing and ridehailing apps have shut down. There was also miscalculation on car ownership as latest data shows an increase of car ownership in Germany from about 500 cars per inhabitants to 567 even after introduction of various vehicle sharing programs. Traditional carmakers such as BMW and Daimler's joint ventures have around 90 million customers in more than 1,300 cities, but have struggled to attract repeat customers. The average registered driver of a car-sharing app only uses the service for 12 hours a year.

New wave of consolidation in the global automotive brands. The rising costs associated with the development of electric cars and stricter emission regulations from the EU has forced the industry to consolidate and among the latest is the merger agreement between Fiat Chrysler and Peugeot. Many other carmakers are also in talks for consolidation, which may result in layoffs and restrategizing the business models. Moody has forecast that part suppliers will also embark on joint ventures due to higher development costs.

The electric vehicle industry outlook, however, remains positive. World production was over 2 million vehicles in 2018, and it is expected to reach 2.2 million by end of 2019. Annual electric vehicle sales are forecasted at 10 million in 2025. An even more positive outlook shows that by 2040, 57% of all passenger vehicle sales will be electric. Global passenger vehicle fleet, currently still at less than 0.5%, is expected to reach 30% by 2030. In China, US, and Europe, the share of electric commercial vehicles is set to rise substantially over the next 20 years. This overall trend is driven by falling battery prices thanks to massive investments by countries such as China, the advent of the autonomous economy, and other the impact of key structural technological, institutional changes in the world economy.

China is the lead country in the electric vehicle industry driving the global trend. China has established itself as a leader by adopting strategic policies and undertaking massive investments designed to boost its imprint in the industry. As a result, the share of China electric vehicle sales is already about 4%. By 2025, China is expected to sell almost half (48%) of electrical vehicles in the world albeit leveling of around a quarter (26%) by 2040. East Asian economies such as Japan and South Korea are set to significantly boost their electric vehicle sales over the coming decades. Meanwhile in Europe, considerable political will has driven big automakers, especially in Germany, to massively invest in the electric vehicle market.

Figure 8: Global Car Production in Million Units



Source; IHS Markit

Snapshot of the Industry

The automotive industry is one of the most significant global trade and the global exports in 2018 was US$1.47 trillion with components making up US$676 billions, subassemblies US$76 billions and passenger vehicles, US$720 billions. From the year 2007 to 2018, the share of components has steadily increased from 40% to 46% in 2018. Subassemblies did not significantly increase as many countries have imposed localization policy and subassemblies are usually closer to the component makers. This trend also shows that since there is an increase for components exports, higher value-added activities in component manufacturing are not in the same location as the final assembly of the passenger vehicle.

Table 3:Global Automotive Exports by Value Chain Stage and Subsector 2007-2018

Value Chain Stage and Sector	Value (US$ billions)			Share of Auto-Related World Trade (%)			CAGR (%)
	2007	2012	2018	2007	2012	2018	2007-2018
Total	**1,144**	**1,280**	**1,472**				**2%**
Components	**457**	**568**	**676**	**40**	**44**	**46**	**3%**
Of the Body system	175	217	257	15	17	17	**3%**
Of the Drive train	114	150	180	10	12	12	**4%**
Electrical systems	76	102	146	7	8	10	**6%**
Of the Body system or Drive train	93	99	93	8	8	6	**0%**
Subassemblies	**69**	**69**	**76**	**6**	**5**	**5**	**1%**
Body system	3	4	4	0	0	0	**0%**
Drive train	66	65	73	6	5	5	**1%**
Final Products (Passenger Vehicles)	**618**	**643**	**720**	**54**	**50**	**49**	**1%**

Source: Authors using UN Comtrade data

Global Production (in units) is Dominated by China, U.S., Japan and Germany; however, the Turnover Values are Significantly Lower for China Suggesting Lower Value-Added Activities.

As shown in Table 4, China, U.S. and Japan have dominated the global production with a total of around 50 million units. However, when the production is broken down to value terms, the major global carmakers which originates from Japan, U.S. and Germany make a turnover of around 57.6% which suggests that these countries are engaged in higher value-added activities compared to China with only 4.6% of global turnover. Turkey also suffers a similar dilemma that indicates the industry is comparatively lower value added given only 1.49% of global turnover. Consequently, the situation shows that Turkey and China may have many foreign large automotive companies operating and manufacturing, however, the production does not directly add significant value to the economy.

China Moved Away from Petrol and Diesel Vehicle Development to Focus on Electric Vehicles and Bus Manufacturing

Realizing this contrasting situation owing to the influence and capabilities of large automotive companies from Japan, U.S., Germany and South Korea, China has shifted focus to produce other vehicles such as bus and tractors in addition to focus on electric vehicles (EV). Similar shift is also seen in Turkey for bus and tractor manufacturing and the country is still in the midst of encouraging EV manufacturing. The signal from China moving

Table 4: Global Automotive Production 2017

World	EU	Country	Production	Growth, %
1		China	29,015,434	3
2		U.S.	11,189,985	-8
3		Japan	9,693,746	5
4	1	Germany	5,645,581	-2
5		India	4,782,896	6
6		S. Korea	4,114,913	-3
7		Mexico	4,068,415	13
8	2	Spain	2,848,335	-1
9		Brazil	2,699,672	25
10	3	France	2,227,000	7
11		Canada	2,199,789	-7
12		Thailand	1;988,823	2
13	4	UK	1,749,385	-4
14	5	Turkey	1,695,731	14
15		Russia	1,551,293	19
16		Iran	1,515,396	18
17	6	Czech Republic	1,419,993	5
18		Indonesia	1,216,615	3
19	7	Italy	1,142,210	4
20	8	Slovakia	1,001,520	-4

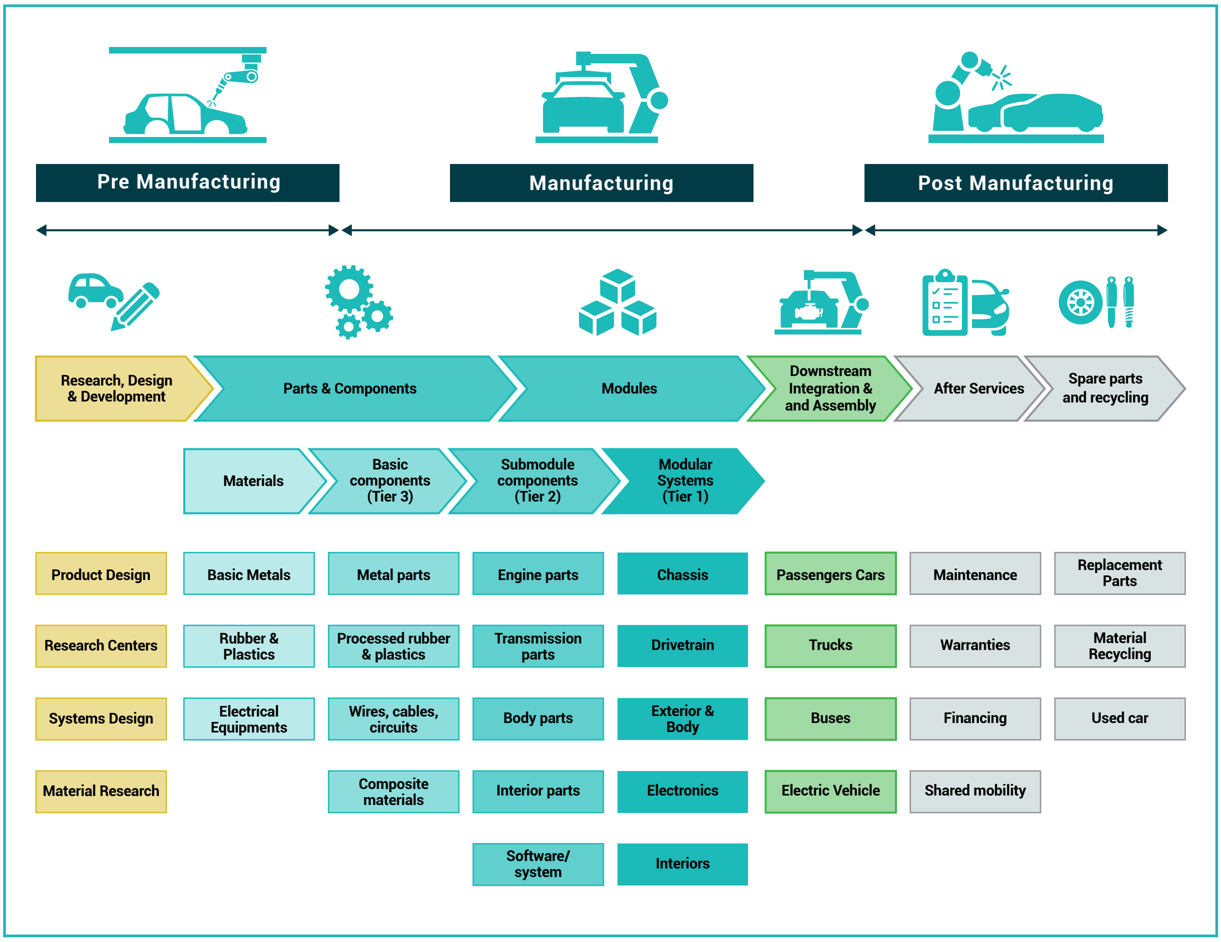
Source: Association for Automobile Manufacturers of Turkey to electric vehicle and infrastructure systems that support EVs is a strong indication that developing petrol and diesel engine vehicles is a race that China has abandoned and shifted its focus in developing EV capacities where the competition is still open.

The Global Automotive Value Chain

The global value chain of the automotive industry can be divided into six main stages that involves pre-manufacturing activities, manufacturing activities and post manufacturing activities. Although emphasis is usually given to the manufacturing activities up to the final product stage, the interlinkages between pre and post manufacturing activities which are usually captured as service sector data are often overlooked. The Figure 9 below, provides a detailed breakdown of the production stages in the automotive industry, including pre and post manufacturing activities.

Typically, the research, design and development stage which requires more technical capacity, technology and innovation is typically a high value-added activity. The automotive industry is usually driven in this stage by huge investments from the global carmakers to develop and design new products, improve current products or create a new product. The competition between the global automakers mainly drives the companies to innovate and spend more on research.

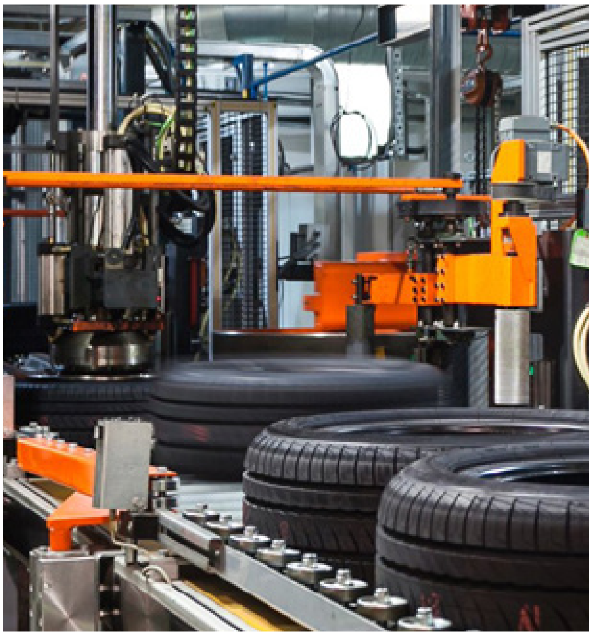
Figure 9: The Global Automotive Value Chain



Source: Authors

On a global scale, automotive industry has the highest expenditure on research and development. In the global rank of 2500 enterprises with the highest expenditure on R&D in 2018 (EU Industrial R&D Investment Scoreboard), the automotive industry was clearly in the lead with Volkswagen (€13.1 billions), Daimler (€8.7 billions) and Toyota (€7.9 billions) as shown in Table 5 below.

For the manufacturing activities, the automotive industry has a very unique value chain standardization. The value chain can be broken down to 4 main processes which are processing materials, basic components (tier 3), subsystem components (tier 2) and system modules (tier 1). Each stage of the value chain and tiered approach differentiates the types of suppliers and parts that are manufactured in the value chain. Tier 1 suppliers are the most complex and need the highest technical and quality requirements and adhere to global standards. The companies are usually larger and usually seen as the backbone of the automotive manufacturing as these companies need to coordinate between the OEMs and tier 2 suppliers. Most of the productivity gains in the automotive industry in the past 20 years has mainly been contributed by strong tier 1 suppliers with just in time manufacturing. Tier 2 suppliers on the other hand have moved to more precision parts manufacturing as the industry is moving towards lightweight and emission targets which controls the type of parts supplied by tier 2 manufacturers. The power relations between all tiers manufacturer and the efficiency of automotive industry in any country depends on to what level and extend all these three tiers of supplier are productive, efficient and adhere to high quality standards. Some trends at a global level have suggested that the move of many assembly lines to lower wage countries has resulted in the supply for lesser sophisticated tier supplies, thus limiting the type of vehicle to be manufactured in a particular country.



In post manufacturing activities, the automotive industry has seen a strong emphasis on shared mobility (ride sharing and ride hailing services). Many carmakers have entered this space, however, due to the weakening demand and cost pressures, investment in software related to shared mobility has been decreasing. The traditional post manufacturing activities such as extended warranties have also pressured the carmakers on cost while the used car industry has picked up quite significantly in the US, with companies like CarMax, grew its total revenues by 8% to US$17.1 billions in 2018 (CarMax 2018 Annual Report).

Table 5: Ranking of Automotive Companies in R&D Spending

Global ranking 2018	Company	Country	R&D in 2017/18 (€ billion)	R&D intensity (%)	Rank change 2004-2018
3	VOLKSWAGEN	Germany	13.1	5.7	up 5
10	DAIMLER	Germany	8.7	5.3	down 7
12	TOYOTA MOTOR	Japan	7.9	3.6	down 7
14	FORD MOTOR	US	6.7	5.1	down 13
17	BMW	Germany	6.1	6.2	up 11
18	GENERAL MOTORS	US	6.1	5.0	down 12
19	ROBERT BOSCH	Germany	5.9	7.6	up 9
22	HONDA MOTOR	Japan	5.4	4.8	up 9
31	FIAT CHRYSLER	Netherlands	4.3	3.9	up 13
37	NISSAN MOTOR	Japan	3.7	4.1	down 3
44	CONTINENTAL	Germany	3.2	7.3	**up 73**
48	RENAULT	France	3.0	5.0	down 3
50	PEUGEOT	France	2.9	4.5	down 12

Source: 2018 EU Industrial R&D Investment Scoreboard https://publications.jrc.ec.europa.eu/repository/bitstream/JRC113807/eu_rd_scoreboard_2018_online.pdf

2.2.4. Turkey in the Automotive Global Value Chain

Turkey is integrated into the Automotive GVC. The country is actively participating in the major value chais segments of the automotive industry, namely in final assembly, parts & components, and subassembly. As of 2018, the share of its own exports in total automotive world trade has been steady and is highest in final assembly (53%), followed by parts & components (44%), and subassembly (3%). Although, Turkey remains a small participant in the sub-assembly market, this VC segment has grown by 21% during the 2007-2018 period. Overall Turkey's automotive industry is dominated by the major world automakers in final assembly, by international top tier 1 suppliers of parts and components along with a large number of small companies which are also active in subassembly.

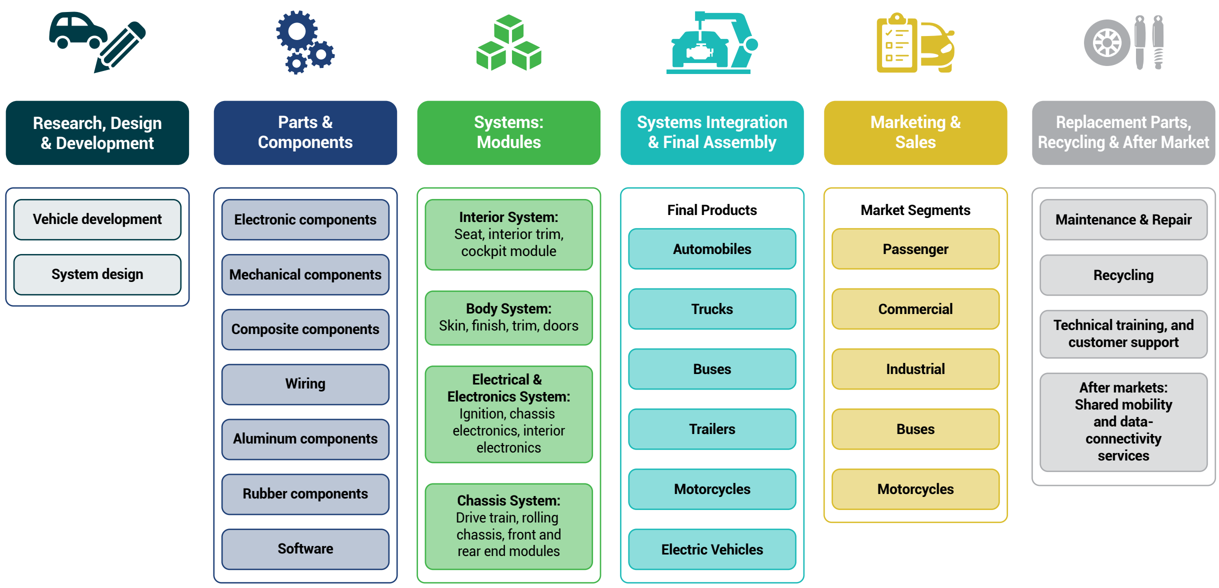
Table 6:Turkey Automotive Exports by Value Chain Segment, 2007-2018

Value Chain Stage and Sector	Value (US$ million)			Turkey Share of World Exports (%)		Share of Turkey's Auto Exports (%)	CAGR (%)
	2007	2012	2018	2007	2018	2018	2007-2018
Total	11841	12390	17752	1.0	1.2		3%
Components	**4937**	**6098**	**7832**	**0.4**	**0.5**	**44.1**	**4%**
Of the Body system	2092	2540	3448	0.2	0.2	19.4	4%
Of the Drive train	1575	1746	2045	0.1	0.1	11.5	2%
Electrical systems	565	814	975	0.0	0.1	5.5	5%
Of the Body system or Drive train	705	998	1364	0.1	0.1	7.7	6%
Subassemblies	**64**	**283**	**598**	**0.0**	**0.0**	**3.4**	**21%**
Body system	1	2	12	0.0	0.0	0.1	28%
Drive train	63	281	586	0.0	0.0	3.3	20%
Final Products (Passenger Vehicles)	**6840**	**6009**	**9322**	**0.6**	**0.6**	**52.5**	**3%**

Source: Authors using UN Comtrade data

Subsystem components which are usually tier-2 and tier-3 suppliers grew faster compared to global average. The subsystem components (subassemblies) grew 21%, at a faster pace than global average of only 1% from 2007 to 2018. This is mainly due to the increase in exports for body system and drive train. Components under this category shows a huge potential for further development as most tier-2 and tier-3 suppliers are locally owned companies that benefit from long term technical upgrading required by the tier-1 global or joint venture companies.

Figure 10: Turkey Automotive Participation in GVC, 2007-2018



Source: Authors using UN Comtrade data

Few international top automakers dominate the final assembly market in Turkey. The major players are Renault, Toyota, Hyundai, Isuzu, Mercedes, and Honda (although Honda is expected to leave Turkey in the near term). Most of the companies produce passenger cars, some light and heavy trucks. Meanwhile, few local companies share the truck, bus, pick up markets with the major companies. In January-June 2019, Renault and Toyota produced 35.7 % and 26.5 % of all passenger cars, respectively. Isuzu produced 93.1 % of light trucks. Mercedes Benz Turkey produced 6,832 heavy trucks and Ford Otosan with a production of 2,004 trucks. Ford Otosan specialized in pick up production with a 72 % share in the market. Ford Otosan also dominates the minibus market with a production of 27,851 and a share 98.6 %. Mercedes Benz Turkey has 44.1% of the share in the bus market followed by MAN Turkey with a share of 32.6 %. Isuzu is the leading firm in the Minibus market with a 48.8 % production share. Finally, Türk Traktör produces 95.1 % tractor market with a production of 10,056 tractors in the first six months of 2019.

Ten of the top 20 Tier 1 suppliers in the world dominate the parts & component market in Turkey. Tier 1 companies such as Bosch, Denso, Magna, Faurecia, ZF, Yazaki, Delphi, Valeo, Toyota Boshoku, Cummins have established their presence in the country through foreign direct investment or joint ventures. In general, there are around 400 top suppliers in Turkey working directly with the OEMs. However, the parts & components supplier market is highly fragmented with few thousands active participating companies. These include tier 2 and tier 3 companies and are almost all local Turkish companies.

Turkish automotive industry has a highly developed supplier's network. This network covers diversified players from global top 20 suppliers to SMEs having capability to produce special, niche products for global market. At the beginning, domestic parts and component producers developed through their association with domestic OEMs. In the late 1990s, however, domestic parts and components producers started to directly integrate into GVCs, and in doing so, they became more productive as the export demand required quality upgrading. There is a high geographic concentration of top tier 1 companies, most of which are located in the northwestern part of Turkey in cities such as Bursa and Istanbul.

The top tier 1 companies in Turkey earned almost US$2 billions (2015)[4] supplying domestically and internationally a wide range of parts & components, most of which is exported. These include vehicle parts and accessories (n.e.c. in heading no. 8708) (870899); engines; parts for internal combustion piston engines (excluding spark-ignition) (840999); vehicles; parts and accessories, of bodies, other than safety seat belts (870829); vehicle parts; road wheels and parts and accessories (870870); rubber; new pneumatic tires, of a kind used on motor cars (including station wagons and racing cars) (401110); engines; parts, suitable for use solely or principally with spark-ignition internal combustion piston engines (for other than aircraft) (840991).

Turkey's participation in the subassembly GVC is relatively small but steadily rising with a large number of companies directly and indirectly active in production. The subassembly market comprises mainly of subassemblies of parts and components of a vehicle, "Body systems" consisting of tires, brakes, wheels, suspension, systems and parts (incl. shock absorbers). Other subassembly manufacturing includes drive train consisting of engines; Interior Body systems subassembly of a vehicle consisting of electronic instruments.

Table 7: Production of Automotive Manufacturers in Turkey, January-June 2019

Firms	Car	Light Truck	Heavy Truck	Pick Up	Bus	Minibus	Midibus	Tractor
Isuzu	-	326	-	413	183	-	525	-
Ford	13 347	-	2004	143 464	-	27 851	-	-
Hattat	-	-	-	-	-	-	-	514
Honda	11 249	-	-	-	-	-	-	-
Hyundai	83 750	-	-	-	-	-	-	-
Karsan	-	-	-	1375	225	389	55	-
Mercedes	-	-	6832	-	2082	-	-	-
MAN	-	-	-	-	1541	-	-	-
Otokar	-	-	-	96	477	-	325	-
Renault	175 669	-	-	-	-	-	-	-
Temsa	-	24	-	-	218	-	170	-
Tofaş	78 144	-	-	53787	-	-	-	-
Toyota	130 541	-	-	-	-	-	-	-
Türk Traktör	-	-	-	-	-	-	-	10 056
Total	**492 700**	**350**	**8836**	**199 135**	**4726**	**28 240**	**1075**	**10 570**

Source: Association for Automotive Manufacturers, http://osd.org.tr/sites/1/upload/files/Otomotiv_Sanayii_Uretim_Bulteni_2019.06-5435.pdf (Retrieved August 6, 2019).

4 See Table 8

The manufacturers in Turkey of the subassembly of drive train, consisting of "Gear boxes", "Drive-axles" and "Clutches". Body system (front & rear end modules), Body system (other), Body system (panels) are relatively less competitive subassemblies of vehicles in Turkey.

In general, Turkey's participation in other components of the automotive GVC is nonexistent or considerably small. Turkey has aspiration in participating in the vehicle design & development GVC component the major automotive companies are the main actors in this stage. Big companies such as General Motors, Ford, Volkswagen, Daimler-Benz, and Toyota have their design & development centers in their home countries (US, Europe, Japan, South Korea) where the competitive advantage has been development over many decades through industrial clusters.

The synergy between the capabilities of parts export and the increasing imports of diesel engines should result in production of local diesel engines. The automotive industry in Turkey is capable of exporting some relatively more complex and sophisticated parts and components such as pistons for engines. However, the highest import bill is paid for "Engines; compression-ignition internal combustion piston engines (diesel or semi-diesel engines) (840820). The 15.8 % of all parts and components belong to this item. However, there is no domestic engine production in Turkey despite the capabilities in key components such as pistons.

Table 8:Automotive Top Tier 1 in ISO (Istanbul Chamber of Industry) 500 List

Company	Products	ISO 500 2015	ISO 500 2014	Net Sales Revenues (TRY million)
Bosch San.	Brake systems, sparkplugs, filters, windshield wipers, batteries, headlights and taillights, belts, horns and alarms, socket connections, relays and magnets, sensors, electric motors, starter motors, alternators, start / stop systems	22	22	2,938
Delphi Automotive Systems	Cables, electrical/electronical systems and parts, fuel pumps, injectors, valves	114	83	838
Autoliv Cankor Otomotiv	Steering wheels, seatbelts, airbags	134	138	740
CMS Jant ve Makine	Wheels	142	158	709
Yazaki Otomotiv	Electrical and electronical parts	424	-	277
Hema Endüstri	Power delivery and engine parts	144	168	679
Beyçelik Gestamp Kalıp	Sheet metal	141	156	719
Maxion İnci Jant Sanayi A.Ş.	Wheels	139	183	722
Coşkunöz Metal Form Makine	Suspension and chassis parts, fuel tanks, chassis and real axles, external parts	182	163	565
Diniz Johnson Controls	Seat systems, internal systems, metal frames			
Aunde Teknik Tekstil	Fabrics and seat covers	178	239	585
Gates Powertrain Plastik	Belt tensioners	277	282	405
B-Plas Bursa Plastik	Plastic bumpers, fuel tanks, gloveboxes, door panels, interior and exterior coated parts	387	456	302
Teknorot Otomotiv Ürünleri	Rot shafts	414	424	281
Maxion Jantaş Jant San. ve Tic. A.Ş.	Wheels	427	366	275
Bpo B-Plas Plastic	Plastic bumpers, mirror and engine covers	489		232
CMS Jant	Wheels	142	158	709
Ege Endüstri	Differential shells, axles and axle parts	318	396	364
Ermetal Otomotiv	Sheet metal shaping and installation	443	482	263
Total	**19 Companies**			**11,239**

Source: Istanbul Chamber of Industry (İSO)

Deep Dive for Passenger Vehicles Value Chain

The passenger car manufacturing is dominated by four big international automakers, however, the types of car assembled locally in Turkey is limited to segment A to C (smaller engine compact cars). Turkey is established as an assembly hub in terms of the volume when it comes to passenger vehicle. However, when broken down into the OEMs, there are only four top companies that dominate the production, with Oyak Renault, 375,000 units, Tofas, 290,000 units, Toyota, 280,000 units and Hyundai Assan, 245,000 units (as shown in Figure 11).

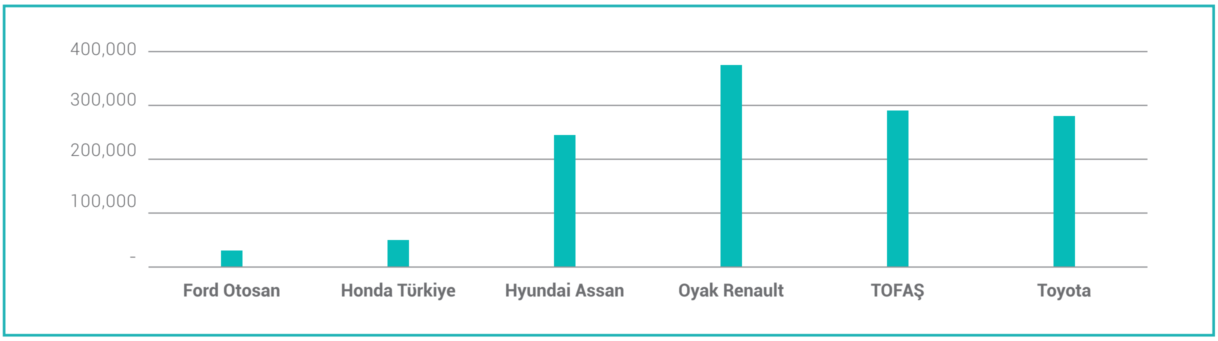
Besides the domination by top 4 OEMs, the local assembly is focused at smaller engine models that are in segment A, B or C. Oyak Renault for example produces only Renault Clio IV (Super Mini B segment) and Renault Megane Sedan (Family C segment) while Tofas produces Fiat Egea (Compact C segment), Hyundai with Hyundai i20 (super mini-B segment) and Hyundai i10 (city A segment). Toyota is the only manufacturer that introduced hybrid vehicle in Turkey with two models, Toyota C-HR and Toyota Corolla which are also C segment models.

The exports of cars are concentrated to four main countries, with a widening gap between the four countries and other export markets which indicates lack of model diversification that may impede the competitiveness of the overall industry. Turkey's car exports grew tremendously since 2007 to 2015 with four countries dominating the top four export destinations as shown in Figure 12 below. However, after 2015, the trend shows a widening gap between the top four countries (Germany, Italy, France and United Kingdom).

One of the key factors behind this widening gap could be the lack of product differentiation in Turkey. Turkey exports similar category of vehicle (segment A-C) while other categories are imported. It also means that global firms view Turkey as a market destination and assembling smaller vehicles which are popular in the domestic market as an option for exports as well.

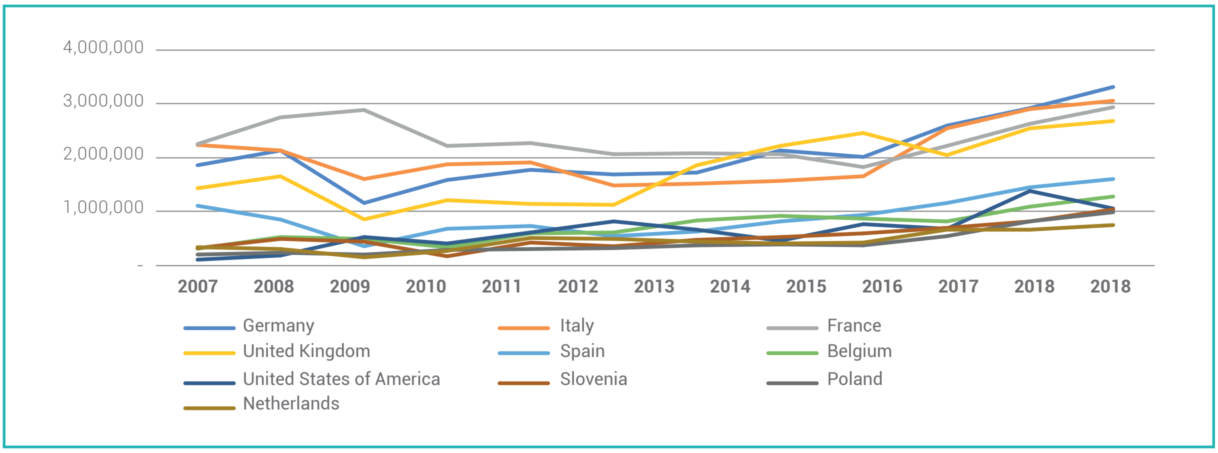
When a comparison was made between Turkey's focus on smaller segment cars with other competing countries with comparative ranking in global automotive exports in 2018 (as shown in Figure 11 below), Turkey stands out as the only country that focuses on segment A-C production. Thailand in the 14th rank of global exporter is a hub for nearly all models of BMW, Mercedes, Toyota Camry and Honda Accord, while European countries such as Slovakia exports Jaguar Land Rover, Volkswagen Touareg, Audi Q7 and Porsche Cayenne while Hungary has moved from smaller cars like Suzuki Vitara (Segment C) to luxurious brands such as Audi TT, Mercedes CLA and Mercedes B Class.

Figure 11: Breakdown of Production by Company, 2018



Source: Authors using Association for Automotive Manufacturers 2019 data

Figure 12: Turkey Exports of HS87: Vehciles (US$ thousand)



Source: Authors using UN Comtrade data

Figure 13: Competing Countries and Production of Model Types n 2018

Ranking	Exporters	Exported value in 2018 (US$ thousand)
11	Belgium	51,753,080
12	Italy	44,897,197
13	Czech Republic	40,912,915
14	Thailand	30,446,948
15	Poland	29,982,813
16	Slovakia	27,845,406
17	Turkey	26,758,524
18	Netherlands	26,283,547
19	Sweden	23,618,283
20	Hungary	20,491,114

Toyota Camry, Honda Accord,
BMW (nearly all models)
Mercedes (all segments)

Jaguar Land Rover
Volkswagen Touareg
Audi Q7
Porsche Cayenne

Audi TT
Suzuki Vitara
Mercedes CLA
Mercedes B Class

Source: Authors

None of these competing countries are the main consumer of the models exported on a global scale suggesting that the models are produced in the countries due to their competitiveness. It may also reflect that Turkey is losing its competitiveness at the global level due to over concentration on smaller car segments for the domestic market. The difference of producing smaller vehicle against medium or large sized vehicles is the technology adoption in the automotive industry usually begins from premium vehicles. Concentration on small sized vehicles may have disrupted the upgrading trajectory of the tier-2 and tier-3 suppliers.

Electric Vehicle (EV) Value Chain

Although Turkey is set to produce home-grown EV, the key component to make it or break it, battery, requires a comprehensive understanding of the Global Electric Battery Value Chain. Turkey has set an ambitious target to domestically produce electric car by unveiling two prototypes developed by a consortium named Turkey's Automobile Joint Venture Group Inc (TOGG) comprising top companies in Turkey such as Anadolu Group, BMC, Kök Group, Turkcell, Zorlu Holding and the Union of Chambers and Commodity Exchanges of Turkey (TOBB). The production is set to start in 2022 with an investment of about US$3.7 billions. It is expected to produce five models with a total output of 175,000 vehicles a year.

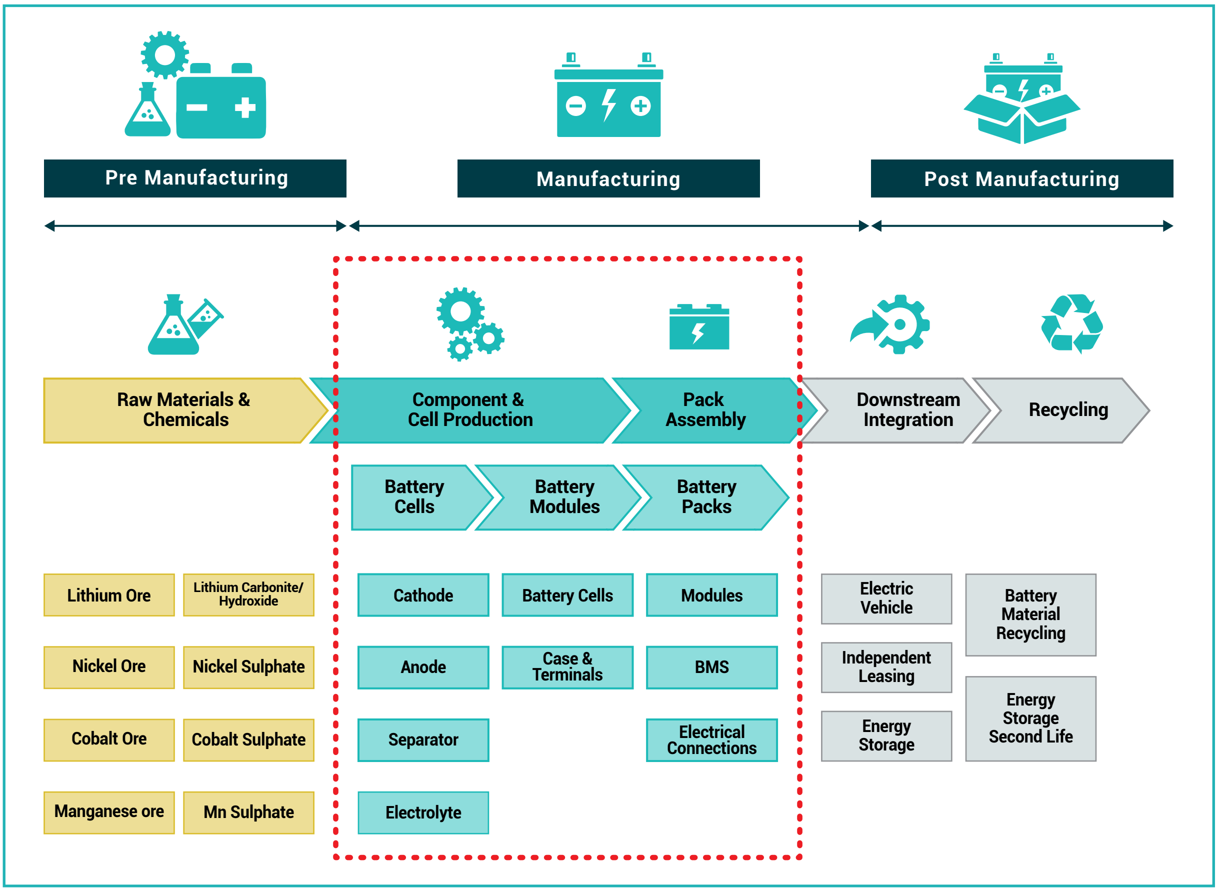
The main consideration for EV adoption as experienced by many EV manufacturers is electric battery which requires breakthrough strategies as many EV models are still not profitable despite the decrease in battery price. Batteries are the key differentiator among EV manufacturers and since the amount of energy stored in battery determines the range of EV and plays a vital role in consumer adoption of EV. Although battery prices have remarkably declined by cost per kWh from US$1,000 per kWh in 2010 to US$227 per kWh in 2016[5], the profitability of EV manufacturers has not improved significantly as the introduction of EV in many countries are driven by subsidies. The bulk of battery price decline can be attributed to the policies introduced by China, however, with the cut in subsidies from China in 2018 for EVs, the sales of EVs declined and the local EV manufacturers that were dependent on the subsidies and incentives from the government are facing risks.

At this juncture, Turkey's participation in the EV manufacturing should be carefully considered from the perspective of accessing the battery value chain. EV batteries have a complex global value chain in which production is separated into stages and those stages can be completed in different locations. Figure 14 below shows the mapping of a global EV batteries value chain. In the stage of pre manufacturing, the EV batteries have not arrived to a conclusive battery technology across the industry, however, the main materials that are required for the cell production of a battery are lithium ore, nickel ore, cobalt ore, manganese ore, and some salt forms of the ores. The combination of these materials makes up the cathode, anode and electrolyte of the EV batteries.

In the manufacturing stage, EV batteries components and cell production can be divided into two products which is battery cells and the combination of a few battery cells makes up a battery module with case and terminals. The battery modules are then packed together according to the requirements of the EV and energy that is required for certain EVs. The battery pack is the final product that is integrated into an EV. Post manufacturing, the integration process in the EV also requires some services and software. There are also new business models such as EV battery independent leasing and some of the used batteries are also used for energy storage. Unlike the use of petroleum products in internal combustion engine that depletes the resources, EV batteries value chain needs a strong recycling strategy as most of the materials used for the batteries needs to be recycled to ensure the sustainability of the value chain.

5 McKinsey & Company, Electrifying Insights, January 2017, 10

Figure 14: Electric Vehicle Battery Value Chain



Source: Authors

The complex and emerging new technology from EV batteries has shifted the cost from the battery pack and modules which used to be the most expensive part in 2015 to the raw materials in 2018. The value add of an EV battery today mostly comes from the cost of active materials. The lack of scale in production of EV batteries would hamper the negotiations in price of raw materials, whereby most global mining companies are now setting up long term contracts with battery manufacturers as a way to ensure availability of material and get the best price. The power relations between global mining companies and battery manufacturers have started to shift prices towards volume and scale, where battery manufacturers with higher demand will be able to influence the long-term price of materials.

Recommended Approach for Turkey

Turkey's ambition in EV battery manufacturing should be realistic and ensure the scale and profitability of batteries that will drive the locally manufactured EV. Given the steep competition and investments by China, United States and the EU, an aggressive, yet implementable solution would be to encourage the sizeable domestic market in Turkey to absorb the EV batteries manufactured in Turkey. Depending only on TOGG's expected 175,000 annual production may not be enough to compete with other global players. The European lithium-ion battery capacity ramp-up until 2025 includes competing countries such as Hungary with a planned 16GWh plant with Samsung SDI and 20GWh plant with SK Innovation which totals up to 36GWh capacity. LG Chem will also be building a 45GWh capacity plant in Poland.

Only focusing on Poland and Hungary, it is expected that there will be 81GWh capacity of batteries which is estimated to serve around 1,620,000 passenger vehicles annually (assuming Tesla Model 3 capacity of 50kWh). Since both Poland and Hungary have a planned OEMs manufacturing EVs in the country, the global production of EVs from these countries is bound to increase while both of them have the price advantage for raw materials which forms around 50% of the cost for batteries.

Turkey needs a comparable sized factory to compete with global EV players on the cost and access to materials such as cobalt is crucial. The estimated investment for 5 GWh factory would require investment of around US$1 billion[6]. A comparable size of 30-40 GWh may require around US$6-8 billions initial investment while a 30-40 GWh will serve around 600,000 to 800,000 units of EVs (based on Tesla Model 3). The annual production target of the local EV in Turkey will only cover around 20-30% of the overall capacity.

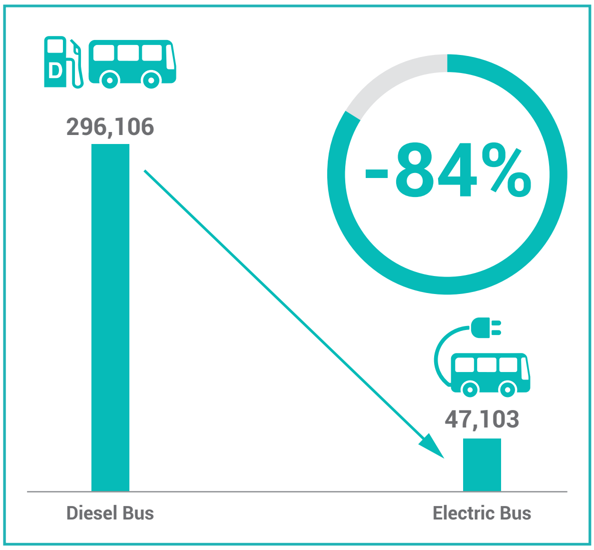
6 Author's calculation based on BaTPac Version 3.1 by Argonne National Laboratory

Given Turkey's sizeable market and capabilities in bus manufacturing, adoption of electric buses to replace diesel buses may offer a good option to absorb the demand for EV batteries and at the same time provide savings to the economy from importing fuel. Considering the number of buses currently operating in Turkey which is estimated at 215,486[7], the opportunity to replace these buses with electric buses offers a huge advantage.

By modelling[8] an electric bus and diesel bus with its annual fuel cost, replacing a diesel bus to electric bus results in close to TRY 250,000 savings as shown in Figure 15 below. An expanded modelling which calculates the purchase cost of both buses, annual fuel cost, maintenance and all other lifetime costs of both electric and diesel bus, for each bus, with a lifetime of 10 years results in a total lifetime cost of TRY 8,083,783 while only TRY 4,796,013 for electric bus. This is with the assumption of the current battery price and average diesel price which is the low base case scenario. Even with this scenario, the savings in total lifetime cost of replacing electric bus with diesel bus would result in around TRY 3,287,770.

The calculations are then made for total expected savings for annual fuel cost and a 10 year lifetime electric bus replacement of all diesel buses in the city of Istanbul and entire Turkey. Figure 17 shows that the replacement of diesel bus to electric bus for the city of Istanbul only will amount to an annual savings of TRY 10.39 billions and for entire country, would total up to savings of TRY 53.66 billions. These amounts not only show the opportunity of breaking away from diesel fuel dependency, but also create the necessary demand for EV battery manufacturing plant that can absorb the local demand for the increase in usage of EV batteries. At the same time, the savings can also be channeled to upgrade the grid and invest in various renewable power plants planned across the country.

Figure 15: Annual Fuel Operational Cost Savings



Source: Authors

Figure 16: Calculation Base for Diesel vs Electric Annual Fuel Operational Cost

Diesel		Price
Diesel Consumption Per Day		
0.5 litre/km x 250 km/day		125 litres
Diesel Cost Per Day		
125 km/day x TRY 6.49 liter		811.3
Annual (365 Days)	**TRY**	**296,106.25**
Battery		**Price**
Battery Efficiency Per Day		
0.89 kwh/km x 25 0km/day		222.5 kwh
Electricity Cost Per Day		
222.5 kwh/day x 58 kr/kwh		129.1
Annual (365 Days)	**TRY**	**47,103.25**

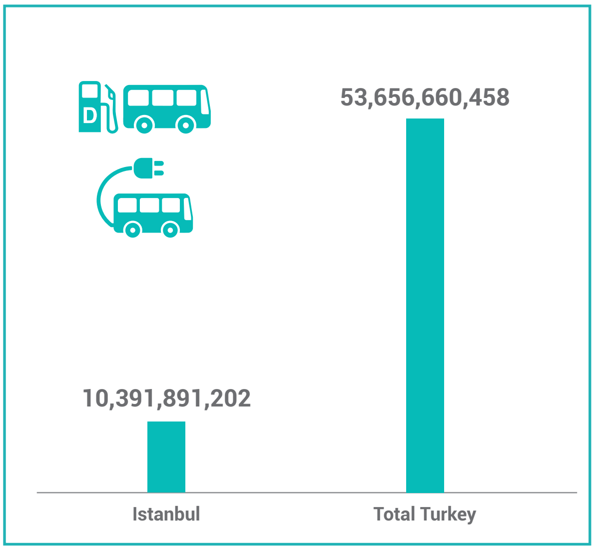
Source: Authors

Table 9: Lifetime Cost Breakdown for Diesel Bus vs Electric Bus

Cost Type	Diesel bus	Electric bus
Capital cost		
purchase Charger	550,000	2,000,00
Smart Charger		6,500
Operational cost		
Yearly Fuel/Charging Cost	2,961,063	471,033
Maintenance / Service Cost		
Preventive Maintenance	365,00	216,080
Running Maintenance	1,789,960	899,360
Servicing	131,400	43,800
Total Maintenance / Service	2,286,360	1,159,240
Total Lifetime Cost 10 years	**8,083,783**	**4,796,013**

Source: Authors

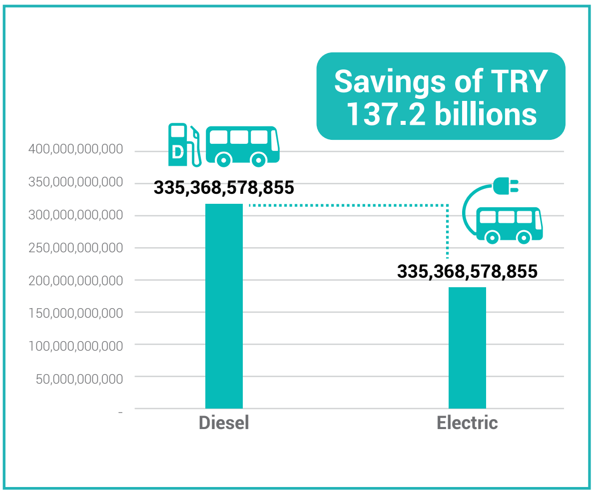
Figure 17:Total Annual Fuel Cost Savings Replacing Diesel Bus with Electric Bus in TRY for Istanbul and Turkey



Source: Authors

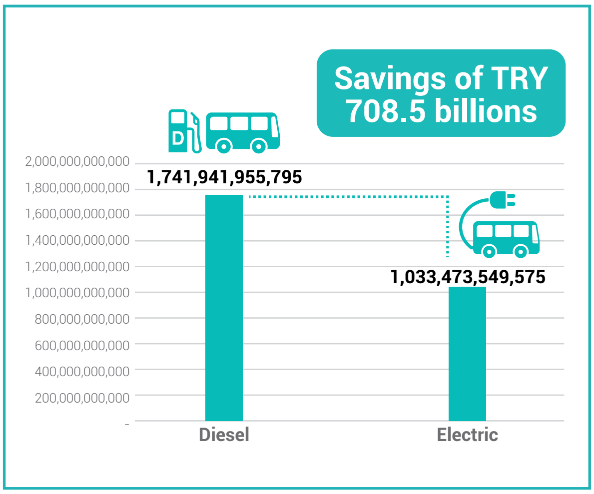
7 TurkStat, Road Motor Vehicles, July 2019
8 Author's own model based on referenced data points

Figure 18: Lifetime Cost Comparison for Istanbul in TRY



Source: Authors

Figure 19: Lifetime Cost Comparison (10 years) for whole Turkey in TRY



Source: Authors

The final part of the model calculated the lifetime cost comparison to purchase and run diesel buses against electric buses. The consideration in these calculations took the price of current average diesel and electric buses, all the lifetime operational, maintenance and service cost for 10 years. In 10 years, lifetime cost of electric bus against diesel bus would result in savings of TRY 137.2 billions as shown in Figure 18 above. If all buses in Turkey are then converted to electric buses, the economy is expected to save around TRY 708.5 billions. These scenarios and assumptions point out that the expansion of battery usage domestically can be enhanced not only to create the scale, but also provide huge savings to the economy.

From a global perspective, it is important for the country to ensure a strong hold of battery supply to ensure export competitiveness and higher value add. Battery currently is the key component that has the majority value add in EV and the failure to have a vibrant domestic battery manufacturing industry would trap the automotive industry to be stuck with lower value-added manufacturing. The proximity of Turkey to European markets would also provide a cost advantage to export electric buses, moreover, with the emerging policy trends to incentivize EVs across many countries.

2.2.5. Opportunities and Challenges

The automotive industry in Turkey is stuck in a trilemma, where the country is promoting advancement by tapping into new opportunities based on emerging technology such as EVs, increasing productivity especially in the small passenger vehicle segment given the double-digit production growth and shifting focus from passenger vehicles to other vehicle segments such as buses and LCVs. The trilemma is described in Figure 20 below.

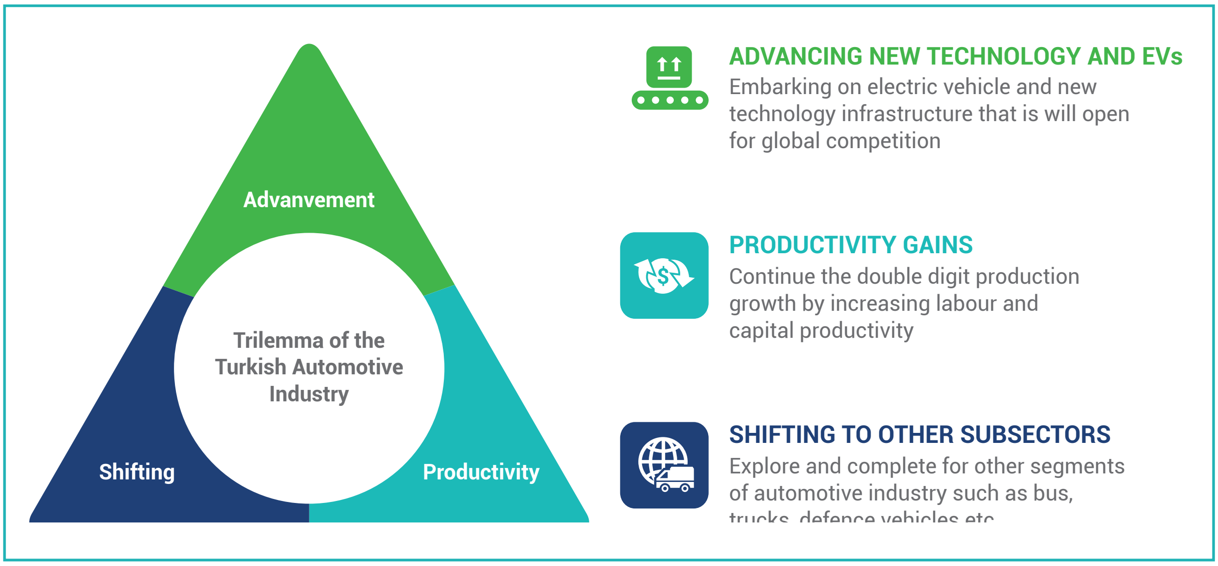
The question however is, how can the Turkish automotive industry leap forward and have a higher share of value add to the economy from the global market. It requires the policymakers to make a bold step that incorporates the trilemma faced by the industry and rethinking the policy options to achieve increased value add and exports while at the same time create quality jobs.

As for the advancement, the newer concepts of technological transformation that is centered around CASE (connectivity, autonomous or assisted driving, new mobility or car sharing, electrified powertrains and components) capabilities has gained global attention. Although some parts of CASE, focusing on EV was discussed in this paper, the overall emerging and disruptive technology offers Turkey an opportunity to be part of this global trend. However, this must be balanced with the current capabilities and comparative advantage of Turkey in the automotive industry. Advancing in these trending technologies would require investment and spending on R&D and besides prototypes and startup stage of the technology, implementation needs huge initial capital cost. The huge initial capital cost also needs to be complemented and coordinated across the country with practical government incentives which may require subsidies or interventions from multiple ministries and stakeholders. Another possible challenge is also the fact that many countries with strong global automotive brands have already invested and lead the development of CASE.

Another challenge with increasing value add is also centered around the focus on productivity. The automotive industry has shown tremendous double-digit growth in the past 10 years owing to productivity gains and renewed investments in passenger vehicle manufacturing. Both, capital and labour productivity gains from the current passenger vehicle manufacturing has increased value added, however when comparison is made across different industries in Turkey, the automotive industry still lags in terms of value added. The challenge of having the big four – (four brands and four export markets) shows that the over concentration on popular domestic brand and segment of vehicle as the main export product, limits the learning advantage from foreign OEMs. This limitation is quite alarming as it is also affecting the overall value add of the automotive industry. Tier-2 and Tier-3 suppliers in Turkey are supplying to smaller sized vehicles where new technology by any brand is usually introduced in medium to larger sized vehicles. The premise of offshoring older technology to Turkey also seems to take place to certain extent. As shown in this paper, competing countries like Hungary, Poland and Thailand are manufacturing latest models of medium to large segment vehicles including some luxurious brands. Renault, for example, moved the complete global production of its Clio model to Bursa and turned the plant in France to build EV model, Renault ZoE. The production of the type of vehicle plays an important role in the trickle-down effect to the tier-1, tier-2 and tier-3 suppliers and increasing the value add should be complemented by some changes in the type of vehicles produced in Turkey.

Shifting the automotive industry into other subsectors such as bus or heavy vehicle manufacturing and defense vehicles has started to take pace in Turkey. Besides the LCVs where Turkey has a huge comparative advantage in Europe, most of the other manufacturers such as bus, tractors and defense vehicles are domestic companies. As domestic companies, there are huge potential to increase the value added but most of these companies are struggling with small margins and do

Figure 20: Trilemma of the Turkish Automotive Industry



Source: Author

not have strong investments in R&D, thus creating products that might not increase the value add. Some of the more successful companies have penetrated the EU market which has helped gain more profits. Besides the EU market, they lack export diversification making these products dependent on the EU market. The overall value addition in this segment is also challenged with the fact that all engines used in the buses and tractors are mainly imported.

2.2.6. Selected Recommendations

Recommendation 1

Given the lack of control on global OEMs that focus on smaller sized vehicle in Turkey, advancing into the Electric Vehicle industry with a national brand is likely to be more successful, however as discussed in this paper, it requires full strategy on EV battery manufacturing. It also requires Turkey to fully understand on the global EV value chain, to ensure obtaining higher value added that shifts the entire economy. Turkey can explore its privileged relationship with some IsDB member countries to export and collaborate in EV manufacturing.

Recommendation 2

Manufacturing EV batteries needs a comparable sized factory to compete with global EV players on the cost and access to materials such as cobalt which is crucial. Given Turkey's sizeable market and capabilities in bus manufacturing, adoption of electric buses to replace diesel buses may offer a good option to absorb the demand for EV batteries and at the same time provide savings to the economy from importing fuel. On the access to material, Turkey could collaborate with some of IsDB member countries, where the raw materials for battery is sourced from.

Recommendation 3

Increasing productivity with higher value-added activities by specializing in certain niche areas such as carbon fiber parts. As the automotive industry is bound for huge customization and the concept of sharing platforms, the use of composites (from carbon fiber) for car parts can be developed to target the production of luxury models in Turkey or as a hub of carbon fiber production. Dow Chemical & Dowaska have the largest plant for carbon fiber testing in Europe. Turkey could develop R&D centers for companies to do testing and incentivize innovation in carbon fibre parts.

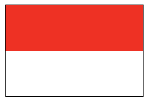
Recommendation 4

The automotive industry can leverage strengths of the textile industry to improve key automotive products. For instance, Turkey accounts for 6% of the global market share of car seats (metal seat and textile fabric); therefore, with R&D centers in Bursa, the automotive industry can play a key role in the production of smart fabrics for luxury cars. Turkey can seize this opportunity to specialize in these types of products, especially when the EU is shifting away from processed leather in favor of smart fabrics.

Recommendation 5

Capturing the diesel car market from EU. Due to EU's policy shift away from diesel, Turkey can leverage its industrial and geographical position to become the production hub of diesel vehicle by first manufacturing diesel engines locally. This strategy should, however, be only for medium term due to the global market shifts from diesel. Turkey can also diversify car exports to other emerging markets of diesel-based models where demand for diesel is likely to remain steady for a medium term, which would increase the value-added of the industry.

2.3 INDONESIA IN THE AUTOMOTIVE GLOBAL VALUE CHAIN



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Summary

The automotive industry is of strategic importance to numerous countries, with many developing and emerging country players competing for growth markets and the generation of new business and employment opportunities. The industry is one of the biggest industrial sectors in the world. Moreover, global auto production has seen 8 years of continuous growth, peaking at 97.4 million units produced in 2017. Several trends can be observed in the industry, including: a shift towards global integration with a complex economic geography, growing importance of globally engaged suppliers, increasing role of developing countries with large domestic markets, lead firms' strength and influence over suppliers, electrification, and digitization.

The automotive Global Value Chain (GVC) stretches from various levels of suppliers through to final car producers (OEMs). A finished vehicle will consist of thousands of parts and components that are produced by hundreds of suppliers. Those suppliers are dispersed from Tier 1 to Tier 3 suppliers. It is essentially an assembly industry with a complex and multi-layered organization of assemblers and suppliers that produce a variety of parts and components, ranging from simple labor-intensive parts, such as seat covers, to capital-intensive systems, such as electronic systems.

The governance of the automotive GVC is producer driven given that the top 10 (with Volkswagen and Toyota the largest two) have the ability to leverage their market power and technology leadership to dictate the criteria such as 'Just-in-Time' (JIT) delivery and adopting lean production systems for being awarded a contract as a supplier. This market concentration allows lead firms to dictate certain aspects of the industry such as supplier co-location requisite. As in the case of OEMs, the automotive supplier industry is dominated by developed countries. Bosch leads the suppliers ranking not only in terms of revenue generated, but also on expenses incurred on Research and Development (R&D) costs.

By 2018, Indonesia became the second-largest car manufacturing nation in Southeast Asia and the ASEAN region, second only to Thailand. Still, Indonesia's lower per capita car ownership level, rapidly expanding middle class, and market size (biggest in ASEAN) primes itself to reduce its gap with Thailand in the years to come. This will present an opportunity for car manufacturers to open additional manufacturing plants or expand production capacity.

The total Indonesian production of automobiles increased at a Compound Annual Growth Rate (CAGR) of 6.1% from 2011 to 2018, with Passenger vehicles accounting for a higher share of total vehicles produced, rising from about 67% in 2011, to 78% in 2018. Like production, the Indonesian export of passenger vehicles also increased, from US$1.2 billions in 2008 to reach around US$3.3 billions in 2018 with a higher CAGR of 10.3%.

Indonesia has significant participation for mechanical, wiring, and rubber components and in automobiles and motorcycles as a final product. Motor vehicles (Hs 8703) represents 1.8% of total Indonesian exports, and is thus selected for further analysis. Meanwhile, Indonesian imports of final passenger vehicles decreased from US$2.73 billions in 2012 to US$1.07 billions in 2018. This decline is a result of highly competitive local production. Indonesia's auto parts and components industry also plays an important role in driving the Indonesian economy, especially in terms of trade flows. Exports of automotive components increased 13 times from 6.2 million components in 2016 to 81 million components in 2017.

Derived from the thorough analysis of the Indonesian Automotive Sector and its participation in the Global Value Chain, the report identifies number of challenges that face the development of the Indonesian Automotive sector and suggest a set of recommendations to overcome these challenges. The set of challenges are identified under three main levels; macro, manufacturing and technological. The macro level address high level challenges including attracting FDI and logistics. The manufacturing and technological levels focus more on improving the quality and quantity of the production. This includes; aligning with international standards, suppliers' base capabilities, educational gap and innovation.

2.3.1. The Global Automotive Industry

The Global Automotive Industry

The automotive industry is of strategic importance to numerous countries, with many developing and emerging country players competing for growth markets and the generation of new business and employment opportunities. Its complex product development and manufacturing process makes it one of the most knowledge-intensive industries.[1]

The industry is one of the biggest industrial sectors in the world. If one includes the economic activities up and downstream of actual manufacturing, the sector's global value-added stands at around 5–10 percent. Worldwide there are around 500 million registered passenger cars and this number is expected to triple by 2030 (Bartel et al. 2015: 6)[2]. Moreover, the global auto production has seen 8 years of continuous growth, peaking at 97.4 million units produced in 2017, and slightly declining to 96 million in 2018.

Another emerging trend for the automotive industry in recent decades has been the shift towards global integration, where more value creation exists outside of automakers' home countries before the finished vehicles are sold. The industry was second only to electronics in having the highest share of non-domestic value added in total exports—around 35%, compared with electronics' 45% (UNCTAD 2013, 129). In light of this shift, the automotive industry possesses key features which are outlined in the following:

1. Noting recent technical standards, a modern personal vehicle consists of a few thousand parts supplied by parts suppliers and then assembled through the production chain.
2. The Automotive Sector in Emerging Economies: Industrial Policies, Market Dynamics and Trade Unions, Rudolf Traub-Merz (ed.)

A. Production in the automotive industry has a complex economic geography

There exists a regional production trend in the automotive industry which can be largely attributed to economic, technical, political, and cultural factors (Sturgeon et.al.,2009). Because many automotive parts tend to be bulky, heavy, and fragile, (which would amount to higher transportation costs) production of automotive parts/components tend to be in close proximity to the final assembly plants, which concentrate on national or regional markets (Sturgeon et.al., 2016). Within regions, there is a shift toward locations with lower operating costs (Mexico for North America, Spain for Europe, China for Asia) while nationally, production is commonly grouped in one or a few industrial regions resulting in 'nested' value chains at the local, national and regional levels (Sturgeon & Biesebroeck, 2011). Given the high capital investments needed in equipment and skills, these automotive clusters tend to be long term in nature once established (Sturgeon et al., 2016).

B. Growing importance of globally engaged suppliers

The automotive industry is normally seen as producer-driven, in which major international vehicle assemblers exercise control (governance) over other stages of production, including the location of the industry as well as procurement and retail distribution. One of the major changes in recent years has been the growth and increasing global reach of first-tier automotive suppliers (often known as mega-suppliers). The emergence of mega-suppliers enabled automotive assemblers to move towards a modular system, which requires that mega-suppliers deliver complete modules rather than individual components. In this context, some higher-value-added activities are transferred from assemblers to mega-suppliers (Doran 2004; Takeishi and Fujimoto 2001).

C. Increasing role of developing countries with large domestic markets

According to Sturgeon, et.al., (2009) "a combination of real and potential market growth with a huge surplus of low-cost, adequately skilled labour in the largest countries in the developing world, such as China, India, and Brazil, has attracted waves of investment, both to supply burgeoning local markets and for export back to developed economies" (p.9). This shift of automotive production is reinforced by the internationalization of automakers from developing countries (e.g. Geely's takeover of Volvo), and political pressure for local production (Sturgeon & Biesebroeck, 2011). The acquisition strategy of struggling automakers by Chinese companies exemplifies the rising significance of developing countries in the industry which also enables them to acquire advanced engineering and design expertise. By doing so, China will increase its production capacity which in turn, will be followed by the emergence of important supplier firms (Sturgeon & Biesebroeck, 2011).

D. Lead firms' strength and influence over suppliers

There are fifteen major motor vehicle groups in the world accounting for about 82% of the world motor vehicle assembly. These groups are head-quartered in Japan, Germany, the U.S., South Korea, France, Italy, China and Canada.[3] This market concentration allows lead firms to dictate certain aspects of the industry such as supplier co-location requisite. Consequently, 'supplier parks' emerged with the aim of minimizing the total cost for each component. Suppliers' strength relative to lead firms have further weakened according to Sturgeon, et.al., (2009), from the constant political attention paid to automakers, and due to the lack of standards permitting lead firms to establish their own specifications, further limiting opportunities for smaller firms to improve their prospects.

E. Climate control

There is also a growing demand by consumers and policy-makers alike, induced by global initiatives such as the Paris Agreement, for the production of more environment friendly and sustainable vehicles, especially with respect to stricter emissions controls. This trend will intensify the relationship between automakers and technology companies where there are already approximately 665,000 electric vehicles in use around the world (Sturgeon et al., 2016). It is estimated that every third new car sold will be propelled or assisted by an electric battery by 2025 (Wagner, 2020). Adding to this growing demand is China's ambitious target for 60% of all vehicles sold to be run on electric motors by 2035 (Bloomberg, 2019).

F. Digitization

Digitization and new business models have revolutionized many industries. For the automotive industry, these forces are giving rise to four disruptive technology-driven trends: diverse mobility, autonomous driving, electrification, and connectivity (McKinsey, 2016). A few developments illustrate some of these advances[4] such as autonomous driving, shared mobility, connectivity, and electrification.

The industry is one of the biggest industrial sectors in the world. If one includes the economic activities up and downstream of actual manufacturing, the sector's global value-added stands at around 5–10 percent. Worldwide there are around 500 million registered passenger cars and this number is expected to triple by 2030.

3. Advances in Economics and Business 7(5): 171-184, 2019
4. Automotive revolution –perspective towards 2030, McKinsey, Jan 2016

Mapping the Automotive Global Value Chain

Figure 1.1 above shows the visual representation of the automotive value chain. The principal value chain in the automotive industry starts from vehicle Research, Design and Development (i.e. Pre-Manufacturing). This process is mainly performed by the automakers, albeit a growing trend where large suppliers collaborate closely with lead firms whereby the conceptual design is centralized in or near the design cluster located around the headquarters of the lead firms.

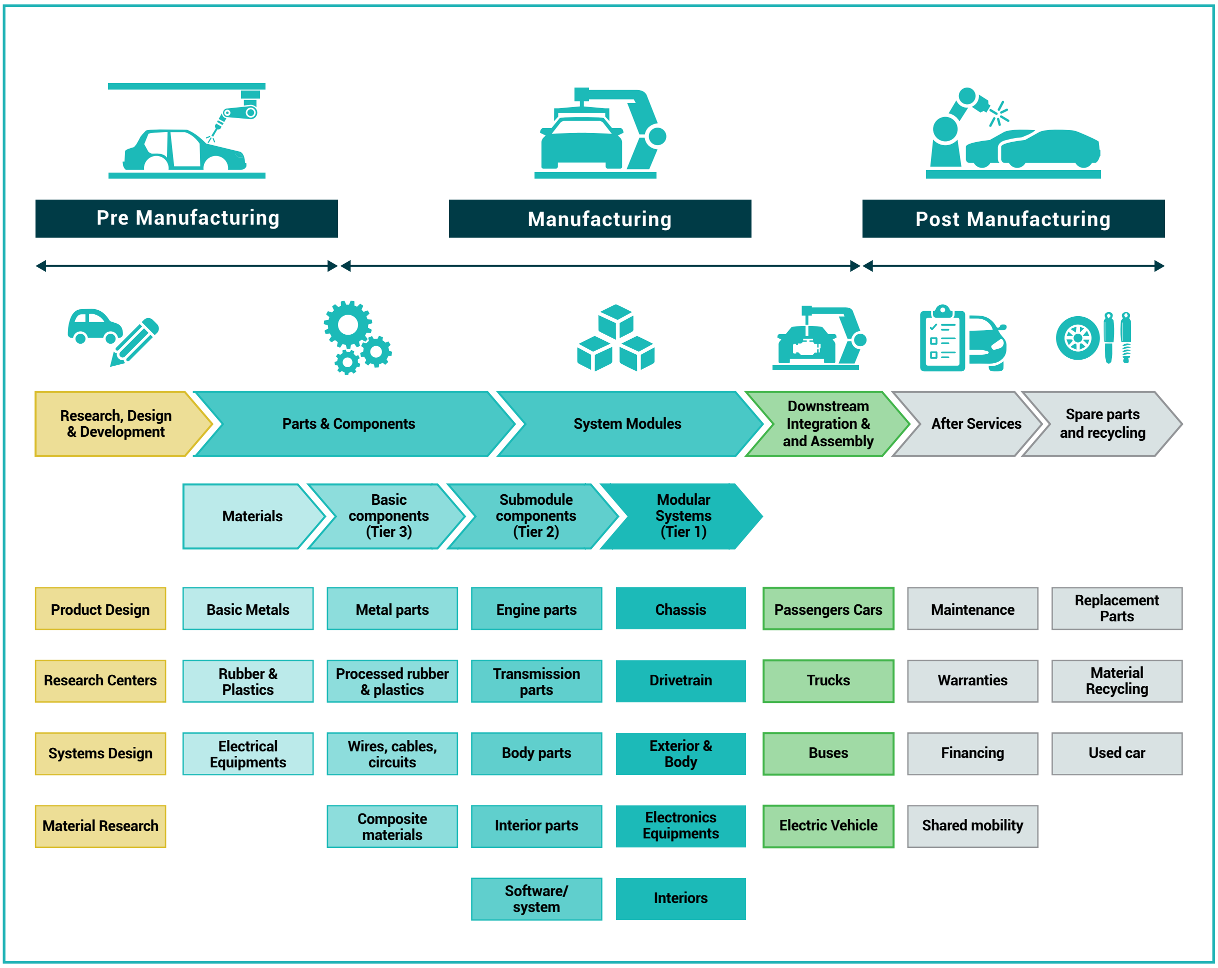
The manufacturing phase of the automotive vehicle industry is a complex assembly industry with a "tiered" supply chain structure and final assembly. One single finished vehicle consists of thousands of parts and components that are produced by hundreds of suppliers. Those suppliers are dispersed from Tier 1 to Tier 3 suppliers.

The automotive industry requires a wide variety of raw materials for their production, including iron used for steel, aluminum, and glass as well as the petroleum products used to make plastics, rubber, and special fibers. After being mined or extracted from the earth, the materials are transformed into products that automakers or auto parts companies use in their production processes. This stage is the foundation stage of the automotive industry and include suppliers from industries outside auto and auto parts industries.

These raw materials are utilized by Tier-3 suppliers to provide more generic low-tech engineering materials and services such as metal parts, processed rubber and plastic, wires, cables, circuits and composite materials. In Tier-2, suppliers manufacture auto parts and components that can be grouped into; engine parts, transmission parts, body parts, interior parts, and software/system.

These parts and components are fed to Tier-1 suppliers - who govern the highest capital and technology intensive value chains in the industry - to build modules, which describe physically interconnected system of parts such as front ends (bumpers, grills, lighting, etc.), instrumentation or 'cockpit' clusters, or front or rear end suspension 'cradles' that include dozens of suspension parts (springs, shock absorbers, tie rods, etc.). Modules then form the basis of systems, which can be divided into four broad categories: interior (seat, trim, and cockpit module); body (doors, skin, finish, trim); electrical

Figure 1.1: Automotive Global Value Chain



and electronic (ignition wiring, chassis electronics, and interior electronics), and chassis (drivetrains, radiators, front and rear end modules). Modules can sometimes be built up separately from the final assembly line, commonly in nearby plants owned and operated by suppliers. These plants typically source components farther afield—in cases where parts have a high enough value-to-weight ratio (electronics) or are labor intensive and produced in lower cost locations (wire harness and seat cover), very far afield. Adding to the complexity of this, capital-intensive subsystems such as engines and transmissions tend to be produced in a few centralized locations and shipped to multiple final assembly plants.

Tier-1 suppliers are typically multinational lead firms, such as Ford, General Motors and Toyota and control the core technologies, R&D, product design, financial resources, marketing and final assembly. In contrast, suppliers in Tier-2 and Tier-3 are typically local firms.

Although not depicted in the figure above, it is worth mentioning the emergence of Tier-0.5 suppliers to lessen the increasing responsibilities of the Tier-1 suppliers and assemblers. Notwithstanding the line between Tier-0.5 and Tier-1 is still blurred, the main difference between these two tiers is primarily that Tier-0.5 suppliers possess the capacity to design auto modules and systems and help assemblers with product development rather than simply manufacturing the modules and systems.

The final stage of the manufacturing phase is system integration and final assembly. Similar to commercial aircraft, final assembly of motor vehicles is almost always undertaken by lead firms. This means that final assembly plants are strategic assets meant for the sole use by the lead firm, rather than shared assets of contract manufacturers producing for multiple brands. Furthermore, many production fixtures for high volume assembly plants continue to be platform or even model-specific, and product variety is typically limited to variations on vehicle colors and options, although innovations in assembly techniques and equipment are gradually leading to increased assembly-line flexibility.

The post-manufacturing phase can be divided into two groups, namely, after services, and spare parts and recycling. The former includes services for maintenance, warranties, financing and shared mobility whereas the latter include markets for replacement parts, material recycling and used cars.

Global Supply and Demand in the Automotive GVC

As already illustrated above, the automotive sector is very complex and has a wide scope of products segments. Accordingly, our research approach is to narrow the global analysis to automotive products segments where Indonesia has a competitive edge. Indonesia is involved in the production and exports of various automotive final products and it represents 2.6% of their total exports, which is illustrated in the table below.

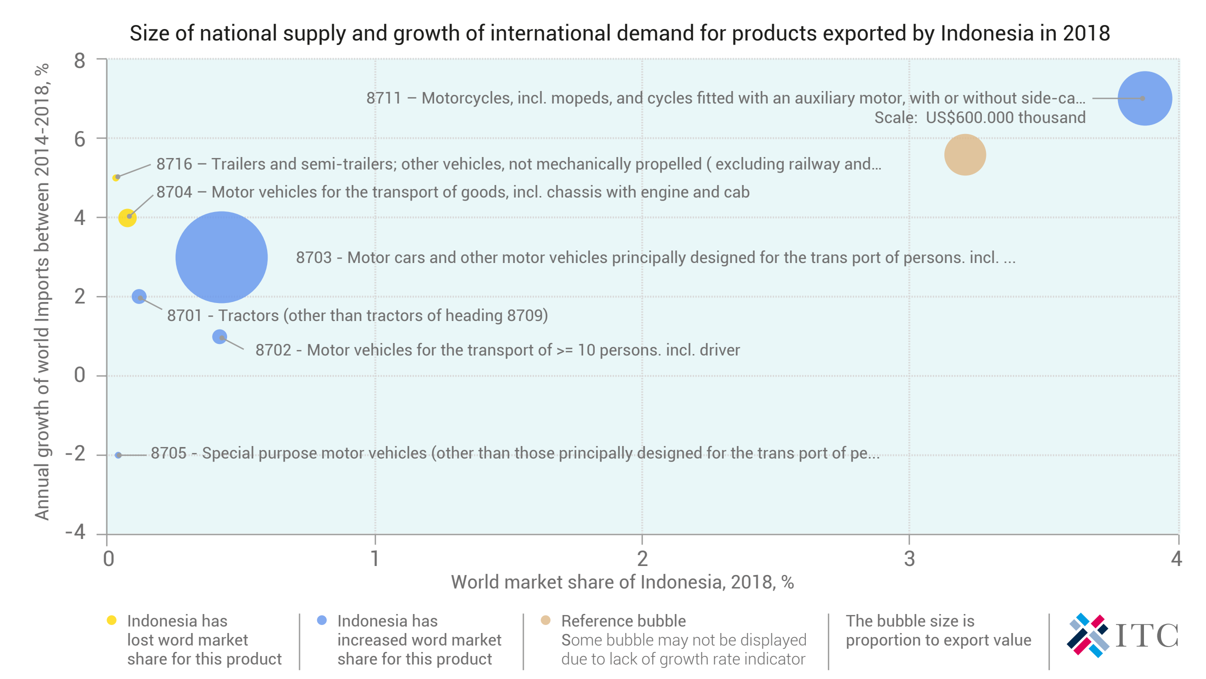
From Table 1.1 above, Motor vehicles (Hs 8703) represents 1.8% of total Indonesian exports, and is thus selected for further analysis. Furthermore, the international markets of the motor vehicles are expanding, evident from its annual growth of world imports of approximately 3%, during the period 2014-2018 as illustrated in the figure below.

Table 1. 1: Indonesian Automotive Exports

Product Hs code	Product label	Export Value in 2018 (US$ thousand)	% in Indonesia exports
'TOTAL	All products	180,215,034	100%
	Automotive final products	4,635,673	2.6%
'8701	Tractors	69,144	0.0%
'8702	Motor vehicles for the transport of >= 10 persons, incl. driver	71,067	0.0%
'8703	Motor vehicles for transport of persons	3,276,970	1.8%
'8704	Motor vehicles for the transport of goods	101,236	0.1%
'8705	Special purpose motor vehicles	5,062	0.0%
'8711	Motorcycles	1,103,297	0.6%
'8716	Trailers and semi-trailers;	8,897	0.0%

Source: Trade map, US$ thousand, Downloaded on 1/4/2020

Figure 1. 2: Global Demand on Indonesian Automotive Exports



Final Product (Motor Vehicles / Hs-code 8703)

Along the period from 2010 to 2018, Germany and Japan were the leaders in exporting passenger cars with an average of 35.7% market share during the observed period. However, their respective shares in world exports were decreasing in favor of other exporters as Germany's share decreased from 23.3% in 2010 to 19.9% in 2018 whereas Japan's share saw a 20.1% drop from 16.2% to 12.8% during the same period. The top 10 exporters of final product passenger vehicles are predominantly developed economies with only South Korea and Mexico the only two developing countries to have made it on the list. Mexico in particular, has seen its world exports share increase quickly in the last couple of years to be ranked 4th world exporter with 6.4% share. Indonesia's performance (ranked 30th) is steadily improving over the years from 0.2% market share in 2010 to 0.4% by 2018.

The U.S. has consistently held the top spot for importer of passenger vehicles reaching 22.8% of world imports in 2018, albeit a slight drop from 24.6% in 2016. It is notable that most of the major importers did not change from 2010 to 2018 (only change prevalent was in their respective shares).

Table 1. 2: Top 10 Exporters of Passenger Vehicles, By Value 2010-2018 (in US$ billions)

	Export Value (US$ billions)					Export Share				
Exporters	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	557.89	651.34	709.85	699.55	775.94	100%	100%	100%	100%	100%
Germany	129.93	146.85	160.31	151.92	154.74	23.3%	22.5%	22.6%	21.7%	19.9%
Japan	90.37	97.46	88.54	91.90	99.12	16.2%	15.0%	12.5%	13.1%	12.8%
U.S.	39.32	54.58	61.68	53.84	51.41	7.0%	8.4%	8.7%	7.7%	6.6%
Mexico	23.09	29.17	32.39	31.42	49.41	4.1%	4.5%	4.6%	4.5%	6.4%
UK	26.53	33.99	42.37	40.79	42.00	4.8%	5.2%	6.0%	5.8%	5.4%
Canada	36.90	46.93	44.88	48.80	41.01	6.6%	7.2%	6.3%	7.0%	5.3%
S.Korea	31.78	42.39	44.82	37.50	38.25	5.7%	6.5%	6.3%	5.4%	4.9%
Spain	26.01	25.12	31.93	35.56	35.87	4.7%	3.9%	4.5%	5.1%	4.6%
Belgium	23.38	27.45	30.29	30.33	34.12	4.2%	4.2%	4.3%	4.3%	4.4%
France	21.09	20.32	19.27	18.40	25.26	3.8%	3.1%	2.7%	2.6%	3.3%
Indonesia	1.03	2.26	2.64	2.57	3.28	0.2%	0.3%	0.4%	0.4%	0.4%

Source: Trade map, US$ billions, Downloaded on 1/4/2020

Table 1. 3: Top 10 Importers of Passenger Vehicles, By Value 2010-2018 (in US$ billions)

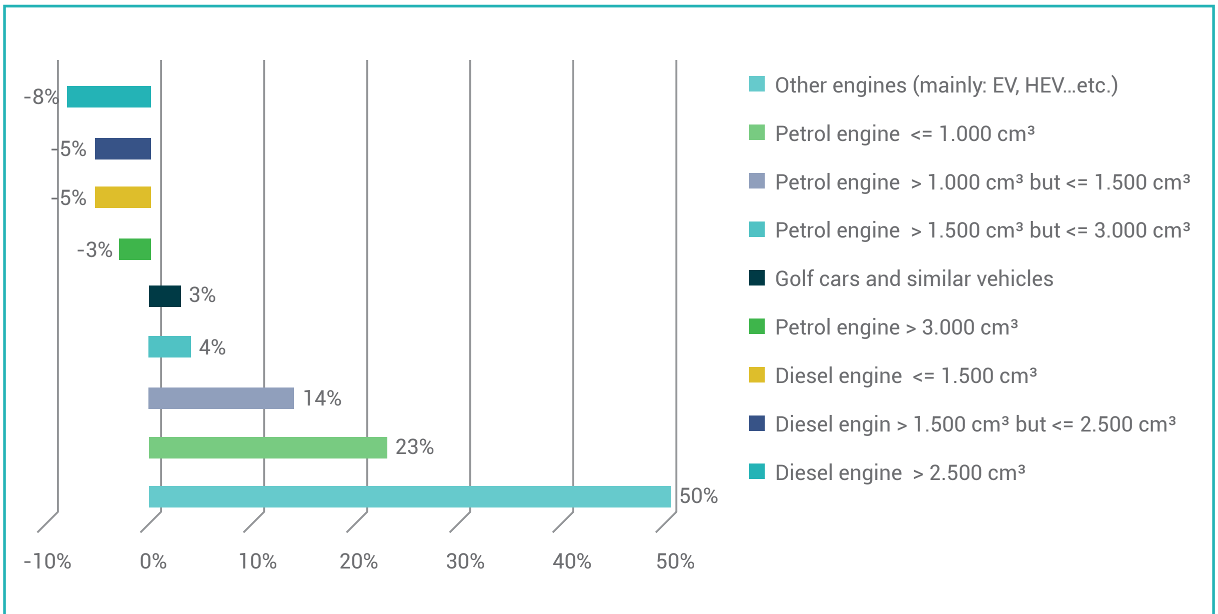
	Import Value (US$ billions)					Import Share				
Importers	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	554.91	654.78	711.40	705.23	781.96	100%	100%	100%	100%	100%
U.S.	116.64	149.32	156.36	173.29	178.52	21.0%	22.8%	22.0%	24.6%	22.8%
Germany	36.10	42.22	46.54	51.27	61.98	6.5%	6.4%	6.5%	7.3%	7.9%
China	28.92	45.49	59.73	44.01	49.61	5.2%	6.9%	8.4%	6.2%	6.3%
UK	35.74	34.50	46.33	45.58	43.94	6.4%	5.3%	6.5%	6.5%	5.6%
Belgium	24.65	25.53	26.95	31.45	38.48	4.4%	3.9%	3.8%	4.5%	4.9%
France	31.17	29.93	31.08	31.90	38.31	5.6%	4.6%	4.4%	4.5%	4.9%
Italy	28.06	20.28	22.87	27.58	32.36	5.1%	3.1%	3.2%	3.9%	4.1%
Canada	22.36	25.93	27.01	26.50	29.95	4.0%	4.0%	3.8%	3.8%	3.8%
Spain	11.61	10.07	14.97	18.27	22.22	2.1%	1.5%	2.1%	2.6%	2.8%
Australia	15.28	17.55	15.85	15.94	16.79	2.8%	2.7%	2.2%	2.3%	2.1%
Indonesia	1.41	2.73	1.48	1.19	1.07	0.3%	0.4%	0.2%	0.2%	0.1%

Source: Trade map, US$ billions, Downloaded on 1/4/2020

Meanwhile, Indonesian imports of final passenger vehicles decreased from US$2.73 billions in 2012 to US$1.07 billions in 2018. This decline is a result of highly competitive local production from 745K units in 2012 to more than 1 million units in 2018, representing an increase of approximately 40% (The Association of Indonesia Automotive Industry). This trend can be explained by a comprehensive package of governmental incentives to boost domestic production and exports (especially for low carbon emission vehicles) in addition to high import and luxury taxes on Completely Built Up (CBU) passenger cars.

Furthermore, figure (1.3) confirms on new disruptive technology and trends that the automotive industry is experiencing in last few years. It indicates the quick and the substantial emergence of new car types which are not using spark or compression ignition engines which show the increasing trend (with 50% export increase) for using of new car types like EV, HEV and PHEV...etc. Furthermore, this figure indicates also the increasing global preferential trend of small cars with engine less than 1000 cm^3.

Figure 1. 3: Growth of Passengers' Cars Exports Between 2015-2019



Source: Trade map, US$ million, Downloaded on 1/4/2020

Automotive Chain Segments

The table below explores the "Global and Indonesia Automotive Exports by Value Chain Stages" according to Duke CGGC classifications. The Automotive value chain consists of two major stages: First, the Subassembly which is usually manufactured by lead firms and; second, the Components/ Parts which is manufactured by suppliers. Each stage is then divided into more sub-categories (Drivetrain, Body systems etc.), which is detailed with its relevant Hs codes in Annex (1). The analysis of world exports shows that in the period between 2008 to 2018, the "Components - Electrical equipment" has the highest Compound Annual Growth Rate (CAGR) at 6%, followed by "Components- Body System" and "Components- Drivetrain" with CAGR 4% and 3% respectively.

In 2018, Indonesian "Components- Body system" possessed the highest share of the Automotive VC exports with 39.3%, followed by "Components - Electrical equipment" and "Components - Drivetrain" with 26.5% and 23.4% respectively. We will proceed with the global supply and demand analysis for only those segments that possesses high world export share and growth, and where Indonesia has a substantial participation in its exports. These segments are "Sub-Assembly: Drivetrain", "Components: Electrical Equipment", and "Components: Drivetrain" (detailed tables are available in Annex 2).

Table 1. 4: Global and Indonesian automotive components/parts exports

	World Exports							Indonesia exports						
Automotive Value chain stages	**2008**	**% of total Auto VC exports**	**2017**	**% of total Auto VC exports**	**2018**	**% of total Auto VC exports**	**CAGR for world exports (2008 -2018)**	**2008**	**% of total Auto VC exports**	**2017**	**% of total Auto VC exports**	**2018**	**% of total Auto VC exports**	**CAGR Indon. exports (2008-2018)**
Sub Assembly - Drivetrain	61,358	11.0%	66,853	9.4%	72,536	9.4%	2%	87	2.5%	262	4.7%	263	4.5%	11.7%
Sub Assembly - Body system	4,153	0.7%	3,310	0.5%	3,602	0.5%	-1%	00.23	0.0%	00.21	0.0%	00.27	0.0%	1.7%
Components - Electrical equipment	86,226	15.5%	135,274	19.1%	152,955	19.8%	6%	1,152	33.2%	1,448	25.8%	1,545	26.5%	3.0%
Components - Drivetrain	129,202	23.3%	168,672	23.8%	180,701	23.4%	3%	598	17.3%	1,355	24.1%	1,366	23.4%	8.6%
Components- Body system	188,583	34.0%	249,797	35.3%	272,466	35.3%	4%	1,404	40.5%	2,258	40.2%	2,290	39.3%	5.0%
Components - Body & Drive	85,785	15.4%	83,751	11.8%	90,563	11.7%	1%	222	6.4%	288	5.1%	368	6.3%	5.2%
Grand Total	**555,306**	**100.0%**	**707,656**	**100.0%**	**772,822**	**100.0%**	**3%**	**3,463**	**100.0%**	**5,611**	**100.0%**	**5,833**	**100.0%**	**5.4%**

Source: Trade map, US$ million, Downloaded on 1/4/2020

Sub Assembly - Drivetrain (Engine): Developed countries dominate exports of Sub Assembly - Drivetrain (mainly engine), representing more than half of total exports as this segment is usually produced by lead firms (OEM). Developing countries that made the list (Mexico, China, and Thailand) have benefited from Lead firms' decision to establish subsidiaries in their country to produce engines due to availability of low cost skilled labours (e.g. Volkswagen engine plant in Mexico). Developing countries in the top 10 exporters of drivetrain has, at the minimum, doubled their export value during this period. Indonesia ranked 22nd in the list but has made impressive strides where export value increased from US$87.5 million (2010) to US$450 million (2018), capturing a larger share of the market from 0.2% to 0.8% in the years 2010 and 2018 respectively.

Moreover, the top 10 importer countries of "Sub Assembly - Drivetrain" didn't change from 2010 to 2018, where the only change was in their rankings. Over that period, the U.S. retained its spot as the number one importer with 23.6% by 2018. Germany dropped to 3rd rank with its shares declining from 13.5% in 2010 to 8.1% in 2018, whilst Slovakia had managed to climb up the rankings from 0.7% to 2.7% in the years 2010 and 2018 respectively. The rest of the countries in the top 10 remained fairly constant throughout the observed period. This includes Indonesia (ranked 32nd) whose share of drivetrain imports marginally increased from 0.5% at the beginning of the period to 0.6% at the end. The presence of developing economies as top importer of "Sub Assembly - Drivetrain" (with the exception of China) and their increasing share shows the trending shift of final assembly process to those countries.

Components - Electrical equipment: The overall world exports of this segment (which includes batteries, accumulators, Ignition and parts, wire harness, signaling, lighting, sound and wipers) increased by nearly 80% from 2010 to 2018, with no substantial changes in the structure of the top exporters. This is an indicator on the large expansion of the automotive industry in last 10 years. The major exporters under this segment are developing economies (lead by China) which reflects the world trend of having the automotive suppliers in developing countries to benefit from the low production cost. Indonesian performance in this segment is relatively below world average (especially by comparing to other developing countries like Mexico and Vietnam) as its exports increased only by 45% from 2010 to 2018, which led to the decrease of its share from 1.3% to 1%.

The major importer countries are advanced economies where it uses the components under this segment in its final assembly processes. The major importers didn't change from 2010 to 2018. Indonesia's import share was 0.9% in 2010 and decreased to 0.7% in 2018.

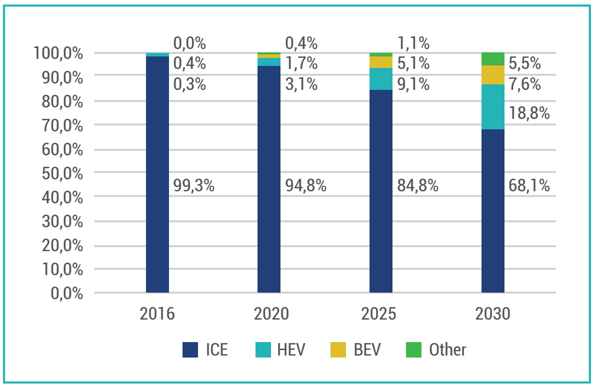
Components - Drivetrain: This segment includes the production of, among others, engine parts, gear boxes, drive-axles and clutches. Germany and Japan respectively lead world exports from 2010 to 2018. Mexico and China are increasing their export shares from 5% and 3.7% respectively in 2010 to 7.2% and 5.4% in 2018. Indonesian exports increased by 85% from 2010 to 2018 which is relatively higher than world average (48%), but still its participation is limited globally. In terms of imports, advanced economies are dominating this segment but there are developing economies that are competing to increase their share in this segment imports. China, Mexico and Thailand have increased their respective imports share in world trade from 2010 to 2018 illustrating the increasing presence of sub-assembly processes in developing economies.

Automotive Global Market Forecast

- **Electric Vehicles**

The EV evolution begins with the Hybrid Electric Vehicle (HEV) that is a combination of the ICE and the electric motor/generator. Then came the Plug-in Hybrid Electric Vehicle (PHEV), essentially the same as its predecessor, but due to having a charging possibility a relatively smaller ICE is combined with a larger battery capacity. Finally, the BEV "Battery Electric Vehicle" emerged, which are only powered by a battery (100% pure electric car).[5] Over one million EVs were sold in 2017[6], which amounted to about 1% of the global sales. According to the Bloomberg's EVs timeline (Bloomberg, 2016) it will be growing about 35% until 2040. Battery pack[7] determines about 75 percent of BEV's power train cost (Wolfram & Lutsey, 2016), and one third of the total vehicle cost (UBS 2018 via portfolio.hu4), so the propulsion of the electric car is determined by the price of the batteries. However, the breakthrough will not be the BEVs but the mixed HEVs (see figure 1.4). The forecast of Berckmans and his co-authors (2017) highlights the uncertainty of the market launch of e-technology.

Figure 1. 4: Motor Vehicle Forecasted Market Share



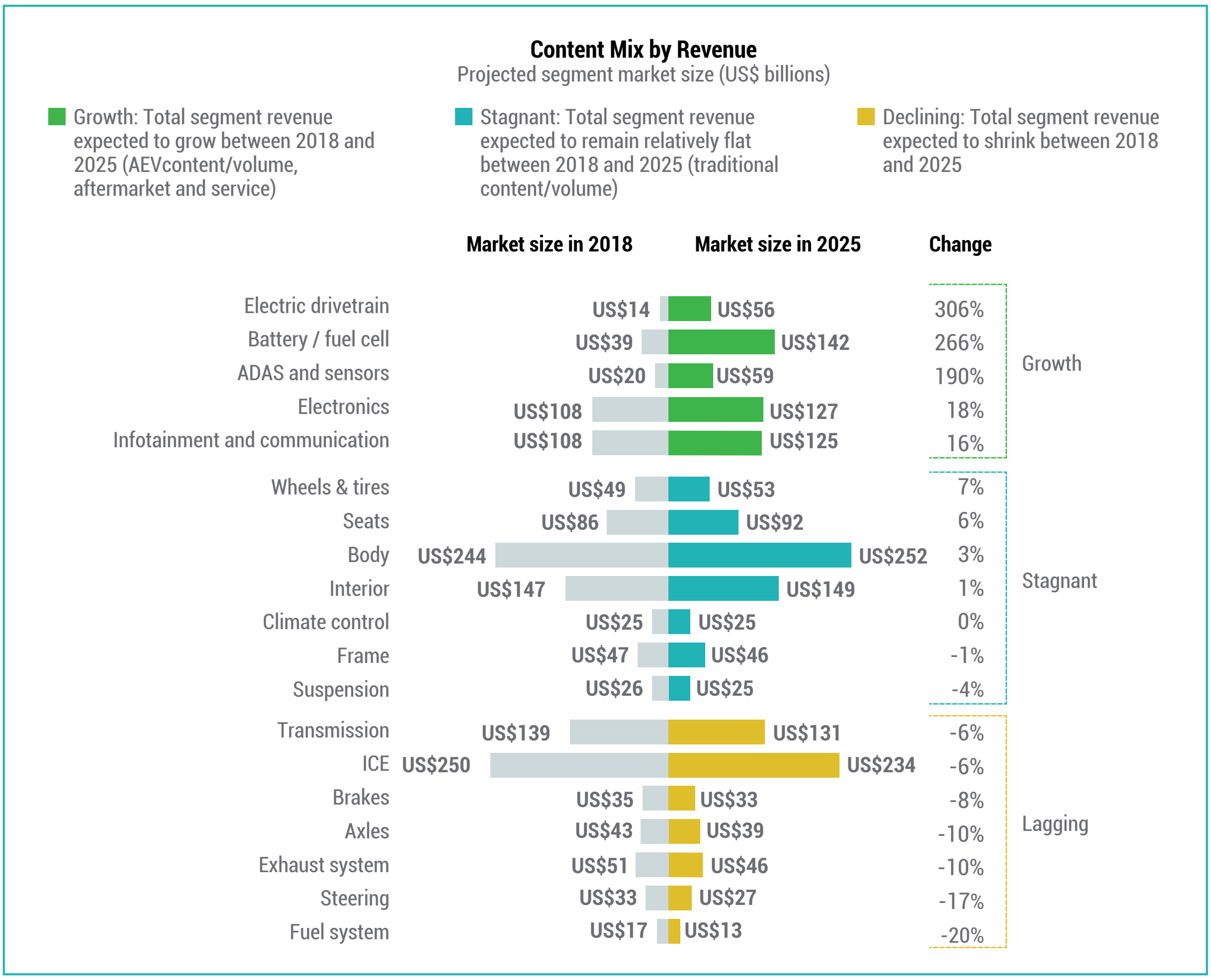
Source: Berckmans et al., 2017

- **Auto Components**

Deloitte's analysis estimates that some segments could face as much as 20% in revenue erosion over the next five to seven years. Those suppliers operating in more commoditized automotive supply segments like frames, interiors, brakes, and internal combustion engines could be at risk as these segments stagnate and decline between now and 2025. Suppliers driving innovation in autonomous and electrified systems will likely see the most opportunity and growth—tripling in revenue in some segments. Segments with the strongest growth potential and ability to differentiate will be the most attractive, including electric drivetrain (300% growth, from US$14 billions to US$56 billions); battery/fuel cell (266% growth, from US$39 billions to US$142 billions); advanced driver-assistance systems and sensors (190% growth, from US$20 billions to US$59 billions); electronics (18% growth, from US$108 to US$127 billions), and infotainment and communication (16% growth, from US$108 billions to US$125 billions).

5. https://electriccarhome.co.uk/electric-cars/bev-phev-hev-ice/
6. https://www.iea.org/reports/global-ev-outlook-2018
7. https://www.samsungsdi.com/column/all/detail/54344.html

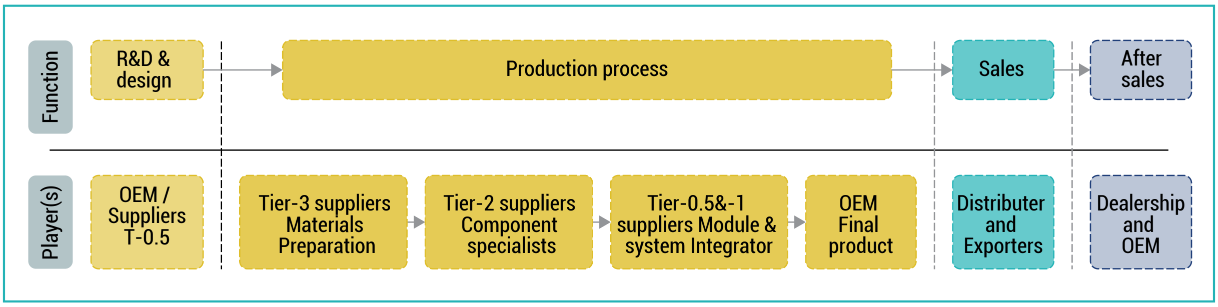
Figure 1. 5: Automotive Value Chain Segments Projected Revenues



Source: Deloitte, 2019 Global Automotive Supplier Study

Lead Firms and Governance Structures in the Automotive GVC

Figure 1. 6: Automotive Governance Structure



The assemblers and original equipment manufacturers (OEMs) are positioned at the top of the tier structure and govern the highest capital and technology intensive segment in the industry. They are typically multinational lead firms, such as Ford, General Motors and Toyota and control the core technologies, R&D, product design, financial resources, marketing and final assembly.

Tier-1 suppliers use parts and components to build modules. Modules then form the basis of the systems. Tier-0.5 suppliers newly emerged to lessen the increasing responsibilities of the Tier-1 suppliers and assemblers. the main difference between these two tiers is primarily that Tier-0.5 suppliers possess the capacity to design auto modules and systems and help assemblers with product development.

In Tier-2, suppliers manufacture auto parts and components and feed them to Tier-1 suppliers to further build modules and systems. In contrast, Tier-3 suppliers provide more generic low-tech engineering materials and services. Tier-2 and Tier-3 are usually local firms.

This section further analyzes data on the top 10 global automotive manufacturers (lead firms). Finally, we discuss the top global motor vehicle suppliers and the prevailing governance structure of the automotive GVC. From Table 1.5, it is evident that the top automotive OEMs have been diversifying

Table 1. 5: Top 10 Global Motor Vehicle Manufacturers (OEMs) by Revenues (2018), US$ billions

Company	HQ Location	Unit sales (K)	Revenue (US$ billions)	Revenue from Automotive (US$ billions)	Geographies	Employees (K)	R& D(US$ billions)	Scope
Volkswagen	Germany	10,900	278.1	237.1	71 europe (28 in Germany) 34 Asia pacific 5 North America 9 south America 4 Africa	664.5	16.1	Passenger, Commercial cars Power engineering Financial services
Toyota	Japan	8,964	266.1	239.1	Europe 8 Asia 24 Japan 17 North America 10 other 8	369.1	9.6	Automotive Housing and financial services
Daimler	Germany	3,352	197.4	149.5	34 Europe 18 Nafta reigon 7 latin america 2 Africa 8 Asia	298.7	10.7	Cars, Trucks, Vans and buses Financial services
Ford	U.S.	5,982	160.3	148.3	32 North America 8 South America 15 Europe 2 Middle east and africa Asia Pasific 4	199.0	8.2	Ford cars, trucks, sport utility vehicles ("SUVs"), electrified vehicles, and Lincoln luxury vehicles, provides financial services through Ford Motor Credit Company LLC ("Ford Credit")
General Motors	U.S.	4,707	147.5	133.1	100 locations in the U.S. (excluding our automotive financing operations and dealerships) which are primarily for manufacturing, assembly, distribution, warehousing, engineering and testing We have manufacturing, assembly, distribution, office or warehousing operations in 33 countries, including equity interests in associated companies which perform manufacturing, assembly or distribution operations. The major facilities outside the U.S., which are principally vehicle manufacturing and assembly operations, are located in Argentina, Brazil, Canada, China, Colombia, Ecuador, Mexico, South Korea and Thailand.	173.0	7.8	Trucks, crossovers, cars and automobile parts worldwide. We also provide automotive financing services through General Motors Financial Company, Inc. (GM Financial

Honda	Japan	5,199	139.1	116.8	"Europe 8	215.6	6.8	Honda's business segments are the Motorcycle business operations, Automobile business operations, Financial services business operations, and Power product and other businesses operations.
SAIC	China	7,052	136.3	134.1	Asia 24	217.5	2.3	Automotive manfacturing and financing
BMW	Germany	2,491	115.0	103.8	Japan 17	134.7	8.1	Automotive (Motorcycle) and financial services
Nissan	Japan	5,516	104.8	NA	North America 10	138.9	4.7	Automotive and financial services
Hyundai Motor Group	South Korea	4,589	88.0	74.5	other 8"	118.3	2.5	The Company and its subsidiaries (the "Group") manufactures and distributes motor vehicles and parts, operates vehicle financing and credit card processing, and manufactures trains

Source: Annual reports for 2018 and Companies websites
Exchange rate used according to: https://www.irs.gov/individuals/international-taxpayers/yearly-average-currency-exchange-rates

their revenue streams, but those from automotive products still represent the large bulk of it, ranging from 76% to 98% of total revenues. Our research has also found that all of the top OEMs possess its own Financial Services (FS) arm. FS products play an important role in creating customer and dealership loyalty in addition to generating revenues directly related to cars (e.g. garages and spare parts). Moreover, information gathered through financial products rendered can generate important customer insights to offer tailored innovative products. Provisioning of financial services offers an opportunity for profitable expansion of product offering close to core business. Car financing is a rather low-risk business for OEMs compared to normal banking as cars can be used as collateral and large scale of business makes the risks more predictable.

The table also shows Volkswagen and Toyota are the two largest (in revenue) automotive companies globally. However, in terms of average revenue per unit sold, Daimler and BMW, each with US$44.5 thousand and US$41.7 thousand become the top two automakers, a reflection of the companies' target of higher-end consumers for more luxury compared to Volkswagen and Toyota.

Further, we can observe the amount invested in R&D by these top automakers, which can indicate the level of innovation and development in cars produced under different companies. According to KPMG, in 2017 the automotive sector was the world's third largest industry in terms of R&D expensed, and the largest in the European Union and Japan. The expenditure on R&D/total revenues is higher in German-based companies followed by the U.S. and Japanese companies, while Hyundai (South Korea) and SAIC (China) are the bottom 2 in the list.

Finally, the geographical distribution of OEMs manufacturing plants confirms the trend in ensuring final assembly near major final markets. This gives them more flexibility in producing according to each market preferences, requirements, reduce the transportation costs and overcome tariff barriers.

Table 1. 6: Top 10 Global Motor Vehicle Suppliers by Revenue (2018), US$ billions

Rank	Company	Counrty of Headquarters	VC Segment	Revenue* (US$ billions)	Geographies	Employees	R&D (US$ billions)
1	Bosch	Germany	Powertrain, Chassis Systems, Electrical Drives, Multimedia, Electronics, Aftermarket, Steering, Connected Mobility Solutions	56.17	Germany, Americas, Europe, Asia Pacific	407,000	7.04
2	Continental	Germany	Chassis, Safety, Powertrain, Interior, Tires, ContiTech	52.39	Germany, Europe, N. America, Asia	243,230	3.78
3	Denso	Japan	Thermal Systems, Powertrain, Electrification, Mobility, Electronic	48.10	Japan, Americas, Europe, Asia	168,813	4.04
4	Magna	Canada	Body&Chassis, Exterior, Powertrain, Electronics, Mirrors, Lighting, Interior, Mechatronics	42.02	N.America, Europe, Asia Pacific	174,000	0.59
5	ZF-Friedrichshafen	Germany	Powertrain, Chassis, Technology, E-Mobility, Aftermarket, Safety, Electronics	40.10	Europe, Americas, Asia Pacific, Africa	149,000	2.91
6	Aisin	Japan	Powertrain, Chassis, Body, ICT&Electronics	37.70	N. America, China, Europe, Asia&Others	110,000	0.16**
7	Hyundai Mobis	S.Korea	Autonomous Driving, Lamps, Electrication, Infotainment, Safety, Suspension, Braking, Steering	29.03	China, Europe, Americas, India	32,302	0.69***
8	Michelin	France	Tires, Aftermarket, Mobility	28.44	Europe, N.America, Others	117,400	0.76
9	Valeo	France	Comfort and Driving Assistance, Powertrain, Thermal, Visibility	26.00	France, Europe, N. America, Asia	72,464	1.84
10	Lear	U.S.	Seating, E-Systems	22.56	Americas, Europe, Africa, Asia	169,000	0.11

**Source: Berylls, at US$/EUR Conversion Rate 1.18*
***Yen/US$ Conversion Rate 110.34*
****KRW/US$ Conversion Rate 1100.3*

As in the case of OEMs, the automotive supplier industry is dominated by developed countries. Bosch leads the ranking not only in terms of revenue generated (US$56.17 billions), but also on expenses incurred on Research and Development (R&D) costs at US$7.04 billions, representing 12.5% of revenues. Continental and Denso rank closely in second and third, however their spending on R&D represents only 7% and 8% of its revenues.

Interestingly, although the revenues of the top global suppliers are a fraction of OEMs, in 2018, Bosch, Continental, Denso and ZF-Friedrichshafen have spent more in R&D as a supplier, than Hyundai and SAIC as an OEM. This can reflect the emergence of Tier 0.5 suppliers discussed earlier, that possess the capacity to design auto modules and systems and help assemblers with product development rather than simply manufacturing the modules and systems.

The governance of the automotive GVC is producer driven given that the top 10 (lead firms) have the ability to leverage their market power and technology leadership to dictate the criteria such as 'Just-in-Time' (JIT) delivery and adopting lean production systems for being awarded a contract as a supplier. This market concentration allows lead firms to dictate certain aspects of the industry such as supplier co-location requisite which in turn, has led to the emergence of global suppliers i.e. first-tier automotive suppliers having an increasingly global reach.

Upgrading in the Automotive GVC

Pavlinek & Zenka (2011) states that upgrading involves engaging in the production of higher value-added products, employing more efficient production strategies, and/or increasing the skill content of activities by firms. In the GVC approach, the concept of industrial upgrading refers to the 'process by which economic actors—nations, firms and workers—move from low-value to relatively high-value activities in global production networks' (Gereffi, 2005). Notwithstanding the above, upgrading in the automotive industry is not as straightforward as firms investing in new areas or taking on different strategies. Pavlinek & Zenka (2011) asserts that automakers may encourage process and product upgrading for suppliers but discourage functional upgrading to prevent 'cannibalizing' their greatest source of value capture such as design and marketing.

Process Upgrading

Process upgrading refers to more efficient production methods and innovation driving the creation of improved goods and expanded adaptability of producers. In the automotive industry, methods of 'lean production' will generally incentivize process upgrading by exerting pressure on suppliers to cut costs, which requires constant improvements in production processes (Pavlinek & Zenka, 2011). In 2017, Tata Motors (India) announced a plan to consolidate vehicle platforms from the current six to two in the next few years. Each of these platforms would have multiple top structures and the platform will be adaptable to various lengths, widths, suspension setups and even wheelbase differences. The first platform of the two will be called Advanced Modular Platform (AMP) and will be used for the next generation of hatchback and sedan applications along with new SUV applications.[8]

Product Upgrading

Product upgrading involves moving into the production of more sophisticated and higher value-added products. Among assemblers, an example would be a shift from the production of basic models towards more advanced, expensive cars. Among suppliers, it may involve the upgrade in production of basic parts towards components and further into modules. Brazil, France and South Korea have identified as future opportunity the development of greener and more energy efficient cars based on the development of new technologies. France has launched two plans on universal cars consuming less than 2 liters per 100 km and driverless vehicles, and has two industrial plans on electric charging stations and on battery life and power.[9] Honda (India) is planning to introduce hybrid versions of its hatchback Jazz and City sedan after 2020. It is planning to launch six models in India in the next three years, and the current favorite is the hybrid technology. Honda Accord with hybrid i-MMD system for small and midsize cars, is more efficient than the earlier i-DCD technology.[13]

Functional Upgrading

Functional upgrading pertains to firms expanding their capacities to acquire new functions, thereby generating higher incomes or abandoning old and lower income generating functions in the value-chain. Pavlinek & Zenka (2011) explains the emerging relationship between automakers and suppliers benefitting the latter with increased functionality, as global suppliers are often required to become involved in research and development (R&D), thereby acquiring new functions within the automotive value chain. Turkey has declared that the accumulated capabilities in the automotive industry, which started to develop in the 1960s in the country, offered a good learning base to be able to tap into the preference shift towards light vehicles, having as a destination market especially the EU. The Turkish industry has strong linkages with traditional car manufactures and has developed over time domestic industrial and design capabilities that allowed the industry to introduce into the EU markets originally designed cars, such as Fiat-Doblo. Turkey is pointing to increase the innovation and knowledge content of the industry in the country and to intensify the domestic production chain.[9]

8. Upgrading in the Indian automobile sector: the role of lead firms, June 2018
9. UPGRADING PATHWAYS IN THE AUTOMOTIVE VALUE CHAIN, OECD, Nov. 2016

Supply Chain Upgrading

Supply Chain upgrading would result in an increase in domestic value-added, from the decreased reliance on foreign producers of inputs and consequently increasing domestic production of the input industry. Maruti Suzuki Motors (India) revealed plans to manufacture electric vehicles at a factory in Gujarat in 2017. As part of the initiative, Suzuki has committed US$600 million (Rs. 3900 crores) for construction of a new plant at Hansalpur (Gujarat). Maruti plans to produce 35000 electric vehicles annually from 2020. For this, Maruti also plans to set up lithium-ion battery plant with the help of its tripartite joint venture with Toshiba.[5]

Chain/Intersectoral Upgrading

In Ireland the industries of software and electronics offer increasing opportunities for linkages with the automotive and aeronautics value chain. The Irish Centre for Composites Research (IComp) was established in 2010 under the EI/IDA Technology Centre initiative. It is hosted by the University of Limerick (UL) which is the leading composites research establishment in Ireland, working in partnership with University College Dublin (UCD). IComp bridges industry and academia to focus on the critical requirements of priority industrial sectors, including automotive, aerospace, renewable energy and construction. IComp currently has 14 industrial members across Ireland.[15]

End-Market Upgrading

Countries with a well-established automotive industry, such as South Korea, Mexico and Turkey are looking forward to tap into the growing demand from the emerging middle classes in emerging and developing economies and they are looking forward to strengthening their capabilities to benefit from the shift in consumers' preferences towards light vehicles. In Malaysia, Major barriers to technological upgrading are the low volume of business in the local market and also the slow product life cycle leading to a lower requirement for innovation. However, with the involvement of MNCs, some firms (small and large) have become competitive and gone into export markets by developing external linkages and internal capability developments, thus overcoming barriers to limited resources or market size for innovation.[17]

2.3.2. Indonesia and the Automotive Global Value Chain

Current Participation of Indonesia in the GVC

An Overview

The Indonesian automotive industry started in the 1970s with the government imposing an array of localization policies under import-substituting industrialization until 1993[10]. From 1993 with the emergence of the World Trade Organization (WTO), liberalization was eased into the industry. However, the country still pursued a protectionist approach that contradicted WTO principles. It was not until the year 1999 that the government started to change their approach. This was the year that the industry became a target of structural adjustment required by the IMF, and liberalization policies such as reduction of import tariffs, elimination of the incentive system, and an assurance of Indonesia's commitment to the WTO's rules (Hale 2001, Nomura 2003).

In May 2013, the Indonesian Government issued a new set of tax incentives designed to help developing a 'Low Cost Green Car' (LCGC) which would not only be affordable for the local population, but also a sustainable solution to their needs. The tax incentives include a 0% luxury tax for cars under 1,200cc (under 1,500cc for diesels).

In 2015, the Indonesian 'National Industry Development 2015-2035' policy was launched by the Indonesian Ministry of Industry which includes a definitive vision for Indonesia to be a "major player in the global automotive industry". The plan is phased into 3 different 5-year horizons which gradually diverts the focus away from Internal Combustion Engine (ICE) vehicles towards Electric Vehicles. Accordingly, the government is providing several fiscal and tax incentives to move forward with the implementation of this plan, especially for R&D activities.[11]

By 2018, Indonesia became the second-largest car manufacturing nation in Southeast Asia and the ASEAN region, second only to Thailand (see Table 2.1 below). Still, Indonesia's lower per capita car ownership level, rapidly expanding middle class, and market size (biggest in ASEAN) primes itself to reduce its gap with Thailand in the years to come. This will present an opportunity for car manufacturers to open additional manufacturing plants or expand production capacity.

Table 2. 1: Passenger and Commercial Vehicles Total Production, by Country in ASEAN (2018)

Country	2017	2018	Variance (%)
Thailand	1,988,823	2,167,694	9%
Indonesia	1,216,615	1,343,714	10%
Malaysia	499,639	564,971	13%
Vietnam	195,937	200,436	2%
Philippines	141,252	79,763	-44%
Myanmar	4,930	12,292	149%

Source: ASEAN Automotive Federation

The long-term vision of the government is to turn Indonesia into an independent car manufacturing country that delivers CBUs of which all components are locally-manufactured in Indonesia (Indonesia investments, 2018). Although this is highly ambitious, the government has devised policies that support high local content models by incentivizing OEMs to increase local production, especially in parts production (Ipsos Business Consulting, 2016).

10. Bulletin of Indonesian Economic Studies, Vol. 51, No. 1, 2015
11. UPGRADING PATHWAYS IN THE AUTOMOTIVE VALUE CHAIN, OECD, Nov. 2016

Market Structure

The contribution of the automotive industry to national GDP was approximately US$100 billions or 10 per cent of total GDP in 2017 (Kaiser 2018). Data from the Ministry of Industry indicates that the automotive sector employs approximately 445,000 people: 45,000 in OEMs; 220,000 in Tier 1; and 180,000 in Tiers 2&3. These employees work in assembly plants, car component industry, showrooms, workshops, financing, and aftersales services.[12]

Moreover, being the largest Southeast Asian economy, Indonesia has transitioned from being an export-oriented car production center (especially for the Southeast Asian region) into a major (domestic) car sales market due to rising per capita GDP (Indonesia investments, 2018). In 2017, Indonesia's automobile industry produced about 1.2 million vehicles, of which almost 90 per cent went to its domestic market. According to data from the Association of Indonesian Automotive Manufacturers (GAIKINDO), domestic car sales had risen by 50%, from 764,710 in 2010, to 1,151,308 in 2018, while imports of Completely Built Up (CBU) units had fallen by approximately 32% from 124, 835 in 2012, to 84,150 in 2018.

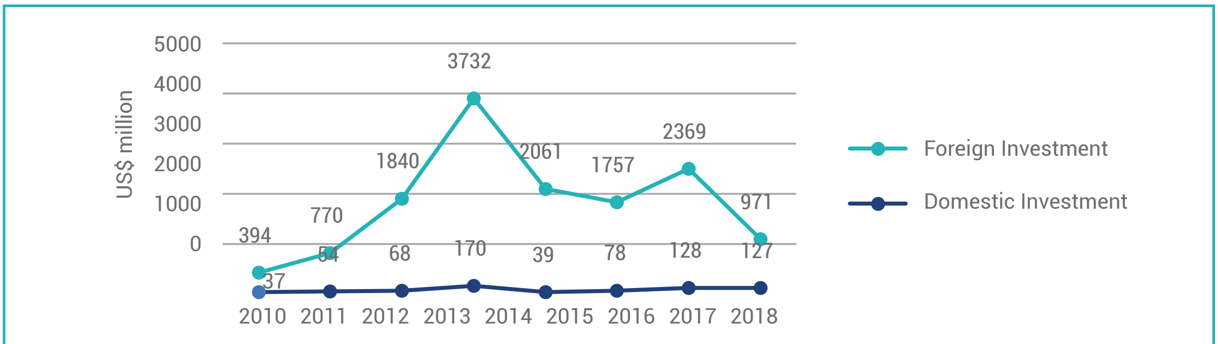
Most of the important automotive industry cluster, including the automobile industry and the parts and components industry, is located in West Java, with Bekasi being "the Detroit of Indonesia", with a small number of companies located in Central and East Java. The Bekasi area makes it well suited to production as it is a strategic location in close proximity to the capital city Jakarta, where motor vehicle demand is highest.

Figure 2. 1: Automotive Industry Cluster in Indonesia

Source: Kaiser (2018)

The main reason Indonesia could attract transnational OEMs to invest in the country was that it had the largest automobile market in ASEAN with significant potential for growth. Indonesia has a population estimated at 270 million in 2019. Moreover, there is still a low motorization rate of 87 vehicles per 1,000 inhabitants, as of 2015, while ASEAN's regional average and the world average is 239 and 182 vehicles per 1,000 inhabitants, respectively (Organisation Internationale des Constructeurs d'Automobiles 2019). Further market expansion is also expected because of an emerging middle class, the large number of first-time buyers, and a poor public transportation system exist in the country.[13]

Figure 2. 2: Investments in Indonesia's Automotive Industry, in US$ million, (2010-2018)



Source: Indonesian Investment Coordinating Board data

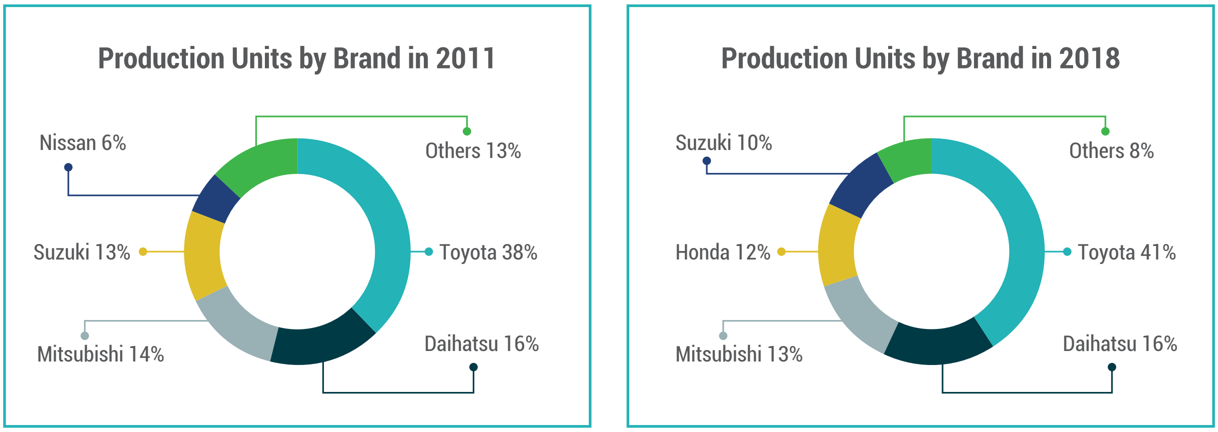
12. https://www.gaikindo.or.id/en/1-3-million-indonesians-work-in-automobile-industry
13. Global Value Chains in ASEAN Automobiles, Jan 2020

As Figure 2.2 shows, most of the investments in Indonesia's automotive sector is foreign-based, reaching its peak in 2013 with an inflow of US$3.7 billions — investment levels close to 10 times more than in 2010. Asian Development Bank (ADB) highlights the reason for the recent downtrend in FDIs is because most of the investments have been channeled to non-manufacturing sectors in recent years. The top five destinations for FDI in Indonesia have been in renewable energy, mining, chemical, real estate, and metals, while manufacturing only comes in at 10th.

Final Products - Motor Vehicles

The total Indonesian production of automobiles increased from around 838,000 units in 2011 to 1.3 million units in 2018 with a Compound Annual Growth Rate (CAGR) of 6.1%. Currently, Indonesia is primarily dependent on foreign direct investment, particularly from Japan, for the establishment of onshore car manufacturing facilities. Ipsos Business Consulting (2016) explains that the key competitive advantages of Japanese OEMs are threefold, namely; localization (having local

Figure 2. 3: Indonesian Motor Vehicles Production Units, by Brand, in % (2011 vs 2018)

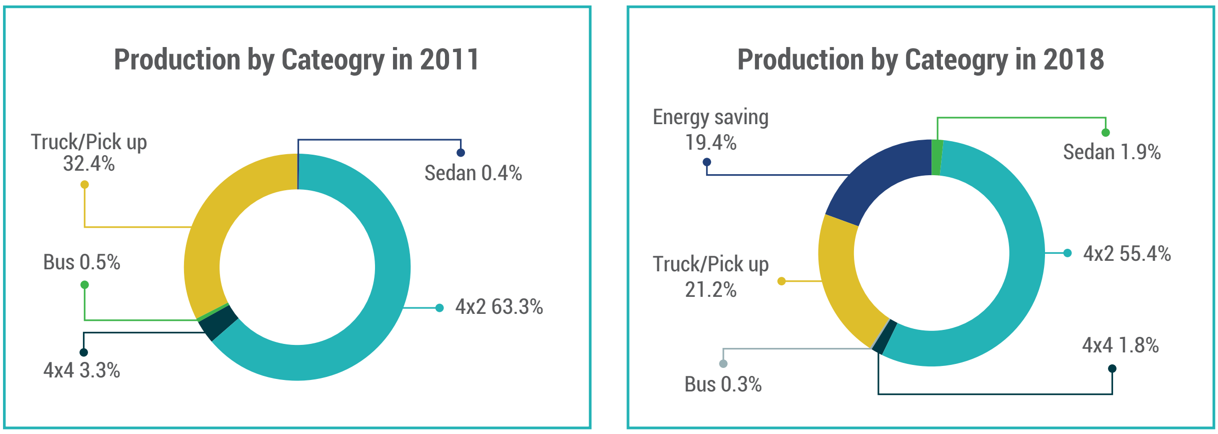


Source: The Association of Indonesian Automotive Manufacturers (GAIKINDO)

manufacturing plants allows 30% cheaper taxes), geographical coverage (possessing a wide-spread distribution network) and government support (bilateral trade agreements resulting in lower import duties). The market is fully dominated by foreign OEMs (no local participation), with Toyota seizing the lion's share of 41% by 2018. Toyota's ability to maintain its strong position in each vehicle segment is attributed to its lower price points in comparison to other Japanese OEMs (Ipsos Business Consulting, 2016). We can observe the changes in the market structure over the last 8 years in that Honda replaced Nissan in the Top 5, and that the Top 5 has increasing power in the industry as their share rose from 87% to 92%.

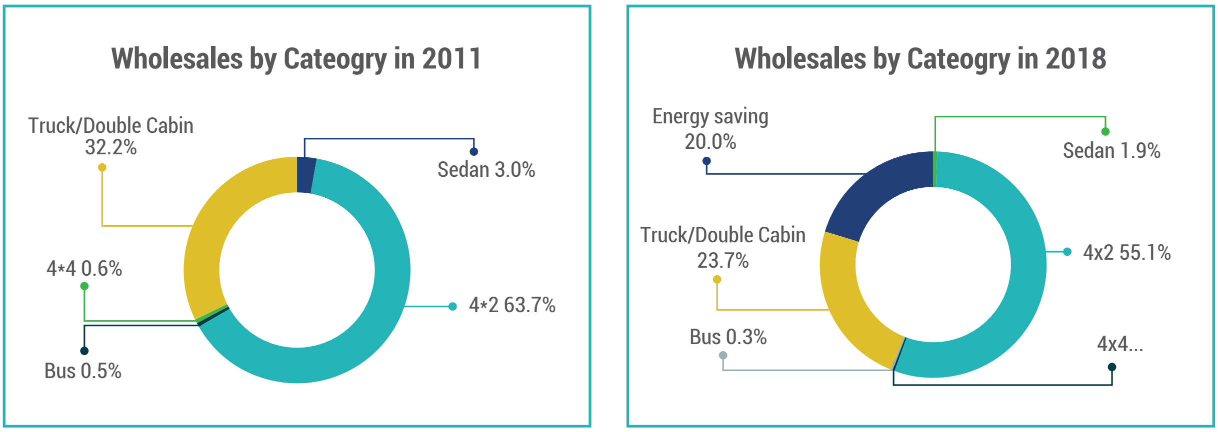
Passenger vehicles is accounting for a higher share of total vehicles produced, rising from 67% in 2011, to 78% in 2018. In the same period, the LCGC has experienced a substantial growth by capturing almost 20% of total production. This can be explained by the tax incentives adopted by the government to encourage OEMs to produce LCGCs, and also the by-product of such incentives allowing it to possess the lowest price compared to any other vehicles in the passenger vehicle segment.

Figure 2. 4: Production of Motor Vehicles in Indonesia, by Catergory (2011 vs 2018)



Source: The Association of Indonesian Automotive Manufacturers (GAIKINDO)

Figure 2. 5: Wholesales of Motor Vehicles in Indonesia, by Catergory (2011 vs 2018)



Source: The Association of Indonesian Automotive Manufacturers (GAIKINDO)

During the period between 2011 to 2018, the sales of passenger cars in Indonesia has increased by 45.3% to reach around 874K units in 2018. This increase is related to the increase in the Indonesian GDP per capita by 6.8% to reach around US$3893 in 2018, especially with middle class grow from 7 percent to 20 percent of the population, with 52 million Indonesians currently belonging to this group[14].

Figure 2.5 illustrates that the sales market share of most of normal passengers' cars (4*2 / Sedan/ 4*4) decreased from 67.3% in 2011 to 56% in 2018. This decrease is mainly attributed the gaining popularity and demand for the 'affordable energy saving' cars which was introduced in the market in 2014. This new car had captured the shares of almost all other passenger car types, with sales rising from 172,210 units in 2014 to 230,443 units in 2018, representing 20% of all car sales in Indonesia.

Like production, the Indonesian export of passenger vehicles has also increased, from US$1.2 billions in 2008 to reach around

Table 2. 2: Indonesia's Export for Passenger Motor Vehicles, in US$ million, (2018)

Value Chain Segment	2008	2012	2018	Export destinations in 2018
Passenger motor vehicles (Hs code: 870321 – 870322 - 870323 – 870324 - 870332 - 870333)	1232.6	2261.1	3271.9	Philippines (34%), Saudi Arabia (11%), Vietnam (8%), Thailand (7%), Oman (5%), Japan (4%), UAE (4%), Pakistan (3%), S. Africa (3%), Mexico (3%)

Source: Trade map - US$ Million, Extracted on 1/4/2020

US$3.3 billions in 2018 with a higher CAGR of 10.3%. In terms of export destinations, the major importers have predominantly been from developing nations and mostly from Asia. This trend can be attributed to the preferential tariff rates from the ASEAN Free Trade Area (AFTA) bloc agreement that came into effect in 1996 with a goal to "promote automotive market integration and growth, cooperation and investments in the ASEAN region" (ASEAN, n.d.).

Parts and Components

Although the number of OEMs does not differ by much, the number of parts suppliers in Thailand (2,390) far exceeds that of Indonesia (850) and Malaysia (850) (Bulletin of Indonesian Economic Studies, 2015). This limited pool and technological capabilities of suppliers hinders the Indonesian strategy of being a regional hub of automotive industry in Asia Pacific region and attracting more FDI in OEMs plants. Despite Indonesia's high DVA share, 70 per cent of automotive parts still needs to be imported to produce automobiles domestically.

According to Gaikindo, the 20 OEM assembly plants had approximately 250 first-tier parts suppliers and 600 second- and third-tier suppliers in 2012. Indonesia's auto parts and components industry also plays an important role in driving the Indonesian economy, especially in terms of trade flows. Exports of automotive components increased 13 times from 6.2 million components in 2016 to 81 million components in 2017 (Kaiser 2018). This comes primarily from parts such as chassis and body assembly; engine block and transmission assembly; fast-moving spare parts; and batteries; among others.[15]

Export data for auto components in Indonesia's automotive industry using the 6-digit Hs-code (Annex 3) where Indonesia

14. https://www.worldbank.org/en/news/press-release/2020/01/30/expanding-middle-class-key-for-indonesia-future 14. https://www.worldbank.
15. Global Value Chains in ASEAN Automobiles, Jan 2020

has a significant participation in the automotive GVC. In 2018, Indonesian body system parts lead its exports with a value of US$2.29 billions, and the main component under this segment was from the exports of tires, growing from US$888 million in 2008 to US$1.38 billions. This is no surprise given that the country is the largest world producer of rubber. In second, electrical equipment parts earned an export value of US$1.54 billions in 2018, with most of the value coming from wire harness exports (US$982 million).

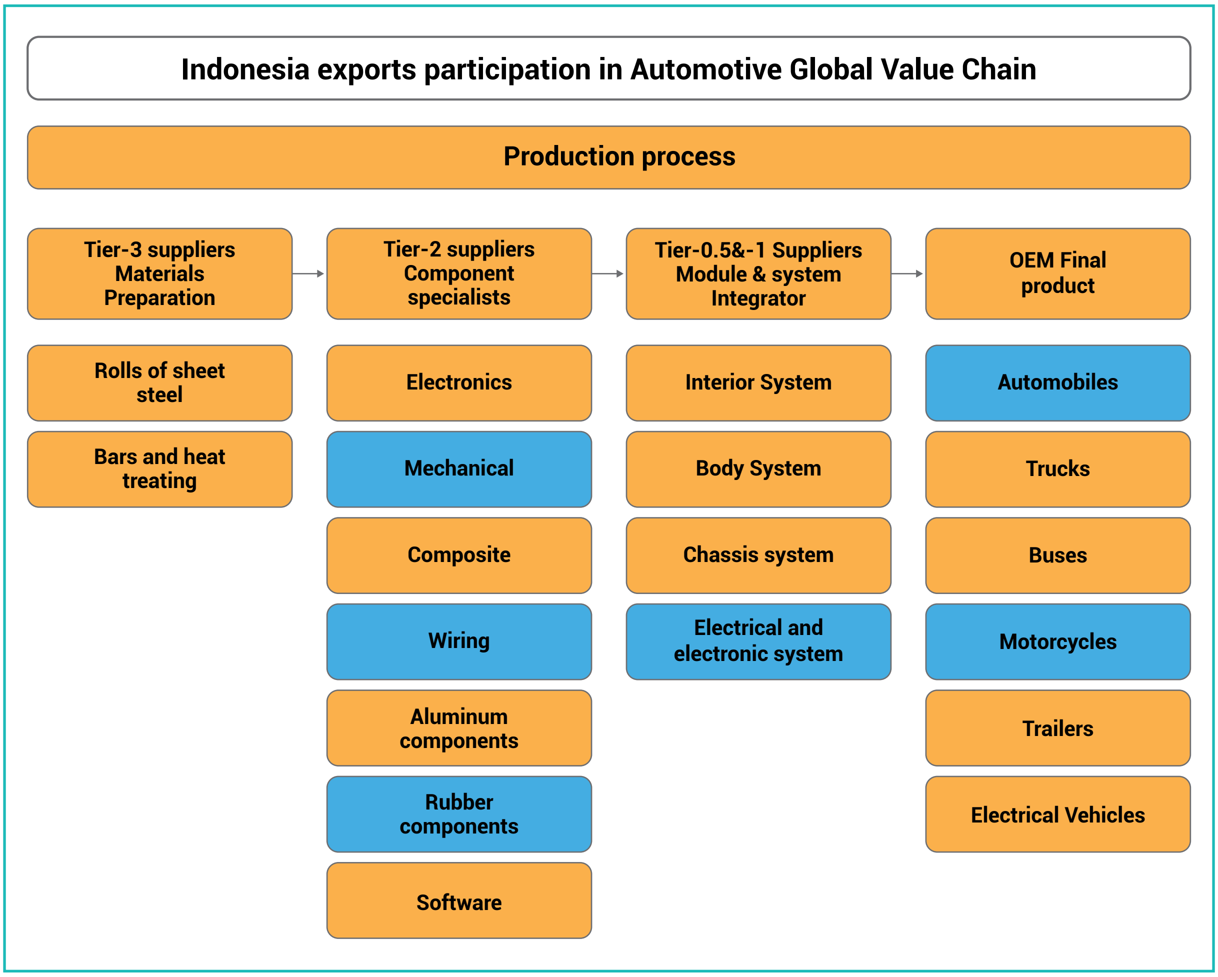
Following body system and electrical equipment is drivetrain parts with around US$1.4 billions of exports in 2018. The major components under this category are: Gearboxes, Engine parts for both petrol and diesel and drive axles. Observing the exports destination of this segment, one can infer that Indonesia is serving as a parts/component base for Thailand and Japan in the production of engines, especially in gear boxes and engine parts (for both petrol and diesel).

While developing Asian countries are the major importers for the Sub-Assembly products (Malaysia at 30.4% share in drivetrain, South Korea at 70.4% in body system), the trend is different for the electrical equipment segment, where Japan, the United Kingdom, and the U.S. have been the dominant player in imports. Indonesia exports 84.8% of wire harness to Japan, 24.5% lead-acid accumulators to the United Kingdom, and 33.1% of electrical lighting/signaling equipment to the U.S. This is illustrative of the region's role as a low-cost production site for low volume to value items.

In addition to its participation in almost of all the segments observed (with the exception of Sub Assembly-Body System and Components-Body System which are big bulky items that tend to be locally produced for assembly rather than traded) it is notable that Thailand is a key partner for Indonesia in the components segment, being the major importer of their products in gear boxes (31.1%), engine parts (40.1% Hs 840991; 50.8% Hs 840999), and body & drive (27.2%).

Finally, the Spark-ignition Engine (Petrol) exports increased from US$69 million in 2008 to US$260 million in 2018 with 14.2% CAGR. This huge increase is still very limited to the overall world exports which is around US$36 billions in 2018.

Figure 2. 6: Indonesia's Exports Participation in the Automotive GVC



Source: Authors

Indonesia's exports participation in the automotive GVC can thus be summarized by Figure 2.5 above. Highlighted in blue, Indonesia has significant participation for mechanical, wiring, and rubber components for Tier-2, electrical and electronic system for Tier-0.5/1, and in automobiles and motorcycles as a final product.

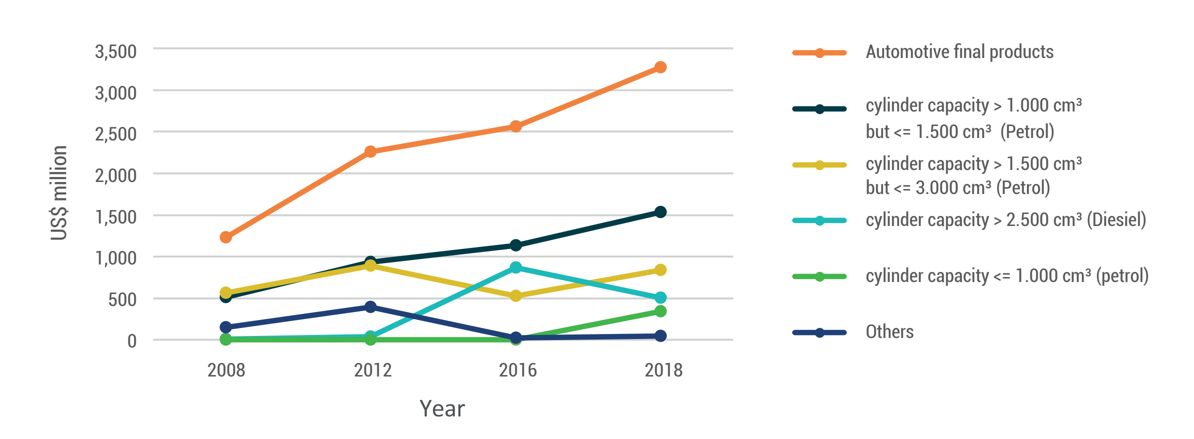
In consideration of the foregoing, exports to more developed and higher value economies will prove to be challenging as Indonesia still lags behind in terms of Euro Emissions Standards (currently at Euro 4 as opposed to Euro 5 in many nations) and safety standards and technology (Indonesia investments, 2018).

Evidence of Upgrading in the Indonesian Automotive Market

Automotive Final Product (Motor Vehicle) Export Analysis

Indonesian passenger cars exports grew by 10% annually from 2008 to 2018 to reach around US$3.2 billions. The top exported product in 2018 is passenger cars with engine of cylinder capacity > 1.000 cm³ but <= 1.500 cm³ (Petrol), it represents around 47% of total exports. The main remarkable development in the Indonesian passenger cars exports is the significant increase of passenger cars of engine cylinder capacity <= 1.000

Figure 2. 7: Indonesian Passenger Vehicles Exports, in US$ million, (2008-2018)



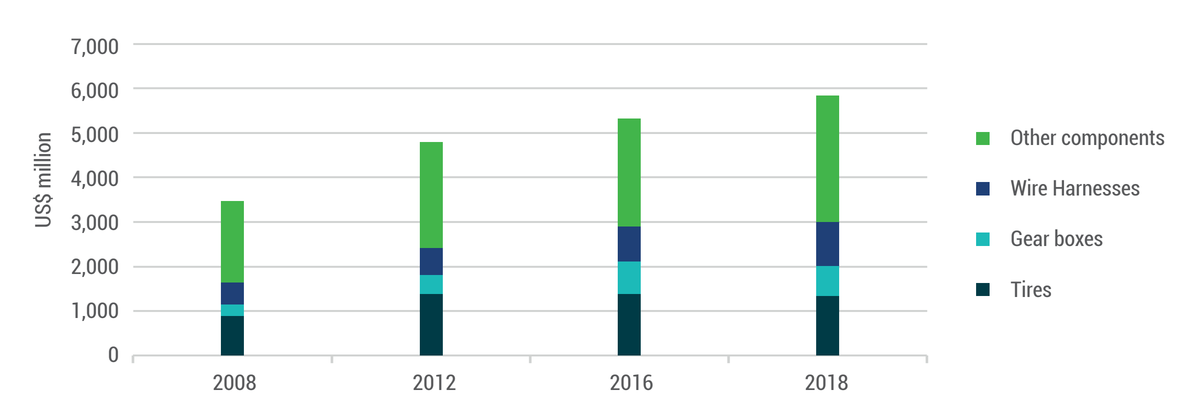
Source: Trade map - US$ million, Extracted on 1/4/2020

cm³ (petrol) from US$0.8 million in 2008 to US$345.5 million in 2018 with 84% CAGR. This significant increase started after 2016. In 2018, 34% of Indonesian exports are destined to the Philippines. The Indonesian exports already penetrated a lot of markets but with a limited scale (e.g. KSA, Vietnam, Oman, Japan, UAE, Mexico etc.).

Automotive Components Export Analysis

Tires, gearboxes and wire harness represent 51% of Indonesian auto components exports in 2018. The Indonesian wire harness exports share from total Indonesian auto components exports increased from 14% in 2008 to 17% in 2018. Indonesia's wire

Figure 2. 8: Indonesian Main Components Exports



Source: Trade map - US$ million, Extracted on 1/4/2020

16. https://investingnews.com/daily/resource-investing/base-metals-investing/copper-investing/copper-production-country/

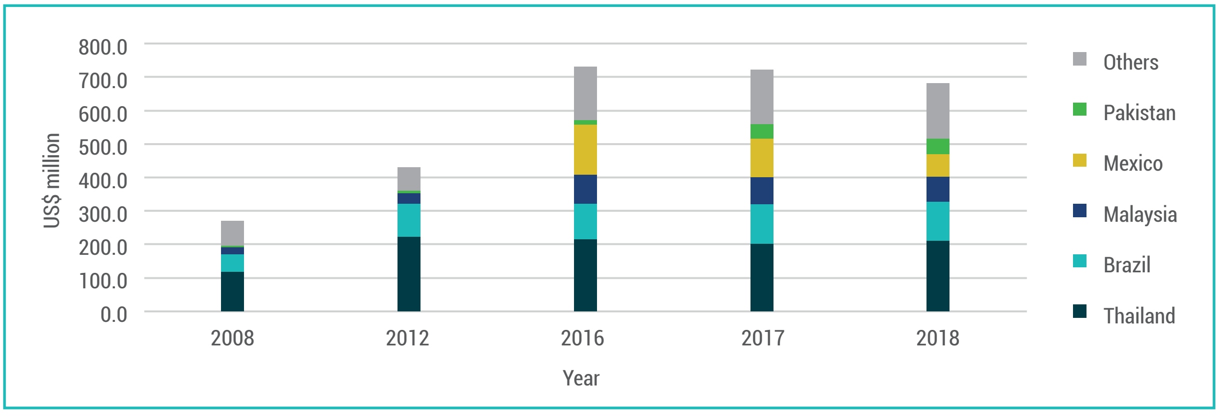
harness production is backed by the Indonesian production of copper (10th world major producer) [16] which is the main component in wire harness. Gearboxes exports also increased from 8% in 2008 to 14% in 2016, before declining to 12% from total Indonesian auto components exports in 2018. The Indonesian tires exports share represented 29% of Indonesian auto components exports in 2012 but since then it has been in a downward trend as its share in 2018 fell to 23%. The domination of tires in Indonesian auto components exports is due to the fact that Indonesia is among the top natural rubber producers in the world.

Automotive Components Export Destination Analysis

- ***Gearbox***

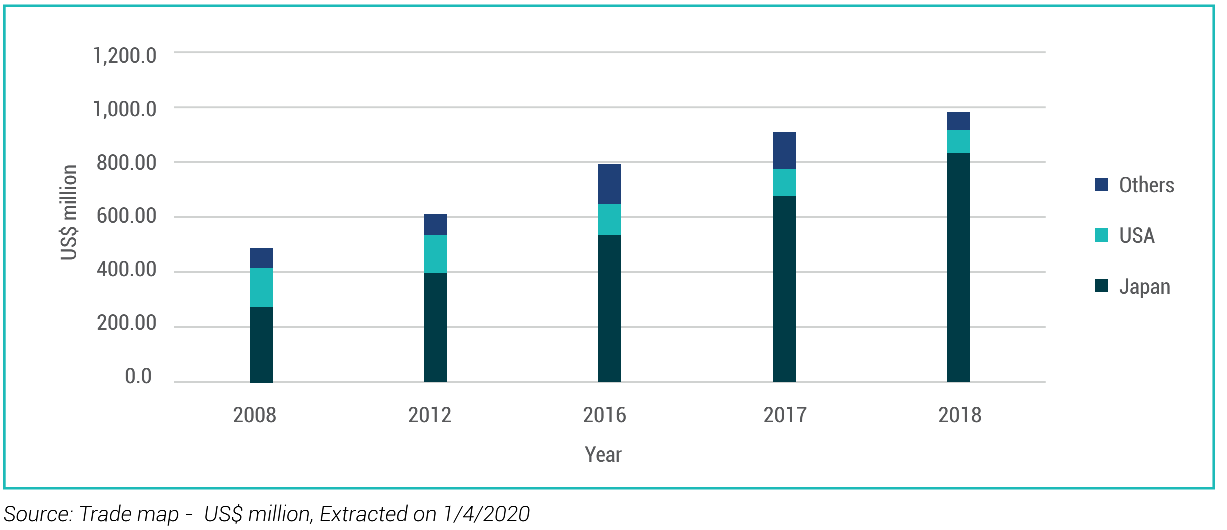
The exports of Indonesian-made gearbox increased over last decade and there are new emergent destinations for Indonesian exports. There were no Indonesian gearbox exports to Mexico in 2008 but in 2018, Mexico received 9.7% of Indonesian exports. Pakistan was importing only 2% of Indonesian exports while the number rose to 7% by 2018. Furthermore, Malaysia also increased its share as an export destination from 8% in 2008 to 11.1% in 2018. Thailand and Brazil remain the main export destinations of Indonesian gearboxes but their share is gradually decreasing.

Figure 2. 9: Indonesian Gearbox Exports, in US$ million, (2008-2018)



Source: Trade map - US$ million, Extracted on 1/4/2020

Figure 2. 10: Indonesian Wire Harness Exports, in US$ million, (2008-2018)



Source: Trade map - US$ million, Extracted on 1/4/2020

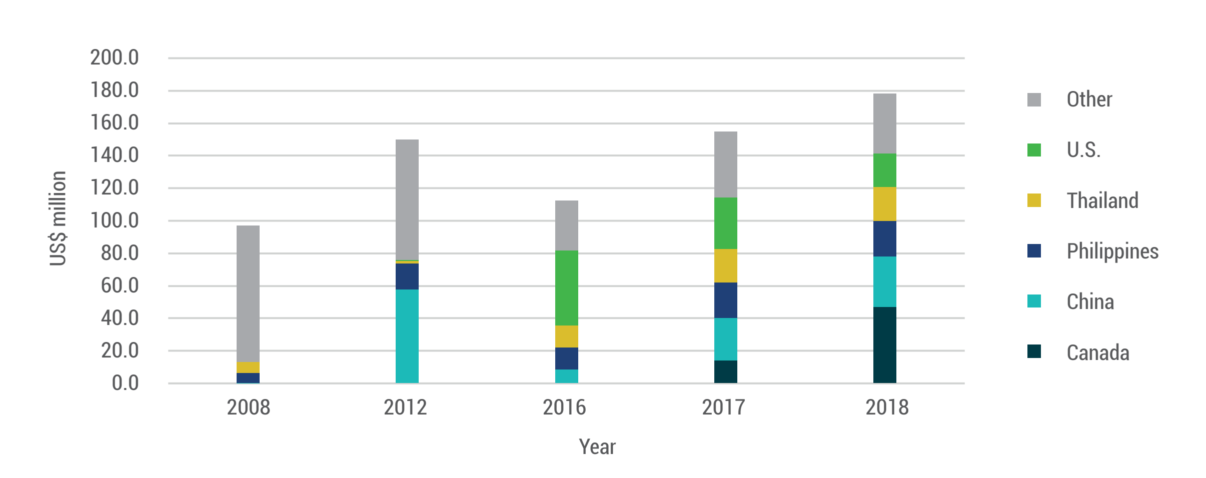
- ***Wire Harness***

Figure 2.11 below illustrates the high dependency of Indonesia on Japanese imports for wire harness, as it represents 84% of Indonesian exports in 2018. The growth has been impressive considering in 2008 Japan's share was 57%, with the U.S. coming in second at 29%.

- ***Drive Axle***

The Indonesian drive axle exports is a success story of diversifying export destinations. Exports to China has increased dramatically from 0% in 2008 to 17.5% (US$31 million) in 2018. Similarly, Canada has also substantially increased its imports in drive axles from 0.2% in 2008 to 26.5% in 2018. Although representing smaller shares, The Philippines and Thailand have increased their shares during the same period.

Figure 2. 11: Indonesian Drive Axle Exports, in US$ million, (2008-2018)



Source: Trade map - US$ million, Extracted on 1/4/2020

Evidence of Supporting Policies/Strategies

Automotive Industry Roadmap (2018-2035): The roadmap (2018-35) was drafted in 2018 based on the new National Industrial Policy 2015-2019 (KIN) and "Making Indonesia 4.0" was announced in March 2018. It outlines the basic strategy for the industry to become the hub for ICE as well as for EV. In the initial period of the Roadmap until 2021, Indonesia will pursue industrial upgrading and export base expansion of ICE, while, after the mid period from 2025 onward, Indonesia aims to produce local EVs.[17]

Low-Cost Green Car (LCGC) Policy: In order to develop the local industry to decrease dependence on imported vehicles and auto parts, and also to promote more fuel efficient and affordable cars in market, the Indonesia government announced the LCGC policy in 2013. The policy promoted local production of low-class passenger cars through incentives, namely exemption of luxury tax. The policy was effective as it attracted investment from 5 Japanese OEMs with an investment value of US$3 billions. It also aims to attract new investment from major suppliers as the policy requires localization of 80% in parts/components (including engine and transmission parts) within 5 years from the start of production, totaling around US$3.5 billions. Number of suppliers increased during this period including new Japanese Tier 1 suppliers such as ADVICS and NHK Springs.[18]

Euro4 Emission Standard: The Government of Indonesia officially launched a policy to certify the implementation of the Euro4 emission standard. The plan came into effect in October 2018 for passenger cars and will be introduced in April 2021 for diesel trucks. The introduction of Euro4 is expected to facilitate car exports from Indonesia to higher value markets, as it is in line with international standards.[19]

Electric Vehicles (EV) incentives: The President of Indonesia signed the long-awaited presidential regulation on Battery Electric Vehicles (BEV) - Presidential Regulation No. 55 of 2019 on Acceleration of Battery Electric Vehicles Program for Road Transportation (PR 55/2019). The aim is to accelerate the BEV program for road transportation by granting fiscal and non-fiscal incentives to industry players. Another key driver for the regulation is to make Indonesia a base for production and export of BEV.[20]

Indonesia EV Lithium-ion battery production developments: China's Tsingshan Group and partners including GEM Co Ltd are building a US$700 million High-Pressure Acid Leaching (HPAL) plant at the PT Indonesia Morowali Industrial Park (IMIP) on Indonesia's Sulawesi island, a nickel mining hub. This plant will give Indonesia the knowledge on how to perform HPAL, a process to extract nickel and cobalt from laterite ores and an important step in the production of lithium batteries. Indonesia has the largest nickel reserves in the world with 21 million tons. The Indonesian authorities have banned exports of nickel ore and pledged to sell it to local smelters at the prevailing international price, in a bid to develop the local processing industry.

17. GOVERNMENT POLICY ON FUTURE AUTOMOTIVE TECHNOLOGY, Ministry of Industry, Republic of Indonesia
18. Automotive Parts Industry in Indonesia, IPSOS Business Consulting,2013
19. https://www.transportpolicy.net/region/asia/indonesia/
20. https://www.lexology.com/library/detail.aspx?g=db292505-9802-420a-b042-ec1c932dbf14

2.3.3. Challenges and Recommendations

This section identifies number of challenges that face the development of the Indonesian Automotive sector and suggest a set of recommendations to overcome these challenges. The set of challenges are identified under three main levels; macro, manufacturing and technological.

Indonesia lags behind Thailand in the overall performance of its logistics sector. In 2018, it ranked 46 compared to Thailand's 32, scoring poorly in 'quality of trade and transport infrastructure' and 'border control efficiency'.

Macro Level Challenges

Challenge	Description	Recommendations
Attracting Foreign Direct Investment	Through FDI, countries are able to get direct access to foreign expertise and technology. One drawback in Indonesia is that it highly relies on Japanese automakers. Thus, it needs to diversify the source of FDI, and to increase the inflows to the industry (FDI has been significantly falling in the past 2 years).	Indonesia should improve its business environment as it is currently ranked 73 among 190 economies in terms of 'Ease of Doing Business', according to 2019 World Bank annual ratings. and lags behind major countries in the region, such as Thailand at 27 and Malaysia at 15. The above deficiencies will be discussed with automotive business community (especially foreign Investor) to identify specific upgrading intervention in Indonesia Business environment that could stimulate foreign investment in the sector.
Highly concentrated automotive manufacturing area	Most automotive industry plants in Indonesia are near the capitals, the severe traffic jams are an obvious problem for "just in time" delivery. Harbor facilities are often overburdened as ships may enter the port but cannot unload due to lack of port storage capacity.[21] Moreover, land prices have soared over the years,[22] which would eventually lead to a grave loss in industrial competitiveness in the international level.	The automotive manufacturing area needs to be developed and expanded to other areas that will divert traffic away from the existing location. The proposed new industrial area could be located near the new deep-sea port at Patimban to ease the access the international markets for both exports and imports. Furthermore, there should be a thorough discussions with automotive private sector on type of incentives that could attract auto manufacturer to the new zone, and if having a special export zone like in Mexico or China will be beneficial or that will hinder their access to domestic market.
Logistics	Well-developed infrastructure facilitates business activities including international trade and FDI. The availability of well-developed infrastructure such as the transportation system has been argued to have contributed to an expansion of trade and FDI as it increases physical connectivity in the country and region. Indonesia lags behind Thailand in the overall performance of its logistics sector. In 2018, it ranked 46 compared to Thailand's 32, scoring poorly in 'quality of trade and transport infrastructure' and 'border control efficiency'.	Develop a national plan that map current logistics infrastructure and identify areas of development. There should be a support to Indonesian government in developing new deep-sea port at Patimban. Patimban will have a dedicated vehicle terminal with an initial capacity of 250,000 units and it would eventually be able to handle 485,000 finished vehicles. Car plants in Indonesia is in Karawang and the surrounding area, currently road congestion between Karawang and Patimban is relatively mild, however there will be a need to further upgrade this road to ensure that it will accommodate all future traffic when the port is fully operational.

21. AUTOMOBILE AND AUTO COMPONENTS INDUSTRIES IN ASEAN: CURRENT STATE AND ISSUES
22. https://www.indonesia-investments.com/business/industries-sectors/automotive-industry/item6047

Manufacturing Level Challenges

Challenge	Description	Recommendations
Aligning standards with requirements of International markets	Technology of LCGC produced in Indonesia needs to be upgraded to global standards conforming to more stringent emission standards due to serious environment pollution in emerging market, low CO2 emission standards, and advanced safety standards so that these vehicles can be exported in various market.	Indonesia will need to keep up with the demands of the industry in terms of quality system certifications and align with other ASEAN countries emission policies with international export markets (Singapore, has already implemented Euro 6/VI, and Thailand, which is expected to implement Euro 6/VI in 2023). The produced automotive final products/components should also adhere with required new technologies by various markets especially what's relevant to safety standards. Further, it will need to support harmonization of standards under the ASEAN Mutual Recognition Arrangement (MRA) for Automotive Products which will enable time savings for obtaining test certifications and ease of access to the whole ASEAN market.
Suppliers base (quality and quantity)	SMEs face greater difficulty in participating in GVCs than large firms for several reasons such as the inability to benefit from economies of scale and the higher constraints of financial and human resources. Not surprisingly, local suppliers are typically concentrated in Tier-2 and Tier-3. Their production is in specific parts, and this, in turn, limits their chances of moving up to higher tiers. Moreover, the generally low technological and innovative capabilities of the local firms that could become suppliers of parts and components are another main challenge in upgrading their position in the value chain.[23] Despite Indonesia's high DVA share, 70 per cent of automotive parts still needs to be imported to produce automobiles domestically.	Indonesia can upgrade its auto suppliers base by establishing a fund for technological upgrade, incentivizing new entrants in the targeted value chain segments (wire harness, transmissions, drive axles, and electronics), supporting the quality and productivity of suppliers through 'Business Development services' including 'lean production', 'quality management', 'production preparation' and 'specific process'.
Electronics components to meet the automotive sector specific requirements	Indonesia has a large electronics industry that caters heavily to the domestic market and that is largely operating in the lower value-added segments of global supply chains[24] so there will be need in upgrading this industry to fit with automotive standards. Engineers in electronics industry is generally, in short supply and this is one of the obstacles for further development of the sector.	Identify product champions or priority products (e.g. Control Units, Sensors etc.) for integration into the automotive value chain. For industrial electronics, engineers in mechatronics, automation, process engineering and IC design will be needed. Given Indonesia's rich mineral resources such as cobalt and nickel in there are important opportunities to build domestic capabilities to process raw materials for the electronics industry in a sustainable manner.

23. Global Value Chains in the ASEAN, Jan 2020
24. https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_732119.pdf

Technological Level Challenges

Challenge	Description	Recommendations
Gap between industry and educational institutions	The Industry megatrends and challenges emerging from these trends are interlinked. Automakers require workers with suitable skills and also provide skills enhancement to their existing workforce. Acceleration of technology in the auto industry to make improvements with electrification, fuel efficiency and autonomous vehicle technology will no doubt intensify the competition for talented skilled workers. Educational institutions in Indonesia are becoming more important to the quality of education, but there is still a gap between industry and educational institutions. There is an apparent lack of knowledge about needs and dynamics at sector-specific levels. Another major challenge is a lack of financing for skills upgrading activities.	Development of technical universities hard infrastructure (i.e. equipment) and improving curriculum to be more suited for requirement of industry. This should be done in close coordination with the lead firms of the industry. A Skills Development Fund may be set up with the Ministry of Manpower (MOM) and supported by the private sector. A comprehensive plan can be developed from the side of government and universities to raise engineers with knowledge and skills sets required by automotive sector and aligned with Indonesian automotive upgrading strategy of approaching higher value-added components.
Limited Research and Development Capabilities in eco-friendly technologies especially EV components	The companies located in Indonesia have few cases of product design, and the needs for designers and developers have not become obvious. Based on the Indonesian government's ambitious plan for the automotive sector and our recommended upgrading trajectories, the needs for designers and developers in the Indonesian automotive market will increase.	Upgrade national human resource for R&D through close cooperation between technical universities and OEMs, with a budget set aside for scholarships of post doctorate students in this field. Develop Center of Excellence (CoE) for lithium batteries in order to attract global companies to collaborate with universities in R&D. Increase awareness and ensure the proper implementation of Indonesian Government Incentives to boost of R&D in the automotive sector (i.e. income tax allowances of up to 300% for industries carrying out R&D activities)

Annexes

Annex (1): Automotive Value Chain Segments Hs codes

VC Stage/ Subassembly	HS Codes (2002)	HS Code Descriptions	VC Sector	Mfg.
Final Products				
Passenger vehicles	87032 87033	87032: Other vehicles, with spark-ignition internal combustion reciprocating piston engine 87033: Other vehicles, with compression-ignition internal combustion piston engine (diesel or semidiesel)	--	Lead Firms
Subassemblies				
Body system	870600	8706: Chassis fitted with engines, for the motor vehicles of headings 87.01-87.05	Chassis	Lead Firms
Drive train	840733 840734 840820	Reciprocating piston engines used for the propulsion of vehicles of Chapter 87; of a cylinder capacity: > 250 cc ≤ 1,000 cc > 1,000 cc Compression-ignition internal combustion piston engines (diesel or semi-diesel engines); of a kind used for the propulsion of vehicles of Chapter 87	Engine	
Components/Parts				
Body system (suspension)	401110 401211 870831+ 870839+ 870870 870880 870894	401110: New pneumatic tires, of rubber; of a kind used on motor cars 401211: Retreaded tires; of a kind used on motor cars (including station wagons and racing cars) Brakes and servo-brakes and parts thereof; 870831: Mounted brake linings 870839: Other 870870: Road wheels and parts and accessories thereof 870880: Suspension systems and parts (incl. shock absorbers) 870894: Steering wheels, columns and boxes	Tires Brakes^ Wheels Suspension systems and parts (incl. shock absorbers) Steering wheel	Suppliers
Body system (panels)	870710 700711 700721 830230	870710: Bodies (incl. cabs), for motor vehicles of headings 87.01-.05; for the vehicles of heading 87.03 700711: Toughened (tempered) safety glass, of size and shape suitable for use in vehicles, aircraft, spacecraft or vessels 700721: Laminated safety glass... 830230: Other mountings, fittings and similar articles suitable for motor vehicles	Body Panels Windows/ Windshield Metal mountings	
Body system (front & rear end modules)	870810 870891 870892 842139 853910	Parts and accessories of the motor vehicles of headings 87.01-87.05; 870810: Bumpers and parts thereof 870891: Radiators 870892: Silencers and exhaust pipes 842139: Filtering or purifying machinery and apparatus for gases; Intake air filters for internal combustion engines; other 853910: Electric filament or discharge lamps, including sealed beam lamp units and ultra-violet or infra-red lamps; arc-lamps; Sealed beam lamp units	Bumpers Radiators Silencers (mufflers)/ exhaust Filters Headlights	
Body system (interior)	940120 870821	940120: Seats of a kind used for motor vehicles 870821: Safety seat belts	Seats Seatbelts^	
	8527211 8527291 910400	85272: Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles, including apparatus capable of receiving also radio-telephony or radiotelegraphy 910400: Instrument panel clocks and clocks of a similar type for vehicles, aircraft, spacecraft or vessels.	Electronic Instruments: Radios Clocks	
Body system (other)	870829	870829: Parts and accessories of the motor vehicles of headings 87.01-87.05.Other parts and accessories of bodies (including cabs); Other	Other	
Drive train	840991 840999	84099: Parts suitable for use solely or principally with the engines of heading 84.07-08.	Engine parts	
	870840 870850 870860+ 870893	Parts/accessories of motor vehicles of headings 87.01- 05; 870840: Gear boxes 870850: Drive-axles with differential, whether or not provided with other transmission components 870860: Non-driving axles and parts thereof 870893: Other parts/accessories; Clutches & parts thereof	Gear boxes Drive-axles Clutches	
Body System/ Drive train	870899	870899: Parts and accessories of the motor vehicles of headings 87.01-87.05.Other parts and accessories; Other	Other Airbags^	
Electrical Equipment	8507*	8507: Electric accumulators, including separators therefor, whether or not rectangular (including square)	Batteries & parts (accumulators)	
	8511*	8511: Electrical ignition or starting equipment of a kind used for spark-ignition or compression-ignition internal combustion engines (for example, ignition magnetos, magneto-dynamos, ignition coils, sparking plugs and glow plugs, starter motors); generators (for example, dynamos, alternators) and cut-outs of a kind used in conjunction with such engines.	Ignition & parts	
	854430	854430: Ignition wiring sets and other wiring sets of a kind used in vehicles, aircraft or ships	Wire harnesses	
	851220 851230 851240 851290	8512: Electrical lighting or signaling equipment (excl. articles of heading 85.39), windscreen wipers, defrosters and demisters, used for cycles or motor vehicles. NOTE: all of 8512 except 851210 (pertains to bicycles).	Signaling Lighting/ visual, sound, windscreen wipers, parts	

Source: Sturgeon& et, 2016

Annex (2): Tables of top exporters and importers in various automotive value chain segments

Top 10 Exporters of Drivetrain, By Value 2010-2018 (in US$ billions)

Exporters	Export Value (US$ billions)					Export Share				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**35.3850**	**41.7826**	**46.3687**	**44.6148**	**54.0683**	**100%**	**100%**	**100%**	**100%**	**100%**
Japan	5.6157	5.1454	4.8527	5.6953	7.0393	15.9%	12.3%	10.5%	12.8%	13.0%
U.S.	5.2259	5.9198	5.4468	6.3140	6.9131	14.8%	14.2%	11.7%	14.2%	12.8%
Germany	3.1970	3.7967	5.4927	4.7874	5.2466	9.0%	9.1%	11.8%	10.7	9.7%
Mexico	1.5123	2.7012	3.5679	4.1844	4.0066	4.3%	6.5%	7.7%	9.4%	7.4%
Hungary	2.8258	3.6521	4.0520	3.5284	3.9616	8.0%	8.7%	8.7%	7.9%	7.3%
China	1.5332	1.9328	2.2089	2.3550	3.1467	4.3%	4.6%	4.8%	5.3%	5.8%
Canada	2.6590	2.6909	2.5972	2.6151	2.4135	7.5%	6.4%	5.6%	5.9%	4.5%
Austria	2.8249	2.3788	2.1794	1.9807	2.3323	8.0%	5.7%	4.7%	4.4%	4.3%
Thailand	0.7923	1.1416	1.2354	1.1118	2.2216	2.2%	2.7%	2.7%	2.5%	4.1%
France	0.5976	0.8362	0.7170	0.4449	2.1372	1.7%	2.0%	1.5%	1.0%	4.0%
Indonesia	0.0875	0.0926	0.1392	0.3192	0.4504	0.2%	0.2%	0.3%	0.7%	0.8%

Source: Trade map, US$ billions, Downloaded on 1/4/2020

Top 10 Importers of Drivetrain, By Value 2010-2018 (in US$ billions)

Exporters	Export Value (US$ billions)					Export Share				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**38.9240**	**43.7184**	**45.8281**	**41.8457**	**50.8427**	**100%**	**100%**	**100%**	**100%**	**100%**
U.S.	7.2738	10.9517	11.5296	11.0641	11.9858	18.7%	25.1%	25.2%	26.4%	23.6%
Canada	4.2518	4.7967	4.1368	4.9066	4.5334	10.9%	11.0%	9.0%	11.7%	8.9%
Germany	5.2546	4.9514	4.2927	3.1962	4.1155	13.5%	11.3%	9.4%	7.6%	8.1%
Mexico	1.7627	2.3622	2.1049	2.2373	3.2293	4.5%	5.4%	4.6%	5.3%	6.4%
China	2.6567	2.3523	2.3668	2.1504	2.6570	6.8%	5.4%	5.2%	5.1%	5.2%
Spain	1.2202	1.1818	2.0786	1.6364	1.8591	3.1%	2.7%	4.5%	3.9%	3.7%
Slovakia	0.2870	0.8586	0.8095	0.6674	1.3798	0.7%	2.0%	1.8%	1.6%	2.7%
Czech Republic	1.0726	1.0099	1.3685	0.8324	1.3650	2.8%	2.3%	3.0%	2.0%	2.7%
Russian Federation	1.2049	2.3823	2.2353	0.9134	1.3295	3.1%	5.4%	4.9%	2.2%	2.6%
Turkey	0.4345	0.4581	0.6621	0.8243	1.1624	1.1%	1.0%	1.4%	2.0%	2.3%
Indonesia	0.2048	0.2654	0.2792	0.1582	0.2909	0.5%	0.6%	0.6%	0.4%	0.6%

Source: Trade map, US$ billions, Downloaded on 1/4/2020

Top 10 Exporters of Electrical Equipment, By Value 2010-2018 (in US$ million)

Exporters	2010	% of world exports	2012	% of world exports	2015	% of world exports	2016	% of world exports	2017	% of world exports	2018	% of world exports
World	**84,482**	**100.0%**	**102,050**	**100.0%**	**116,939**	**100.0%**	**122,702**	**100.0%**	**135,248**	**100.0%**	**151,847**	**100.0%**
China	12,031	14.2%	15,456	15.1%	19,508	16.7%	18,968	15.5%	20,506	15.2%	24,241	16.0%
Mexico	6,990	8.3%	9,171	9.0%	12,458	10.7%	12,796	10.4%	13,004	9.6%	14,347	9.4%
Germany	6,715	7.9%	7,750	7.6%	8,461	7.2%	9,069	7.4%	10,321	7.6%	11,329	7.5%
U.S.	6,308	7.5%	7,808	7.7%	9,438	8.1%	9,823	8.0%	10,355	7.7%	10,937	7.2%
Japan	7,896	9.3%	9,128	8.9%	8,009	6.8%	9,006	7.3%	9,871	7.3%	10,659	7.0%
South Korea	5,200	6.2%	6,547	6.4%	7,016	6.0%	7,583	6.2%	8,311	6.1%	9,591	6.3%
Czech Republic	2,724	3.2%	3,345	3.3%	3,543	3.0%	3,983	3.2%	4,461	3.3%	4,804	3.2%
Vietnam	1,255	1.5%	2,215	2.2%	2,948	2.5%	3,011	2.5%	3,513	2.6%	4,108	2.7%
France	3,123	3.7%	3,322	3.3%	3,172	2.7%	3,304	2.7%	3,693	2.7%	3,887	2.6%
Romania	2,079	2.5%	2,561	2.5%	3,022	2.6%	3,467	2.8%	3,568	2.6%	3,879	2.6%
Poland	2,173	2.6%	2,194	2.2%	2,650	2.3%	2,765	2.3%	3,133	2.3%	3,734	2.5%
Indonesia	1,065	1.3%	1,223	1.2%	1,210	1.0%	1,354	1.1%	1,448	1.1%	1,545	1.0%

Source: Trade map, US$ million, Downloaded on 1/4/2020

Top 10 Importers of Electrical Equipment, By Value 2010-2018 (in US$ million)

Importers	2010	% of world imports	2012	% of world imports	2015	% of world imports	2016	% of world imports	2017	% of world imports	2018	% of world imports
U.S.	**14,911**	**17.3%**	**19,798**	**19.3%**	**25,142**	**21.6%**	**25,506**	**20.9%**	**27,012**	**20.0%**	**30,197**	**19.7%**
Germany	9,500	11.0%	10,997	10.7%	12,627	10.9%	13,416	11.0%	15,269	11.3%	16,471	10.8%
China	7,487	8.7%	7,244	7.0%	7,082	6.1%	7,207	5.9%	7,815	5.8%	9,304	6.1%
Japan	5,064	5.9%	6,467	6.3%	6,486	5.6%	6,670	5.5%	7,086	5.2%	7,941	5.2%
France	3,818	4.4%	4,211	4.1%	4,321	3.7%	4,543	3.7%	5,396	4.0%	6,082	4.0%
Mexico	2,995	3.5%	3,577	3.5%	4,914	4.2%	5,339	4.4%	5,151	3.8%	5,479	3.6%
UK	3,082	3.6%	3,572	3.5%	4,627	4.0%	4,789	3.9%	5,073	3.8%	5,442	3.6%
Canada	3,290	3.8%	4,298	4.2%	4,537	3.9%	4,764	3.9%	5,061	3.7%	5,115	3.3%
Spain	2,112	2.4%	2,159	2.1%	3,403	2.9%	3,768	3.1%	4,078	3.0%	4,619	3.0%
South Korea	2,065	2.4%	2,623	2.6%	2,894	2.5%	2,982	2.4%	3,261	2.4%	4,021	2.6%
Hong Kong, China	2,255	2.6%	2,291	2.2%	2,416	2.1%	2,475	2.0%	2,893	2.1%	3,367	2.2%
Indonesia	776	0.9%	884	0.9%	634	0.5%	678	0.6%	874	0.6%	1,020	0.7%

Source: Trade map, US$ million, Downloaded on 1/4/2020

Top 10 Exporters of Drivetrain, By Value 2010-2018 (in US$ million)

Exporters	2010	% of world exports	2012	% of world exports	2015	% of world exports	2016	% of world exports	2017	% of world exports	2018	% of world exports
World	121,331	100.0%	**149,732**	100.0%	**149,286**	100.0%	**154,806**	100.0%	**169,458**	100.0%	**180,524**	100.0%
Germany	25,903	21.3%	32,047	21.4%	32,599	21.8%	33,184	21.4%	36,206	21.4%	38,572	21.4%
Japan	25,603	21.1%	30,633	20.5%	22,861	15.3%	25,292	16.3%	27,941	16.5%	29,171	16.2%
U.S.	12,278	10.1%	14,447	9.6%	15,472	10.4%	15,882	10.3%	17,606	10.4%	18,745	10.4%
Mexico	6,046	5.0%	7,972	5.3%	10,799	7.2%	11,229	7.3%	11,664	6.9%	12,916	7.2%
China	4,544	3.7%	6,502	4.3%	8,402	5.6%	8,108	5.2%	8,722	5.1%	9,771	5.4%
South Korea	2,295	1.9%	5,445	3.6%	7,431	5.0%	7,924	5.1%	7,299	4.3%	7,549	4.2%
France	6,814	5.6%	6,056	4.0%	5,521	3.7%	5,828	3.8%	6,187	3.7%	6,163	3.4%
Italy	3,694	3.0%	5,178	3.5%	4,705	3.2%	4,743	3.1%	5,273	3.1%	5,902	3.3%
Poland	1,788	1.5%	2,176	1.5%	2,400	1.6%	2,635	1.7%	2,906	1.7%	3,542	2.0%
Thailand	1,282	1.1%	1,658	1.1%	1,999	1.3%	2,328	1.5%	2,983	1.8%	3,360	1.9%
Canada	2,785	2.3%	2,758	1.8%	2,902	1.9%	2,885	1.9%	2,907	1.7%	3,251	1.8%
UK	2,483	2.0%	2,933	2.0%	3,179	2.1%	2,791	1.8%	2,860	1.7%	3,099	1.7%
Brazil	2,494	2.1%	2,959	2.0%	2,097	1.4%	1,687	1.1%	1,947	1.1%	2,019	1.1%
Indonesia	735	0.6%	995	0.7%	1,131	0.8%	1,220	0.8%	1,355	0.8%	1,366	0.8%

Source: Trade map, US$ million, Downloaded on 1/4/2020

Top 10 Importers of Drivetrain, By Value 2010-2018 (in US$ million)

Importers	2010	% of world imports	2012	% of world imports	2015	% of world imports	2016	% of world imports	2017	% of world imports	2018	% of world imports
U.S.	**16,798**	**13.5%**	**23,304**	15.2%	**25,193**	17.0%	**24,289**	15.9%	**24,559**	14.6%	**26,022**	14.4%
China	11,521	9.2%	13,669	8.9%	14,558	9.8%	16,294	10.6%	17,904	10.6%	19,196	10.6%
Germany	10,611	8.5%	13,490	8.8%	13,150	8.9%	14,759	9.6%	17,580	10.4%	18,708	10.4%
Mexico	7,449	6.0%	9,859	6.4%	10,737	7.2%	11,046	7.2%	12,382	7.3%	13,235	7.3%
UK	6,768	5.4%	8,122	5.3%	7,593	5.1%	7,641	5.0%	8,119	4.8%	8,441	4.7%
France	5,879	4.7%	5,920	3.9%	5,756	3.9%	6,144	4.0%	6,837	4.1%	7,394	4.1%
Canada	7,247	5.8%	7,928	5.2%	5,982	4.0%	6,000	3.9%	6,081	3.6%	6,447	3.6%
Thailand	3,390	2.7%	5,772	3.8%	4,232	2.9%	4,667	3.0%	4,828	2.9%	5,036	2.8%
Spain	2,627	2.1%	2,641	1.7%	3,861	2.6%	3,929	2.6%	4,065	2.4%	4,358	2.4%
Italy	2,809	2.2%	3,208	2.1%	3,808	2.6%	3,904	2.6%	4,247	2.5%	4,234	2.3%
Austria	2,978	2.4%	3,098	2.0%	2,878	1.9%	3,127	2.0%	3,429	2.0%	3,852	2.1%
Hungary	2,364	1.9%	2,941	1.9%	3,381	2.3%	3,474	2.3%	3,613	2.1%	3,505	1.9%
Indonesia	1,499	1.2%	2,165	1.4%	1,360	0.9%	1,434	0.9%	1,853	1.1%	2,350	1.3%

Source: Trade map, US$ million, Downloaded on 1/4/2020

Top 10 Exporters of Body System, By Value 2010-2018 (in US$ million)

Exporters	2010	% of world exports	2012	% of world exports	2015	% of world exports	2016	% of world exports	2017	% of world exports	2018	% of world exports
World	**179,171**	**100.0%**	**217,555**	**100.0%**	**221,560**	**100.0%**	**227,482**	**100.0%**	**240,624**	**100.0%**	**258,521**	**100.0%**
Germany	26,817	15.0%	32,897	15.1%	33,004	14.9%	33,785	14.9%	36,383	15.1%	38,978	15.1%
China	15,334	8.6%	21,897	10.1%	24,408	11.0%	24,685	10.9%	26,795	11.1%	29,147	11.3%
U.S.	19,949	11.1%	24,213	11.1%	26,156	11.8%	25,618	11.3%	25,988	10.8%	27,464	10.6%
Mexico	8,366	4.7%	11,660	5.4%	14,895	6.7%	15,317	6.7%	15,628	6.5%	16,968	6.6%
Czech	7,737	4.3%	9,088	4.2%	11,347	5.1%	12,298	5.4%	12,822	5.3%	13,645	5.3%
Poland	5,964	3.3%	6,994	3.2%	8,161	3.7%	8,913	3.9%	10,144	4.2%	11,804	4.6%
Japan	12,971	7.2%	13,333	6.1%	9,390	4.2%	9,815	4.3%	9,999	4.2%	10,489	4.1%
South Korea	4,307	2.4%	7,920	3.6%	8,783	4.0%	9,243	4.1%	8,649	3.6%	8,939	3.5%
France	8,785	4.9%	8,840	4.1%	7,575	3.4%	7,762	3.4%	7,956	3.3%	8,188	3.2%
Canada	5,766	3.2%	6,888	3.2%	7,645	3.5%	7,111	3.1%	7,121	3.0%	8,042	3.1%
Italy	4,705	2.6%	5,456	2.5%	4,949	2.2%	5,166	2.3%	5,771	2.4%	6,318	2.4%
Indonesia	1,959	1.1%	2,250	1.0%	2,051	0.9%	2,220	1.0%	2,258	0.9%	2,290	0.9%

Source: Trade map, US$ million, Downloaded on 1/4/2020

Top 10 Importers of Body System, By Value 2010-2018 (in US$ million)

Importers	2010	% of world imports	2012	% of world imports	2015	% of world imports	2016	% of world imports	2017	% of world imports	2018	% of world imports
U.S.	29,948	16.2%	40,106	17.5%	47,452	20.3%	46,523	19.7%	46,054	18.4%	49,602	18.2%
Germany	21,473	11.6%	26,518	11.6%	27,590	11.8%	29,151	12.4%	30,731	12.3%	31,401	11.5%
Mexico	8,344	4.5%	11,668	5.1%	13,847	5.9%	12,717	5.4%	14,228	5.7%	15,496	5.7%
Canada	12,534	6.8%	15,334	6.7%	14,192	6.1%	14,501	6.1%	14,346	5.7%	14,226	5.2%
UK	8,874	4.8%	9,368	4.1%	10,239	4.4%	10,564	4.5%	10,988	4.4%	12,013	4.4%
China	7,583	4.1%	9,581	4.2%	10,632	4.6%	10,510	4.5%	10,551	4.2%	11,629	4.3%
France	8,202	4.4%	8,732	3.8%	8,343	3.6%	8,645	3.7%	9,507	3.8%	10,667	3.9%
Russia	7,138	3.9%	12,718	5.6%	5,168	2.2%	5,152	2.2%	7,097	2.8%	8,375	3.1%
Spain	5,496	3.0%	5,168	2.3%	6,879	2.9%	7,273	3.1%	7,757	3.1%	8,053	3.0%
Czech	3,590	1.9%	4,907	2.1%	5,603	2.4%	6,300	2.7%	6,694	2.7%	7,609	2.8%
Japan	4,512	2.4%	5,738	2.5%	5,495	2.4%	5,622	2.4%	6,038	2.4%	6,766	2.5%
Belgium	6,957	3.8%	7,069	3.1%	5,545	2.4%	5,758	2.4%	5,989	2.4%	6,165	2.3%
Indonesia	740	0.4%	1,289	0.6%	1,007	0.4%	996	0.4%	1,184	0.5%	1,563	0.6%

Source: Trade map, US$ million, Downloaded on 1/4/2020

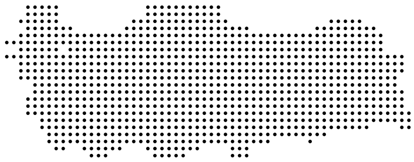
Annex (3): Indonesia's Exports for Auto Components, in US$ million, (2008, 2012 & 2018)

Value chain	Product code	Product label	2008	2012	2018	Export destinations in 2018
Subassembly - Drive Train			87	112	263	
	'840734	Spark-ignition Engine (Petrol)	69	88	260	Malaysia (30%), Vietnam (22%), Philippines (12%), Taipei (12%), Argentina (9%), India (6%), Thailand (5%)
Parts - Electrical equipment			1,152	1,223	1,545	
	854430	Wire Harness	484	612	982	Japan (85%), U.S. (9%), Thailand (3%)
	'850710	Lead-acid accumulators	231	145	203	UK (25%), Malaysia (15%), Saudi Arabia (8%), Philippines (6%), UAE (6%), Spain (5%), Singapore (4%), Italy (3%), Thailand (3%), Sudan (2%)
	'851290	Parts of electrical lighting or signaling equipment	25	53	95	U.S. (33%), Thailand (14%), Malaysia (9%), Japan (6%), China (6%), UK (5%), Singapore (4%), France (3%), Poland (3%), Mexico (3%)
Parts- Drive Train			598	995	1,366	
	'870840	Gear boxes	270	431	680	Thailand (31%), Brazil (17%), Malaysia (11%), Mexico (10%), Pakistan (7%), India (7%), China (5%), Turkey (3%), Taipei (2%), Vietnam (2%)
	'840991	Engine Parts (Petrol)	102	223	227	Thailand (40%), Japan (18%), Vietnam (9%), India (9%), China (7%), Brazil (4%), Taipei (3%)
	'840999	Engine parts (Diesel)	101	111	199	Thailand (51%), Japan (31%), China (8%), UAE (2%)
	'870850	Drive-axles	97	150	178	Canada (27%), China (18%), Philippines (12%), Thailand (12%), U.S. (12%), India (6%), Vietnam (5%), Malaysia (5%)
Parts - Body system			1,404	2,250	2,290	
	'401110	Tires	888	1,379	1,338	U.S. (45%), Japan (8%), Malaysia (5%), Australia (4%), Philippines (3%), Saudi Arabia (3%), Egypt (3%), UK (2%), Thailand (2%), Brazil (2%)
	'870870	Road wheels	224	282	298	Japan (56%), Germany (13%), Netherlands (8%), India (8%), Malaysia (4%), U.S. (3%)
Parts - Body & Drive			222	211	368	
	870899	other (Airbag... etc.)	222	211	368	Malaysia (30%), Thailand (27%), India (9%), Japan (8%), Pakistan (5%), S. Africa (4%), Philippines (3%), Brazil (3%), China (2%), Vietnam (2%)
Grand Total			**3,463**	**4,791**	**5,833**	

Chapter 3

THE GLOBAL TEXTILE AND APPAREL VALUE CHAINS

3.1 PROSPECTS FOR UPGRADING THE TEXTILE INDUSTRY AS THE DRIVING FORCE OF THE TURKISH ECONOMY



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Summary

The Islamic Development Bank's (IsDB) new business model with Global Value Chain (GVC) based Member Country Partnership Strategy (MCPS) aims to identify the bottlenecks, opportunities and challenges in Member Countries' (MCs) integration and upgrading within certain GVCs. The GVC Selection Analysis based on IsDB's GVC methodology and consultations with stakeholders have shown that the textile industry is one of the industries whereby Turkey has natural, dynamic, spillover and surplus potential to increase its international competitiveness, engage in more value-added activities and create employment opportunities. Accordingly, this Preliminary GVC Analysis on the textile industry provides a brief GVC-based analysis in identifying the opportunities and challenges in upgrading within the GVCs. Pending the confirmation from the Turkish Government, this brief analysis will be the basis of a more detailed, full GVC analysis on the ground for the selected industries.

In the last thirty years, Turkey has achieved considerable success with its integration to the textile GVC. Nevertheless, technological developments, demographic shifts, transformations in the global economy, global trends and international competition necessitate going further and upgrading of Turkish textile industry in the GVCs. The upgrading of Turkish textile industry at the global level would not only address the gaps in Turkey's domestic economic transformation in terms of creating employment opportunities, increasing value added, and catching up with latest technological developments for the 4th Industrial Revolution but also provide the basis for international competitiveness, attracting high quality foreign investment and achieving environment friendly sustainable economic development.

This report builds a bridge between global and domestic level value chain analysis for the Turkish textile industry. In doing so, the global level analysis identifies the lead firms in the textile GVC, emerging trends and technologies whereas the domestic level analysis finds the Turkey-based leading textile companies. Moreover, several upgrading trajectories in the GVC are explained and suggestions are made. Covering both apparel, home and technical textile aspects of the Textile Industry, this report makes three key contributions for the Turkish textile industry's upgrading in the GVCs:

- In the apparel and home textile markets, the highest value-added activities include design, marketing and branding activities. Although Turkey has achieved considerable success in the production and design activities, more emphasis should be placed on marketing and branding. This report explains how a GVC analysis can guide the strategic interventions for this purpose.

- In the component segments of the chain, with the advances in the linkages between textile and other industries such as automotive, medical devices, and other manufacturing industries, Turkey can take advantage of the emerging technical textile sector in the country by finding niche areas to be more competitive at the international level. The emerging carbon fiber and medical textiles sectors are examined in the report to illustrate the opportunities to upgrade the textile GVC.

- Along the entire value chain, the textile industry can pursue environment friendly sustainable economic development, can take advantage of new technologies for reducing energy, water consumption and waste management for creating a circular economy for the sector. This would not only reduce production costs but also increases value added for textile production and will position Turkey as a niche market for the textile GVC.

3.1.1. Introduction

From the 1930s to 1980s, the focus of the textile and clothing industry in Turkey was to meet domestic demand. Cotton, silk, and traditional manufacturing skills in wool and growing natural raw materials, as well as large-scale public investments in both natural fiber and synthetic fiber production have been the important initial advantages for Turkey. The development of the textile and clothing industry in Turkey has differentiated from similar economies. In relatively late industrialized, developing countries, there are examples where "downstream" production, i.e., contract textile production, developed and the progress is made at various levels in vertical integration towards "upstream" production over the time. In Turkey, the industry has created an important capacity through upstream investments based both on natural and synthetic fibers since the 1930s, and the structure based on contract production in apparel has become widespread in the 1980s along with export-based production. While the establishment of capital-intensive yarn and fabric facilities in the 1930s and 1960s played an important role in this development, the establishment of facilities such as Petkim as an input provider in synthetic fibers as well as Aksa and Sasa as fiber producers also had a key role in the aforementioned positive differentiation.

In the 1990s, both weaving and knitting fabric and yarn production capacity increased significantly with new investments. New producers were added to the major textile producing groups of the previous period. While companies such as Altınyıldız, Akkök Group, Sabancı Group and Söktaş represent

Turkish textile and apparel manufacturers started to export to over **170** countries, reaching **US$23 billions,** equivalent of **17.5%** of Turkey's total exports and **11%** of total employment in 2010.

the first group, Sanko, Çalık, Orta Anadolu represent the second group. Two important institutional milestones for Turkey are the Customs Union treaty signed between Turkey and the European Union (EU) in 1996 which eliminated customs duties between the countries, and the end of the Multi-Fibre Arrangement (MFA) in 2005, which eliminated the quota regime.

Particularly since the 2000s, some of the production capacity was cut off in product groups where competitiveness was low compared to East Asian countries, especially China. There has been a structural transformation in the industry in line with the supply policies of major procurement groups. Major yarn and fabric manufacturers have largely quit manufacturing standard products where competition was high. Some groups have invested in these product groups in countries with lower production costs (Söktaş' raw cloth investment in India, Çalık Group's investments in Uzbekistan can be cited as examples). The industry started to concentrate on specialty fabrics in woven fabric production, resulting in an increased production of value-added products, which are used as inputs to global brands. Despite the increase in apparel exports and increased demand, the industry turned to imports rather than developing the production capacity especially in synthetic yarns and fabrics, in part because of the high value of Turkish Lira (TRY).

After 2011, partial improvements have been observed in production and exports with the support of additional import taxes, branding, promotion and design incentives. After the impact of the global financial crisis since 2008, EU countries started to source their production from nearby countries in order to reduce inventory costs. Their choice of Turkey in mid-segment products have also contributed to the rise in exports and production. These developments paved the way for Turkey's integration to the textile GVC.

By 2008, Turkey became the fifth largest global apparel supplier and the second largest supplier to the European Union, which accounted for 80% of exports.[1] Turkey integrated the textile GVC as a full-package supplier to global brands, in contrast to the many other emerging economies which entered the textile GVC with cut, make, trim (CMT) assembly operations.[2] By 2008, Turkish textile and apparel manufacturers started to export to over 170 countries, reaching US$23 billions, equivalent of 17.5% of Turkey's total exports and 11% of total employment in 2010.[3]

The capacity utilization rate (CUR) in textile-clothing-leather industry followed a fluctuating course in the 2007-2018 period. The CUR decreased in 2008-2009 due to the decline in exports as a result of contraction in global demand. Since 2010, CUR increased both due to the global demand that has started to recover and due to increased protection measures, particularly with additional taxation on imports. The sharp decline in exports to Russia has been critical in the decline in capacity utilization in the 2015-2016 period. It has been noted that exports and hence production increased, and consequently, CUR increased in 2017 and 2018, in part because of the competitive advantage provided by the depreciation of TRY. Turkey's total textile-related exports were approximately US$29 billions in 2017.[4]

In this report, the textile industry is broken into the following categories:

- Textile components: knit and woven fabric, yarn (staple, filament, unprocessed) and fiber.
- Technical components: nonwoven fabrics, coated fabrics, industrial fabrics and yarn, narrow fabrics, specialty yarn and thread.
- Industrial products: Misc. Final Products, Bags, Rope/Cord, Outdoor Canvas Products, Nonwoven Products, Used Industrial Products
- Home textiles: Linens, Floor Coverings, Curtains/Drapes, Wall Coverings/Tapestries;
- Apparel

In terms of product categories, apparel export reached US$17.7 billions, apparel component export (apparel fabric, yarn and fiber) reached US$6.2 billions, non-apparel final product export such as home furnishings (floor coverings, linens) and industrial products reached US$4 billions, and non-apparel component export of different kinds of fabrics and yarn reached US$0.9 billions.

Some of key findings are:

- Turkey's export value of apparel was ranked 6th in 2017 with a 3.3% global market share and 7th in 2018 with a 3.2% global market share.
- Turkey's export value of home furnishings (primarily floor coverings and linens) increased by 40% between 2012 and 2017; above the world average of 13%.
- Turkey's export value of industrial products (mainly bags and miscellaneous final products) increased by 9% between 2012 and 2017; below the world average of 20%.
- Turkey's export value of non-apparel textile components (primarily nonwoven fabrics) increased by 38% between 2012 and 2017.
- As of 2017, Turkey's top nonwoven fabric export destinations are EU-15 (29%), U.S. (11%), Iran (7%), Israel (6%, for 2016) and Egypt (6%)

The next section describes IsDB's GVC methodology that shows Turkey's natural, dynamic, spillover and surplus potential in the textile GVC with identification of product champions.

1. Fernandez-Stark, K., Stacey Frederick, and Gary Gereffi. (2011). "The apparel global value chain: Economic upgrading and workforce development. Durham, U.S.: Duke Global Value Chains Center (Duke GVCC).
2. Ibid
3. Ibid
4. Export data is based on partner imports; the values may differ from Turkey's reported exports.

3.1.2. Quantitative Analysis of Industry in Turkey (IsDB methodology)

The Islamic Development Bank Global Value Chains Methodology

To align markets with development programs, it is important to focus on areas that are both promising and competitive and that offer inclusive development solutions. This concept, which can be described as inclusive competitiveness, would allow markets or the private sector to participate actively in a development program that can boost market competitiveness and foster development by creating more inclusive development goals such as the creation of high-quality jobs and the promotion of sustainable export competitiveness.

To identify and subsequently develop the sectors with the most potential that Turkey needs to focus on to achieve its high value-add increase and job creation targets, an analytical model of "Making Markets Work for Development through Global Value Chains"[5] was utilized. This instrument is a GVC methodology and a filtering tool to identify sector and product champions of a country. It is based on three criteria (Figure 1).

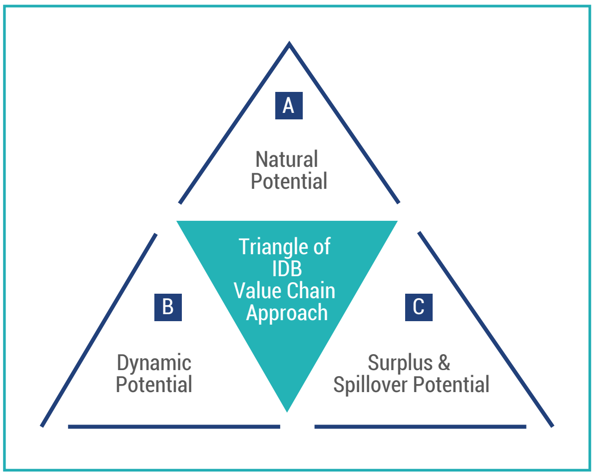
The first criterion is the "natural potential" of a country, which takes into account the existing comparative advantage of a country at the industry level. The second criterion concerns the "dynamic potential", included in a prospective approach that identifies and quantifies the competitive advantage of products or goods according to future market conditions. The third criterion measures the potential in terms of the effects on value add and hence job potential. This "surplus and spillover potential" indicates upstream and downstream linkages, the induced effects that may result from interconnections between industries and optimizes the value added in a specific industry. Through this approach, countries can focus on the GVC of products for which it has a revealed comparative advantage.

After this identification and in-depth analysis, GVCs will be analyzed to identify bottlenecks, capacity gaps and product potential across the value chain from the initial phase of production up to export and distribution. The interventions derived from this process will seek to address the gaps and bottlenecks in the GVCs of Turkey's leading products / industries.

The promotion of global value chains in Turkey would allow markets to mobilize resources for development. For markets to work in GVCs, globalization and industrialization need to be rethought in a rapidly changing world, due to the changing global economy and the pace and magnitude of technological advances.

The Turkish Textile Industry in the Lenses of the IsDB Quantitative Tool

Figure 1: Global Value Chains' Selection Toolki



Source: Hamid, M Faiz Shaul, Kane, K, Demirhan, AE, Khodary, A. 2019. Making Markets Work for Development through Global Value Chains: Methodology and tools to identify and measure the highest-potential value chains.

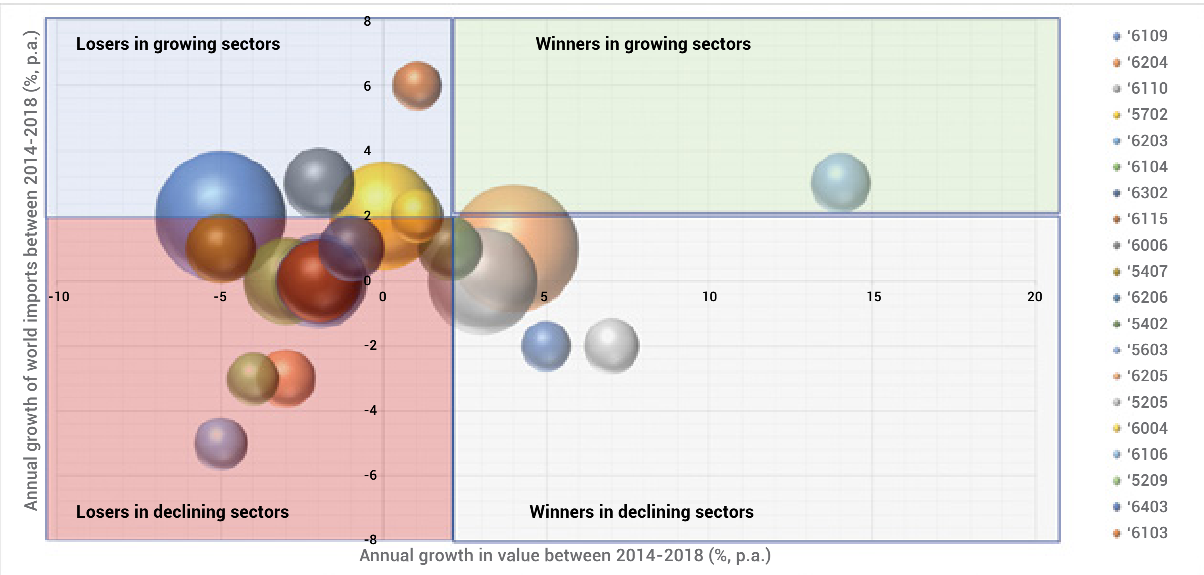
5. M. F. S. Hamid, K. I. W. Kane, A. E. Demirhan and A. Khodary, Making Markets Work for Development through Global Value Chains, Islamic Development Bank, 2019.

The revealed comparative advantage (RCA) index, is used to determine the products at HS2 level in which Turkey has comparative advantage. A product or an industry with an RCA>1 indicates that a country has revealed comparative advantage in this product or industry. As shown in Figure 2, Turkey has very high revealed comparative advantage for Manufacture of Textiles (HS50-59), wearing apparel and footwear (HS60-67), leather, luggage and related products (HS41-43) for the whole period from 2003 to 2018. However, it could also be observed that the RCA for the Manufacture of leather, luggage and related products has rapidly declined over the past 16 years despite the fact that all three industries have remained above the 1 threshold. This demonstrates the importance of these industries despite their historic status in the Turkish economic landscape.

Figure 2: RCA Calculation for Manufacturing Industries with Natural Potential for the Past 16 Years.

In Figure 3, the export growth, over the past five years, of the 20 highest products exported by Turkey in the Manufacture of Textiles; wearing apparel and footwear; leather, luggage and related products industries are compared with the average growth of world demand for all products and the average growth of Turkey's export over the same period. This allowed to gauge the pace at which the exports of Turkish textile products have grown compared to all Turkish and all world goods exports. At first glance, no product with these top 20 products being traded by Turkey belongs to the leather, luggage and related products. As it could be seen, most of the products exported are located in the lower quadrants (declining sectors), and mostly on the left lower quadrant (red quadrant – losers in declining sectors) that is their demand is lower than the world average demand for goods, and that their export values are growing slower than the average Turkish goods' export. In other terms, they have low dynamic potential according to the Product Champion Index (PCI) as shown in Table 1, especially the PCI that emphasizes access to markets. The PCI combines demand, supply, trade and resilience indicators into a single index that indicates the HS4 products with the highest potential for trade.

Figure 3: Relative Capabilities of Production at HS4 Levels



Source: Authors using UN Comtrade data

The PCI for the main HS4 product within 'Manufacture of textile and apparel' is computed and summarized in Table 1. There are two products (formal wear: Women's or girls' blouses, shirts and shirt-blouses; Men suits) on the top left quadrant (losers in growing sectors), which means that despite the fact their export value is not growing rapidly in Turkey, their world demand has been steadily growing over the past five years, indicating these products are relevant products in the GVC and can move to the green quadrant if exports grow. Nonwoven materials (HS5603) are in the top right quadrant, meaning it is growing faster than average compared with world demand and average Turkish products. Among the top 20 export products, Men's or boys' suits, ensembles, jackets, blazers, trousers, bib and brace overalls, breeches (HS6103) are the fastest growing product, which further confirmed by its high PCI (Static, Dynamic and Market Access). As a result, the expansion and upgrading opportunity lies further in the Manufacture of Textiles; wearing apparel and footwear industries than in the Manufacture of leather, luggage and related products. Therefore, this study focuses more on the former, and less so in the latter.

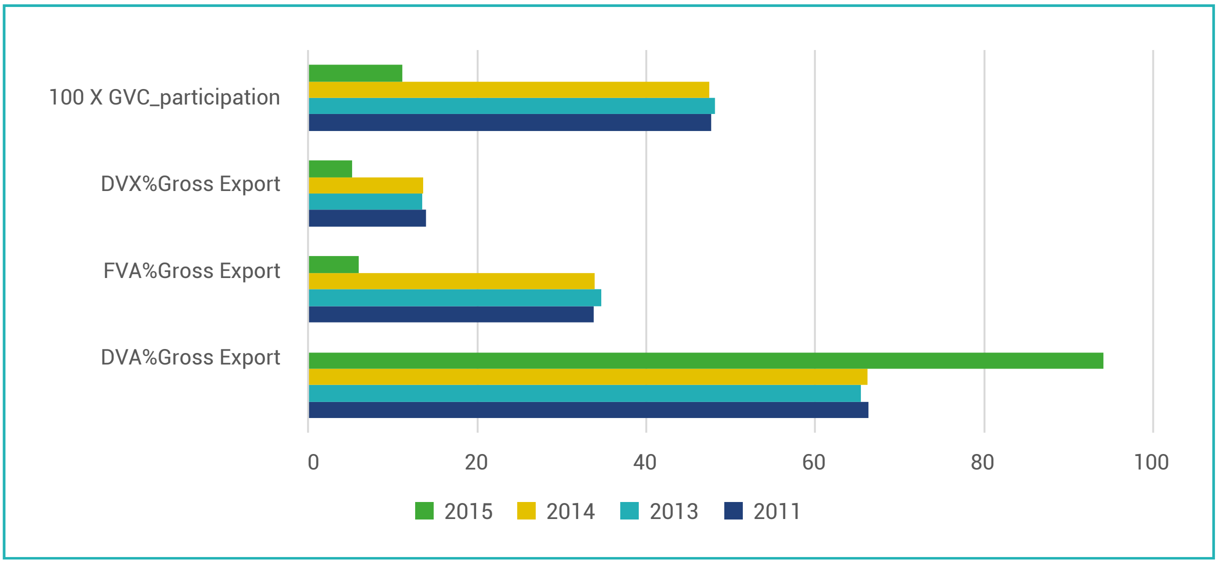
Table 1: Product Champion Indices of Top 20 Exported Products within Textile and Apparel

PRODUCT	PCI STATIC	PCI DYNAMIC	PCI MARKET ACCESS
T-shirts, singlets and other vests, knitted or crocheted	0.240	0.142	-0.077
Women's or girls' suits, ensembles, jackets, blazers, dresses, skirts, divided skirts, trousers, ...	0.292	0.242	-0.027
Jerseys, pullovers, cardigans, waistcoats and similar articles, knitted or crocheted (excluding ...	0.171	0.125	-0.085
Carpets and other textile floor coverings, woven, not tufted or flocked, whether or not made ...	0.158	0.125	-0.181
Men's or boys' suits, ensembles, jackets, blazers, trousers, bib and brace overalls, breeches ...	0.072	0.008	-0.152
Women's or girls' suits, ensembles, jackets, blazers, dresses, skirts, divided skirts, trousers, ...	0.039	-0.024	-0.169
Bedlinen, table linen, toilet linen and kitchen linen of all types of textile materials (excluding ...	0.025	-0.029	-0.219
Pantyhose, tights, stockings, socks and other hosiery, incl. graduated compression hosiery ...	0.029	-0.021	-0.178
Fabrics, knitted or crocheted, of a width of > 30 cm (excluding warp knit fabrics "incl. those ...	0.120	0.126	-0.018
Woven fabrics of synthetic filament yarn, incl. monofilament of >= 67 decitex and with a cross ...	0.003	-0.043	-0.175
Women's or girls' blouses, shirts and shirt-blouses (excluding knitted or crocheted and vests)	0.034	0.019	-0.143
Synthetic filament yarn, incl. synthetic monofilaments of < 67 decitex (excluding sewing thread ...	0.134	0.109	-0.110
Nonwovens, whether or not impregnated, coated, covered or laminated, n.e.s.	0.230	0.353	0.049
Men's or boys' shirts (excluding knitted or crocheted, nightshirts, singlets and other vests)	-0.130	-0.217	-0.300
Cotton yarn other than sewing thread, containing >= 85% cotton by weight (excluding that put ...	0.003	0.002	-0.152
Knitted or crocheted fabrics, of a width > 30 cm, containing by weight >= 5% of elastomeric ...	0.083	0.106	-0.032
Women's or girls' blouses, shirts and shirt-blouses, knitted or crocheted (excluding T-shirts ...	-0.215	-0.345	-0.364
Woven fabrics of cotton, containing >= 85% cotton by weight and weighing > 200 g/m²	-0.166	-0.256	-0.352
Footwear with outer soles of rubber, plastics, leather or composition leather and uppers of ...	-0.027	-0.038	-0.173
Men's or boys' suits, ensembles, jackets, blazers, trousers, bib and brace overalls, breeches ...	0.191	0.280	0.059

Source: Authors using UN Comtrade data

Utilizing Eora Input-Output database for Turkey, the value-add of the overall Turkish export were broken down into all the industries, then further broken into the domestic value-add, foreign value-add and indirect value-add contributions of each industry. The results of which is summarized in Figure 4. The textile and clothing industry have a total gross output of US$86.9 billions, approximately 36% of which is exported. The gross export amounts to US$31.2 billions. Almost US$21.1 billions of this export revenue is collected from final good exports. The value of intermediate good exports is around US$10.1 billions. In terms of value-add, US$21.1 billions value added were generated. In other terms, the share of domestic and foreign value-add is around 67.7% and 32.2% respectively. The indirect value-add, i.e., domestic value added included in the third country's exports is around US$4 billions or 12.7% of total exports. In other words, 12.7% of export of textile and clothing industry is included in the exports of other countries. In terms of GVC position, textile and clothing industry is well connected to GVC, but more with the downstream portion of the GVC. In addition, the domestic value-add has increased over the years as Turkey increased its sets of activities in the value chain.

Figure 4: Value-Added Decomposition of Turkey's Textile and Apparel Export



Source: Authors using Eora database

3.1.3. The Global Textile Industry

The Global Textile Industry

In 2017, world textile and clothing exports were US$660 billions. Correspondingly, apparel trade was US$391 billions, textile components US$153 billions, home furnishings US$44.5 billions, industrial products US$27.2 billions and technical textile components US$44.9 billions. China is the largest apparel exporting country, with a 33% global share. Whereas Turkey is the world's 5th largest exporting country, with a share of 4.5%.

Frederick and Daly (2019)[6] underline the key dynamics in the global apparel industry:

- China is still the world's largest apparel producer and exporter.
- For sourcing decisions of lead firms, pricing is not the sole criteria and lead firms increasingly consider quality, lead time and compliance to social standards for sourcing decisions.
- The largest and the fastest growing apparel consumer market is in Asia with countries such as China, Japan, South Korea, and Russia.
- Tariffs influence global apparel industry considerably.
- In apparel, the importance of knitted garments (over woven) and products made from synthetic materials (compared to cotton) is steadily increasing. This is related to fashion trends towards more form-fitting clothing and shorter fashion cycles.

Beyond apparel, the following tables (Table 2, Table 3, and Table 4) illustrate the key countries in the global home furnishings, non-apparel textile components and industrial products markets.

Table 2: Top Home Furnishings Exporters, 2002-17

Exporter	Value, US$ billions				World Share (%)				Growth
	2002	2008	2012	2017	2002	2008	2012	2017	2012-17
World	20.3	39.0	39.5	44.5					13%
China	3.6	11.2	13.3	14.9	18%	29%	34%	33%	12%
EU15	6.3	9.5	7.7	7.9	31%	24%	19%	18%	2%
India	2.1	4.3	4.6	5.7	10%	11%	12%	13%	23%
Pakistan	1.6	3.3	3.2	4.1	8%	8%	8%	9%	30%
Turkey	1.2	2.4	2.4	3.4	6%	6%	6%	8%	40%
Belgium	1.8	2.6	1.9	1.8	9%	7%	5%	4%	-9%
Netherlands	0.9	1.6	1.5	1.6	4%	4%	4%	3%	3%
Germany	0.8	1.5	1.4	1.4	4%	4%	4%	3%	-1%
U.S.	1.0	1.4	1.4	1.2	5%	4%	4%	3%	-19%
Bangladesh	0.1	0.5	0.6	0.7	1%	1%	1%	2%	18%
Poland	0.2	0.4	0.5	0.7	1%	1%	1%	2%	37%
Portugal	0.7	0.8	0.6	0.7	4%	2%	1%	1%	12%
Vietnam	0.1	0.2	0.4	0.6	0%	1%	1%	1%	52%

Source: Frederick (2019). UNComtrade; exports represented by imports. Subsectors: Linens, Floor Coverings, Curtains/Drapes, Wall Coverings/Tapestries.

6. Frederick, Stacey, Jack Daly. "Pakistan in the Apparel Global Value Chain." (2019).

Table 3: Top Non-Apparel Textile Component Exporters, 2002-17

Exporter	Value, US$ billions				World Share (%)				Growth
	2002	2008	2012	2017	2002	2008	2012	2017	12-17
World	20.5	37.9	41.5	44.9					8%
EU15	9.6	16.1	13.9	14.3	47%	42%	33%	32%	3%
China	1.1	5.0	7.9	10.0	5%	13%	19%	22%	28%
U.S.	3.0	3.9	4.3	4.3	15%	10%	10%	10%	0%
Other Asia	1.6	1.8	2.2	2.1	8%	5%	5%	5%	-4%
Rep. of Korea	1.1	1.6	2.1	2.0	5%	4%	5%	4%	-7%
Japan	1.0	1.8	2.1	2.0	5%	5%	5%	4%	-8%
Turkey	0.2	0.6	0.7	1.0	1%	2%	2%	2%	38%
Czechia				0.8				2%	
Canada	0.5	0.7	0.7	0.7	3%	2%	2%	2%	-2%
Vietnam	0.0	0.1	0.4	0.6	0.0%	0.2%	1%	1%	41%

Source: Frederick (2019). UNComtrade; exports represented by imports. Subsectors: Fabric (Coated, Industrial, Narrow, Nonwoven) & Yarn (Industrial, Specialty, Thread).

Table 4: Top Industrial Products Exporters, 2002-17

Exporter	Value, US$ billions				World Share (%)				Growth
	2002	2008	2012	2017	2002	2008	2012	2017	2012-17
World	9.2	19.9	22.6	27.2					20%
China	2.5	7.2	9.3	11.4	27%	36%	41%	42%	22%
EU15	2.4	4.7	4.0	4.2	26%	24%	18%	15%	6%
India	0.2	0.6	0.9	1.4	2%	3%	4%	5%	49%
Germany	0.6	1.2	1.0	1.2	6%	6%	5%	4%	13%
U.S.	0.7	0.9	1.1	1.1	7%	5%	5%	4%	4%
Vietnam	0.1	0.3	0.6	1.1	1%	2%	3%	4%	70%
Mexico	0.6	0.5	0.6	0.7	6%	3%	3%	3%	20%
Turkey	0.2	0.5	0.5	0.5	2%	2%	2%	2%	9%
Netherlands	0.2	0.5	0.5	0.5	3%	3%	2%	2%	15%
Bangladesh	0.1	0.2	0.4	0.5	1%	1%	2%	2%	15%

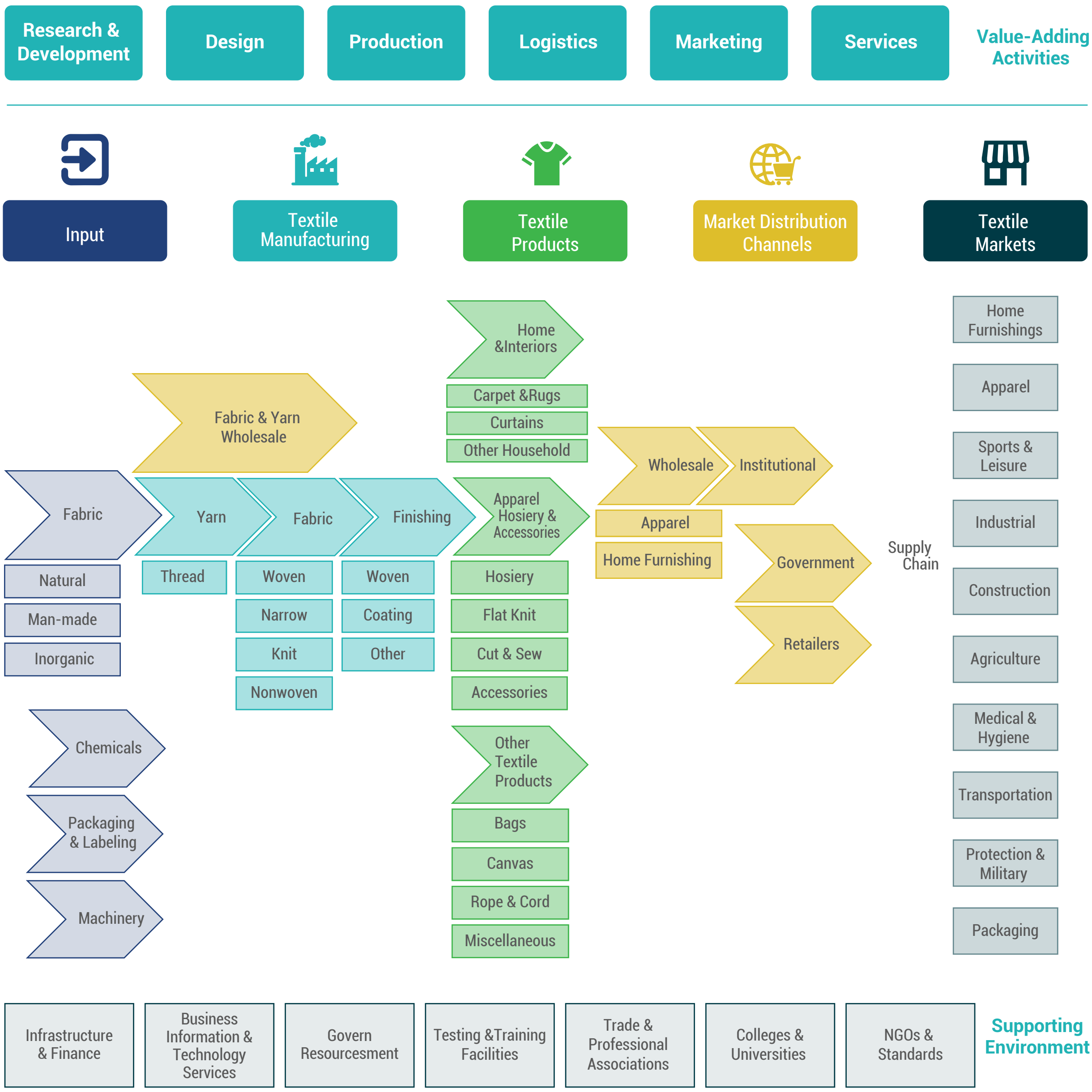
Source: Frederick (2019). UNComtrade; exports represented by imports. Subsectors: Misc. Final Products, Bags, Rope/Cord, Outdoor Canvas Products, Nonwoven Products, Used Industrial Products.

Mapping the Textile Global Value Chain

In contrast to a supply chain analysis, GVC analysis includes all value addition activities in production of goods or services. Thus, the value adding activities such as research and development, design, marketing, branding are critical aspects of GVCs, this is also true for textile GVC. The mapping of textile GVC can be depicted as in Figure 5. One of the critical features of the textile GVC is that design, sales and branding activities bring the most value added compared to production, logistics and sourcing stages of the GVC. This puts the lead firms in an advantageous position so that they can outsource manufacturing activities to other countries.

Figure 5 illustrates that textile products can find end-users in different markets such as industrial, construction, agriculture, medical, transportation, military and packaging. Furthermore, textile GVC is also influenced by the supporting environment or the enabling conditions such as infrastructure and finance, information and technology services, government resources, business associations, universities, NGOs and global standards. Therefore, GVC Analysis should take into account not only the successive supply chain stages, but also other value addition activities, enabling environment and the end markets. With the consideration of these dynamics, bottlenecks, opportunities and challenges in integration and upgrading in GVCs can be analyzed.

Figure 5: Textile Value Chain



Source: Frederick, S. Available at http://www.nctextileconnect.com/value_chain.cfm,

Global Supply and Demand in the Textile GVC

New apparel demand is increasingly from Asia. The Asia Pacific region (and particularly China) is the largest, fastest growing consumer market. Asia Pacific accounts for 57% based on retail volume and 38% by RSP; this was 46 and 25% in 2008 (Euromonitor/Passport; category 'apparel').

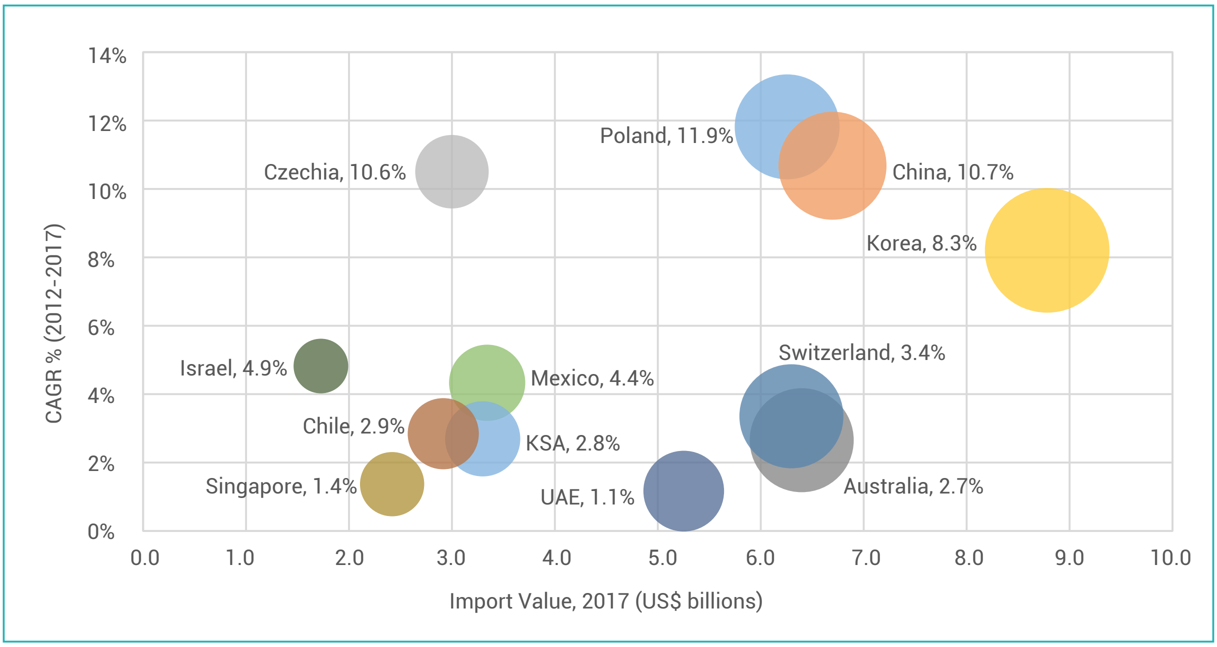
Lead Firms and Governance Structures in the Textile GVC

The apparel and home textile industries can be categorized as a buyer-driven production chain which underlines the power asymmetries between the producers and global buyers of final apparel products.[7] In other words, apparel and home textile industries are characterized as business to consumer (B2C) transactions. Nevertheless, technical textile industry is characterized with business-to-business transactions (B2B). These dynamics and governance structures are critical to understand textile GVC in different product groups.

With the advancement of the new technologies, lead firms identify the key dynamics of apparel industry as changing nature of the industry, need to go digital and speed to market to meet consumer demands.[8] Relatedly, mobile technologies, the prevalence of social media helps small brands to reach the consumers much more easily and grow rapidly. One example is that Chinese apparel companies took advantage of e-commerce in reducing barriers to entry and enabling smaller firms to move up the value chain with functional upgrading as well as end-market upgrading.[9]

Also, lead firms identify sustainability and transparency issues as critical to meet consumer demands and company expectations. As the "A New Textiles Economy Report" by the Ellen MacArthur Foundation and Circular Fibers Initiative indicates, the textile industry relies on non-renewable resources with 98 million tons in total per year and less than 1% of material used to produce clothing is recycled into new clothing.[10] Relatedly, recycling mechanisms and waste management are the new trends to a switch to a circular textile GVC, rather than a linear one. Thus, Turkey can play a niche role in the textile industry by focusing on the circular economy, sustainability and environment friendly production and marketing of the textile and apparel products.

Figure 6: Fastest Growing Apparel Import Markets, by Value, 2012-17



Source: Frederick & Daly. (2019). Pakistan in the Apparel GVC. Duke GVCC. UNComtrade, H02, 61+62, Reported Imports from the World from Reporters. Countries included had imports greater than US$1.7 billions in 2017 (which coincided with at least 0.5% of global apparel imports) and a change in import value greater than the world average (0.9 percent) between 2012 and 2017. Top five importers excluded from figure: US, EU15, Japan, Hong Kong, Canada.

7. Gereffi, Gary, and Stacey Frederick. The global apparel value chain, trade and the crisis: challenges and opportunities for developing countries. The World Bank, 2010.
8. The State of Fashion 2019, McKinsey Report, https://www.mckinsey.com/industries/retail/our-insights/the-state-of-fashion-2019-a-year-of-awakening.
9. Li, Fuyi, Stacey Frederick, and Gary Gereffi. «E-commerce and industrial upgrading in the Chinese apparel value chain.» Journal of Contemporary Asia 49, no. 1 (2019): 24-53.
10. "A New Textiles Economy: Redesigning Fashion's Future", https://www.ellenmacarthurfoundation.org/publications/a-new-textiles-economy-redesigning-fashions-future.

The European Technology Platform for the Future of Textiles and Clothing[11] highlights four strategic innovation themes that will play a much more critical role in textile GVC:

- Smart, high-performance materials
- Advanced digitized manufacturing and business models
- Circular economy and resource efficiency
- High value-added solutions for attractive growth markets.

The Turkish textile industry can take advantage of these developments to increase its value added in GVC, position itself as a niche market for marketing and branding purposes and increase employment, exports and economic growth with these strategies. In this respect, it is critical to examine various upgrading trajectories in the textile GVC.

Upgrading in the Textile GVC

In analyzing Turkey's upgrading trajectories for the textile GVC, it is critical to consider country capabilities. With respect to their capabilities, countries can be categorized as Cut-Make-Trim (CMT) producers, Original Equipment Manufacturers (OEM), Original Design Manufacturers (ODM), Original Brand Manufacturers (OBM), and service providers.[12] CMT countries can undertake low value-added activities in the GVC with their low labor cost; OEM countries as package contractors can invest in machinery, logistics technology and can become a preferred or niche supplier for global lead firms; ODM countries as full-package providers can be categorized as strategic suppliers; OBM countries are similar to ODM but are more advanced in terms of branding, service providers can play the roles of coordinators and investors in the textile GVC. Within these categories, Turkey can be classified as having ODM capabilities, with its strategic role as a supplier to lead firms. Turkish firms can play an increasing role as regional or global lead firms within their product groups. This would require upgrading within the Textile GVC. In the Textile GVC, five types of upgrading can be identified (Table 5).

Turkish Textile industry can take advantage of each upgrading trajectory based on the natural and dynamic potentials in the product groups.

Table 5: Five Types of Upgrading in the Textile GVC

Type of Upgrading	Definition	Example
Product upgrading	Shift to more sophisticated products	From basic production to high fashion products
Process upgrading	Reduce cost, increase efficiency by reorganizing the manufacturing system	Investing in new machinery or logistics technology
Functional upgrading	Shift from manufacturer to service provider producer	From CMT to OEM; from OEM to ODM; ODM to OBM
End market upgrading	Diversifying to new buyers or new geographic or product market	Entering a new emerging market such as East Asia, Southeast Asia
Chain upgrading	Diversifying to other industries	Can take part in a different industry such as automotive and medical devices

Source: Frederick, S., and Gary Gereffi. 2011. "Upgrading and Restructuring in the Global Apparel Value Chain: Why China and Asia Are Outperforming Mexico and Central America." International Journal of Technological Learning, Innovation and Development 4 (1/2/3): 67–95.

11. "Towards a 4th Industrial Revolution of Textiles and Clothing", European Technology Platform for the Future of Textiles and Clothing, http://www.technofashionworld.com/files/2016/11/TextileETP_SIRA_public-version.pdf.
12. Gereffi, Gary, and Stacey Frederick. The global apparel value chain, trade and the crisis: challenges and opportunities for developing countries. The World Bank, 2010.

3.1.4. Turkey and the Textile Global Value Chain

Initial Mapping and Current Participation of Turkey in the Textile GVC

Figure 7 shows a visual representation of Turkey's level of activity in the textile and apparel GVC and Figure 8 lists key players in the domestic value chain especially for technical textile manufacturing. Wherever export data is available through UN Comtrade, it is superimposed on different activities. Turkey was the 5th largest home furnishings exporter in 2017 (US$3.4 billions). Export value increased by 40% between 2012 and 2017; above the world average of 13%. Turkey was the 7th non-apparel textile component exporter with US$1 billion in exports in 2017. This accounted for 2% of world trade with export growth of 38% between 2012 and 2017.

Boxes in green are where the country has the highest shares of the global market, with the color intensity increasing with the share. Sweatshirts, woven and knit shirts, carpets and rugs are the final product categories where Turkey exceeds 3% of the global market. Dresses/skirts, trousers, coats, underwear, formalwear, bras and baby apparel are areas where Turkey holds 1-3% global market share. Turkey has over 3% global market share in both yarn and synthetic fiber production, and 1-3% global market share of natural fibers and fabric production. The main destinations of Turkish exports are the European Union, United States of America and the Middle East. More detailed activities of the domestic value chain are summarized below.

Research and Development

Based on data from the Ministry of Industry and Technology, as of the end of June 2019, 75 of 1,178 R&D centers benefiting from exemptions within the scope of Law No. 5746 on Support of the Research, Development, and Design Activities operate in the textile (including technical textiles), clothing and leather industries, and 70 of 344 Design Centers are from the textile and clothing industries. Indicators such as number of R&D centers (6.3% share in manufacturing), share of R&D spending in turnover (1.1%) and R&D employment (3.4% share in manufacturing) points to medium capability in terms of R&D in textiles. Besides R&D indicators, technical standards and regulations requested by buyers dominate processes of product improvement.

A recent article[13] finds the following trends in the Turkish manufacturing sector since 2012:

- Average employment growth has slowed; the unemployment rate has increased.
- Market concentration has increased.
- The price markups and profit share of market leaders have increased.
- The average productivity of market leaders has not increased.
- There is an increasing persistence among incumbent frontier firms.
- Firm growth rate dispersion has declined.
- Job reallocation rate among incumbents has declined.
- Increase in market concentration is associated with lower labor shares.
- Firm entry rate has decreased and the exit rate has increased.
- Economic activity among young firms has decreased.

Thus, it can be deduced from this analysis that industrial support in terms of R&D subsidy to the market could improve competition and encourage innovation. Since Turkey's foreign trade strategy emphasizes diversifying export markets, increasing productivity and value-added in the Turkish economy, R&D subsidies, innovation-driven financing schemes and incentives can lead to upgrading in the textile GVC.[14]

Production

In terms of product categories, apparel exports reached US$17.7 billions, apparel component exports (apparel fabric, yarn and fiber) reached US$6.2 billions, non-apparel final product exports such as home furnishings (floor coverings, linens) and industrial products reached US$4 billions, and non-apparel component exports of different kinds of fabrics and yarn reached US$0.9 billions (Table 6).

As attested by the production and export profile of Turkey, the production capability of yarn, fabric and home textile can be assessed as high in terms of production capacity, however exports of yarn and fabric have stagnated since 2012. An emphasis on developing branded Turkish products, increasing technology levels and increasing technical textile production could provide opportunities to increase value added and exports.

In synthetic raw materials, import dependency is higher than for cotton. However, access to high quality raw materials at a competitive price is not as challenging as it is for cotton because of increasing production capacity of the petrochemical industry in the MENA region over the past 10-15 years. In addition, Turkey has its own synthetic fiber champions such as Aksa and Sasa supported by the Turkish petrochemical giant Petkim. Turkey has also increased its production capacity of glass fiber with recent investments from Cam Elyaf A.Ş. (Şişecam) in Balıkesir.

Marketing

There is strong connection with global and domestic retail channels. However, more emphasis can be put on developing brands and retail, especially in the apparel industry. In the sections on opportunities, the strategies for marketing and branding are explained.

13. Akcigit, Ufuk, Yusuf Emre Akgunduz, Seyit Mümin Cilasun, Elif Özcan Tok, Fatih Yilmaz, "Facts on Business Dynamism in Turkey", September 2019, TCMB Working Paper No: 19/30.
14. Ministry of Trade, https://ticaret.gov.tr/data/5d67a97a13b87799c4cc1fef/Ticaret_Sunum_29.08.19.pdf.

Figure 7: Turkey in Textile GVC

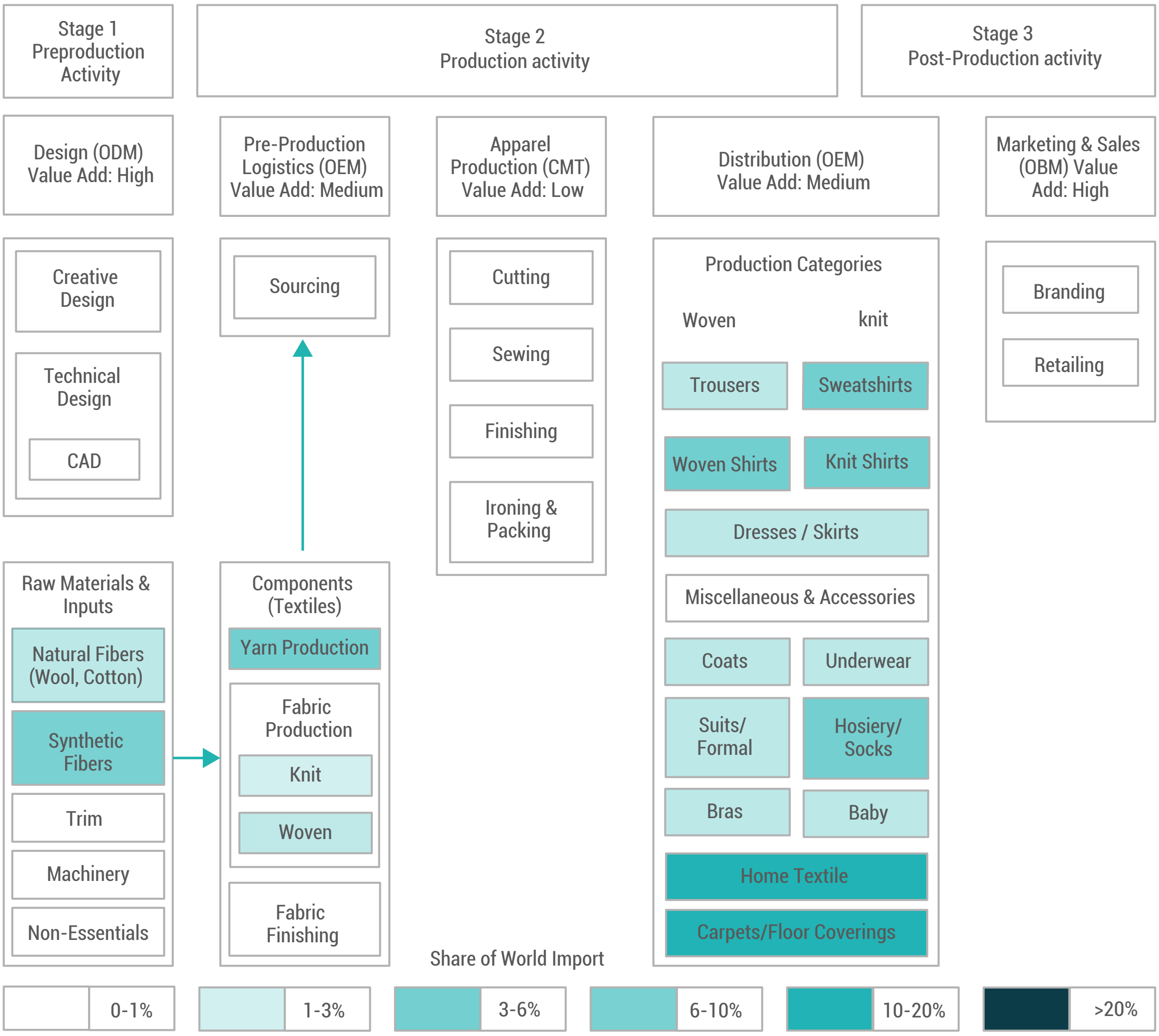


Figure 8: Some Key Players in Technical Textile Value Chain in Turkey

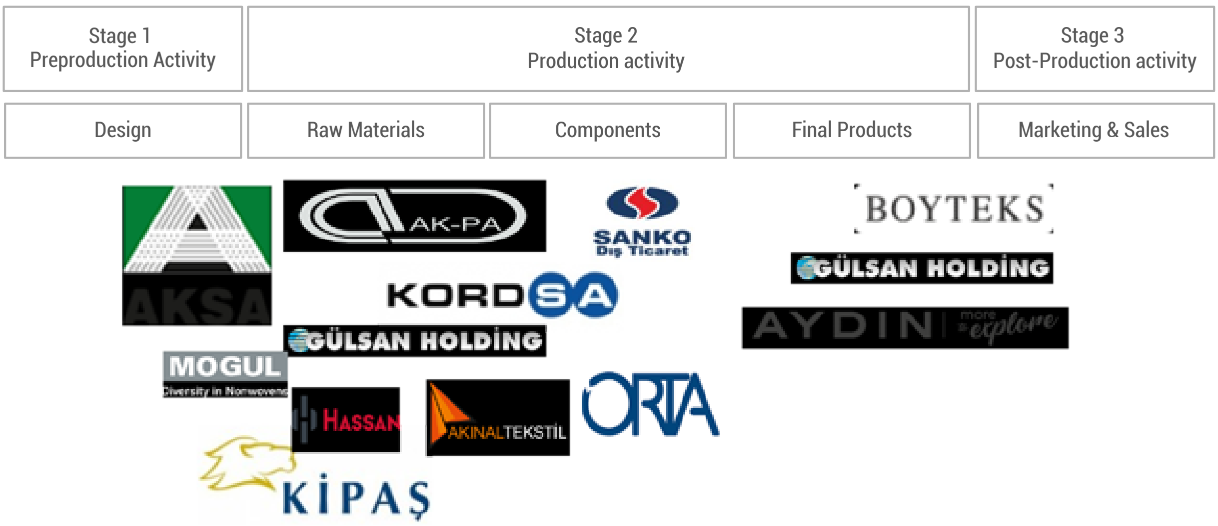


Table 6: Turkey's Textile Exports by Product Categories, 2017

Textile Product Categories	Total Export Value (US$)	Main Products	Top Export Destinations	Global Rank
Apparel Final Products	17.7 billions	Trousers (26%) Knit Shirts (21%) Sweaters (13%)	EU-15 (68%) U.S. (3%) Switzerland (3%)	5th
Textile Components	6.2 billions	Knit/Woven Fabric (63%) Yarn (27%) Fiber (10%)		Knit/Woven Fabric (5th) Yarn (7th) Fiber (11th)
Home Textiles	3.4 billions	Floor Coverings (50%) Linens (6%)	EU-15 (42%) U.S. (21%) Saudi Arabia (7%)	5th
Industrial Products	0.5 billions	Bags (52%) Misc. Final Products (25%)		8th
Technical Components	0.9 billions	Nonwoven fabrics (50%) Industrial fabrics (17%) Coated fabrics (14%)	For Nonwovens: EU-15 (29%) U.S.(11%) Iran (7%)	7th

Source: Frederick, S. (2019) based on UNComtrade data. Global rank uses the EU-15 as one location.

Employment & Human Capital

In 2016, the textile component, home and industrial textile and apparel industries employed 912,556 people, accounting 25% of Turkey' s manufacturing employment (INDSTAT, based on data from Turkstat). Average annual wages for textile and apparel workers are lower than the average of all manufacturing industries, agriculture processing and the automotive industries (T&A was US$6,966/year compared to US$9,427/year for manufacturing, US$8,217/year for agriculture processing and US$16,990/year for automotive in 2015). Within the two industries of textile and apparel, workers earn the highest wages in textile components.

An important characteristic of the apparel industry is its comparatively high share of female employment (Table 7). In 2013, the female share of employment in the textile and apparel industries was 39.2%; higher than all other manufacturing industries and second overall, only behind education (57.8%).

Table 7: Sectoral Female Employment and Total Employment Shares (2013)

Sector	Total Registered Employees	Female (%)	Female Employment
Build	1,849,942	5.1	93,697
Textiles & Clothing	918,496	39.2	359,743
Textile	441,357	29.1	128,251
Clothing	477,139	48.5	231,492
Road Transport and Pipeline Transport	634,354	10.0	63,430
Retail Trade	1,169,771	35.3	412,958
Education	502,169	57.8	290,056
Food and Beverage Services Activities	477,749	26.8	128,114
Food Production	417,671	26.6	111,110
Building and Landscaping Activities	365,916	32.0	117,140
Automotive	350,002	13.0	45,524
Other Sectors	4,879,547	24.7	1,205,389

Source: Republic of Turkey Social Security Institution

Key Firms

Among Turkey's Top 1000 Industrial Enterprises (ISO 1000), a list published by Istanbul Chamber of Industry, there were 178 textile companies in the Top 1000 in 2004 and 124 in 2018. However, the combined export share of the 10 biggest exporters has sharply declined from 54% in 2004 to 13% in 2018 (Table 8 below). One reason for this decline could be the fact that Turkish textile companies are mostly family owned businesses, and the succession from one generation to the next usually results in the fragmentation of the business. This is a clear threat to the competitiveness of the textile industry. Another reason for this shift is that as labor costs naturally increased, Turkish textile giants have attempted to move to higher value-added production, especially in clothing, where the gross added value/turnover ratio increased with the shift to more value-added products.

Similar trends were observed for the clothing firms with a reduction in the number of firms in the ISO 1000 from 76 companies in 2004 to 39 in 2018 (Table 9). However, the decline in market share of the 10 biggest exporters was much lower than what was observed for textiles. The change in clothing is thought to be due to the increase in the number of players with higher value-added and niche products. The Turkish clothing industry is an important European Union supplier, especially for the German market. Some of the largest European apparel buyers from Turkey include Zara (Inditex), Marks & Spencer, H&M, Gant and Verner.

Table 8: Top Ten Textiles Exporters, 2004 and 2018

2004	US$ million	Products	2018	US$ million	Products
Exsa Export	321	Foreign Trade Company of Sabancı Group	Ak-Pa Tekstil	334	Foreign Trade Company of Akkök Group (Mainly synthetic fiber and yarn produced by Aksa, Ak-Al, Aksu etc.)
Yeşim Tekstil	286	Home Textile	Kordsa Tekstil	227	Industrial Yarn / Technical Textiles
Ege Dış Ticaret	249	Foreign Trade Company	Sanko Dış Ticaret	162	Foreign Trade Company of Sanko Group (Mainly yarn and woven fabrics)
Gaat Dış Ticaret	229	Foreign Trade Company	Boyteks Tekstil	125	Upholstery Fabrics and Carpets
Ak-Pa Tekstil	229	Foreign Trade Company of Akkök Group (Mainly synthetic fiber and yarn produced by Aksa, Ak-Al, Aksu etc.)	Gülsan Dokuma	122	Nonwoven / Technical Textiles
Zorlu Linen	215	Home Textile	Akınal Tekstil	111	Synthetic Yarns for Carpet
Bilkont	183	Fabrics	Kipaş	77	Yarn / Woven Fabrics / Denim / Technical Textiles
Zorlu Dış Ticaret	177	Foreign Trade Company of Zorlu Group	Anonymous	70	
LGS Dış Ticaret	166	Foreign Trade Company	Orta Anadolu	62	Denim
DTS Denizli Tekstil	162	Foreign Trade Company of Denizli Home Textile Manufacturers	İskur	61	Yarn / Woven and Knitted Fabrics / Denim / Clothing
Total (US$ million)	2,217			1,351	
Share in Total Textile Exports	54%			13%	

There are more than 150 companies manufacturing technical textiles and nonwovens in Turkey. More than 20 large companies produce nonwoven roll goods. Most large-scale Turkish nonwoven and technical textile companies are members of the European Disposables and Nonwovens Association-EDANA. Three of the largest global nonwoven roll goods producers are headquartered in Turkey (Technical Textiles Market, 2019).

The businesses in the textile and clothing industry mostly have regional production facilities. While yarn production is concentrated in provinces such as Kahramanmaraş, Istanbul, Gaziantep and Bursa, towels, bathrobes, and home textiles are produced in Denizli; Uşak stands out with yarn and blanket production as well as recycling, Çorlu and Çerkezköy with finishing, Adana with cotton weaving and finishing, Gaziantep with nonwovens and machine-made carpets, and Istanbul with apparel and knitting production. Considering only circular knitting production capacity, Istanbul is followed by Tekirdağ, Maraş and Bursa respectively. Şanlıurfa is at the forefront of cotton production.

Leather processing companies are concentrated in Istanbul-Tuzla, İzmir-Menemen, Tekirdağ-Çorlu, Uşak, Bolu-Gerede, Balıkesir-Gönen, Manisa-Kula, shoe companies in Istanbul, Izmir, Konya and Gaziantep, fur goods manufacturers in Istanbul, and saddlery firms in Istanbul and Ankara. Leather apparel companies are mostly located in Istanbul and Izmir.

Table 9: Top Ten Clothing Exporters, 2004 and 2018

2004	US$ million	Products	2018	US$ million	Products
GİSAD	1,741	Foreign Trade Company	TGS Dış Ticaret	862	Foreign Trade Company
GSD	791	Foreign Trade Company	Pergamon Status	626	Foreign Trade Company
Hedef Konfeksiyon	617	Swimwear	Taha Pazarlama ve Dış Ticaret	482	Fabrics and Garment
Trisad Dış Ticaret	103	Foreign Trade Company of Knitting Wear Manufacturers	Birgi Birleşik Giyim	371	Foreign Trade Company
Şık Makas (Vakko)	101	Women and Men Suits and Apparels	LC Waikiki Mağazacılık	318	Outerwear and Retailer
Erak Giyim	101	Denim Wears	Üniteks	251	Knitted Apparel
Trakya Tekstil	86	T-shirt	Yeşim Tekstil	161	Woven and Knitted Apparel / Home Textile
Sertler Örme	73	Knitted Apparel	Menderes Tekstil	142	Home Textile
Üniteks	73	Knitted Apparel	Fore	136	Sportwear
BGS Boğaziçi Giyim Sanayicileri	72	Foreign Trade Company	Cross Tekstil	135	Denim Wear
Total (US$ million)	3,758			3,484	
Share in Total Clothing Exports	32%			20%	

Investment Regimes (Industry-Specific Programs/Economic Development Strategies)

In the 11th Development Plan, which entered into force in July 2019, the textile-clothing-leather industry is among the priority manufacturing industries. The plan emphasizes the goal of being a country that drives the value chain, the development of new business models in production and services, and the role of technical textiles in the transformation into a high value-added structure:

- The main objective of Turkey is to be one of the leading countries that drives the value chain with a focus on fashion design and branding in the textile, clothing and leather industry.
- Fast and flexible production, innovation, customer focus, integrated production structure, social responsibility and environmental awareness, retailing and organizational skills will be improved in the industry.
- Regarding technical textiles, which is one of the most important areas in the transformation into high value-added structure in the industry, company activities toward optimum technology selection, compliance with the legislation to protect the environment, energy efficiency and the circular economy as well as their cooperation with other stakeholders in the value chain (especially machinery, fiber and technical end-use manufacturers) will be supported.

The Incentive System

Between the years of 1980 and 2008 half of the incentive investments were made towards manufacturing. The strongest sectors in the Turkish manufacturing industry are textiles and apparel. Therefore, many incentive policies were implemented to strengthen these industries between the years of 1990-1995. An incentive scheme, Turquality Scheme, was implemented from 2012 to 2019, which aimed to sell the image of Turkish products as good quality. The project was initiated by the Turkish Government, Ministry of Economy, Turkish Exporters' Assembly, and Istanbul Textile and Apparel Exporters' Association. However, Turquality experience underlines that more emphasis needs to be put in marketing and branding activities.

3.1.5. Opportunities

Turkish companies can take advantage of several upgrading strategies. These strategies are highlighted with examples below.

Process Upgrading - New Technologies

There are opportunities provided by the technological developments and some Turkish Textile companies are taking advantage of these developments. For instance, Kordsa as a manufacturer of industrial nylon and polyester yarn, tyre cord fabric and single-end cord, that is predominantly used in the making of tyres, is implementing new technologies to better manage its factory floor and workflows.[15] Kordsa has developed an app for its employees to make its operations as transparent as possible and as a result its operational efficiency increased by 5%; timely and accurate decision making with real-time data analytics has led to a 15% decrease in response time; a 6% increase in staff productivity; and a saving of 70 mins/day, which are now focused on value-added activities.

Kordsa has also invested in intelligent robotics. Prior to this investment a Kordsa employee could handle between 6-7 tons every day (as a fiber roll can weigh up to a ton) but this has been eliminated with the installation of cobots (robots which physically interact with humans in a shared workspace). One of the main lessons from Kordsa's implementation of new technology is that the new technology needs to be aligned with corporate strategy.[16]

Another example for Turkey-based textile company investing in new technologies is Hugo Boss Solutions, the manufacturing segment of Hugo Boss, which produces over 4 million pieces of apparel a year.[17] With a consumer-based digital roadmap, Hugo Boss Solutions has invested in robotics and automation of processes, in its Izmir facility has 100 data collecting points to monitor temperature, vibrations and currents, identify problems, it has a robot using free-mapping technology and the company uses smart data management to monitor and update data in real time. One of the key lessons from this experience is that proper soft and hard infrastructure is needed before implementing the digital transformation.

UNDP White Paper on Total Factor Productivity also highlights that acceleration digitalization by increasing digital skills of companies, improving digital infrastructure, improvement of e-commerce capacity, extending cloud computing would increase productivity levels in Turkish manufacturing sector.[18]

According to data provided by the General Directorate of Energy Affairs of the Ministry of Energy and Natural Resources, a total of 247,169 Gigawatt hours (GWh) of electricity was consumed in Turkey in 2017, of which 114,629 GWh (46.4%) were for industrial consumption and 109,505 GWh for manufacturing industry.

At 17,022 GWh, the textile, clothing and leather industry consumes the most electricity among the manufacturing industry sectors second only to the basic metal industry. This is largely due to the finishing industry and the large production network of the industry. The main inputs of the textile finishing industry which is concentrated in the Marmara Region are natural gas, other thermal energy, steam and electricity. In textile

15. "WTiN Report: Inaugural Textile 4.0 Conference provides digital vision" https://www.whichplm.com/wtin-report-inaugural-textile-4-0-conference-provides-digital-vision/
16. Ibid.
17. Ibid.
18. Support to Development of a Policy Framework on Total Factor Productivity Project, http://tfvp.org/wp-content/uploads/2018/11/White-Paper-Final.pdf.

finishing, 1.5 kilowatt/hour power and 1.10 cubic centimeters of natural gas are consumed to produce 1 kg of textile.

Several governments are implementing incentive schemes to reduce energy consumption in the production process. For instance, Indonesian government regulation (No. 70/2009) provides incentives for improved energy management, including tax deductions, import duty assistance, low-interest funds for investing in energy efficient machinery, and energy audit support (International Energy Agency, 2015).

Another aspect of process upgrading is engaging in recycling and waste management to create a sustainable, circular economy in textiles. There are several opportunities in recycled content amidst rising global concerns of the environmental impact of manufacturing particularly in the European market. This offers opportunities for Turkey, which already has a competitive advantage in meeting the demands of the European market. In this respect, performance and athletic apparel can be considered as key markets to address. Developing products that address environmental and sustainability concerns can be angles for marketing and branding Turkish products. Furthermore, Turkey could expand textile component exports to nearby countries as an alternative to China for brands concerned with reducing the environmental footprint of their goods by reducing the distance component products must travel to reach the destination of final assembly.

Functional and End Market Upgrading –Branding, Marketing and Retail

Even though Turkey is still one of the largest apparel producers in the world, it will increasingly face challenges competing in OEM production as there are many countries with lower labor costs and preferential market access to key end markets that are also developing sourcing and textile production capabilities. Nevertheless, this can be turned into advantages given Turkey's capabilities in design and to a lesser extent branding (Table 10 provides a brief overview of functional upgrading in Turkey). While industry-specific experience is important, the skills needed are more cross-cutting and generally revolve around business development, marketing and creativity. Firms need employees with advertising, social media, networking, product development and consumer market research capabilities. Another important element is developing a network of buyers in new markets; it is critical to develop connections and know-how on brand promotion in new markets. Moving more of Turkey's production from contract manufacturing on behalf of foreign brands to products produced, owned and branded by Turkish firms would lead to higher-skilled jobs and increased exports to new markets. A few Turkish companies such as LC Waikiki[19] and Mavi have been successful in these areas, which has enabled them to access new markets with their own brands.[20]

Related to this, performance/technical apparel (athleticwear, uniforms) and fabrics are potential product areas of focus to develop Turkish brands. This is a growing market globally for both casual 'athleisure' and sports enthusiasts and an area in which consumers still value quality and performance capabilities and are more willing to pay a price premium. Brand development opportunities are not limited to just final products; there also opportunities for upstream branding by fabric, yarn and fiber companies. Upstream branding is a way to enhance consumer awareness of the capabilities and technical benefits of the textile components in a product, increase the value of products and increase the likelihood of buyers' specifying textile suppliers. Examples of company's using this strategy include

Table 10. Turkey: Functional Upgrading in the Apparel GVC

Stage 1 OEM: Full Package: 1980s–2000s	Stage 2 ODM: Design 2000s–Present	Stage 3 OBM: Branding	Stage 4 Retail/Distribution
Turkey has had full-package capabilities since entering the global apparel industry. Many firms are vertically integrated or can source most raw materials locally. Turkey became a prime apparel supplier to European buyers because of its tariff preferences via the Customs Union, skilled low-cost workers, and proximity.	Deep relationships of Turkish manufacturers with European apparel retailers and strong OEM capabilities allowed Turkey to move into the design segment of the chain. Turkish firms sent employees to Europe to train with European designers and hired consultants to come to Turkey to work on design and branding skills locally.	Turkey aimed to leverage its capabilities to penetrate new end markets by developing Turkish apparel brands. In the mid-2000s the Turkish Government provided incentives to firms to upgrade and increase competitiveness in global markets.[21]	Moving forward, Turkish firms can expand into branding and direct sales channels in Turkey and abroad.

Source: Based on Fernandez-Stark, K., Frederick, S. & Gereffi, G. (2011). Duke GVCC.

19. In 2013, the company had US$ 2.4 billions in sales and 22,000 employees.
20. Other examples include Modanisa, Bilsar (retail stores in Italy, France) and for suits Sarar, Ramsey, Damat, Kigili.
21. These incentives included reimbursements of up to 60% of the cost for a maximum of three years for personnel expenses (including training and recruiting highly qualified personnel), machinery,

U.S.brands such as Polartex, Goretex, Invista and Nano-Tex and European firms such as Scholler and Lenzing. In some cases, upstream brands become the name known by consumers (for example, spandex is often called Lycra, however this is the brand of spandex developed by DuPont).

Chain Upgrading – Interlinkages with Different Industries and Technical Textiles

Technical textiles are textile materials and products manufactured primarily for their technical and performance properties in addition to their aesthetic or decorative characteristics. Overall these sectors are more capital-and scale-intensive and there are fewer countries and companies globally with capabilities in these areas. Turkey appears to be strong in automotive fabrics and can capitalize on existing strengths to expand market share in other transportation markets including aerospace, rail and ships for commercial and defense sectors. Beyond transportation, opportunities exist in medical textiles and sustainable construction materials.

Related to technical textiles, carbon fibers and carbon fiber composites are key components for future high-tech applications and relatedly their share in world trade is expected to increase significantly.[22] Demand for carbon fiber is expected to increase by 11.3% on average per annum between 2018 and 2022. In 2018, global demand for carbon fiber was US$2.88 billions; demand is driven by North America (33%), Europe (27%), and Japan (11%). In 2018, demand for carbon fiber in Asia Pacific (excluding Japan) accounted 24%, most of which came from China. Thus, there are opportunities to reach both developed and emerging markets.

Another potential opportunity for Turkey is in medical textiles. The medical textiles sector is expected to grow by 4.9% per annum through 2025 to reach a global value of US$23.3 billions.[23] The Box Article at the end of this report provides further support into opportunities in the areas of medical textiles and carbon fibers.

3.1.6. Challenges

The import dependency in the textile industry increases costs and lowers Turkey's value addition in the production process. The high cost of energy, water, and labor necessitate Turkey to upgrade in the Textile GVC by producing more value-added products and services.

Reliability is critical to address global demands in textile GVC. Turkish companies can use their comparative advantages in production and design capabilities to remain reliable producers.

Adoption of new technologies in the production process for process upgrading requires a labor force with digital skills.

The textile industry is represented by numerous business associations and their coordination is critical for successful marketing, branding and end-market upgrading strategies.

3.1.7. Potential Upgrading Trajectories

Table 11: Potential Upgrading Trajectories for Turkish Textile and Apparel Industries

Upgrading Area	Value-Addition	Increase Exports	Employment (Quality or Volume)
Functional upgrading (branding, marketing, retailing, design) and end market	Yes	Yes	Quality
Chain upgrading; expand capabilities in technical fabrics, yarns and fibers	Yes	Yes	Quality
Process and product upgrading via environmental sustainability	Yes	Yes	Quality

3.1. 8. Recommendations to the Government of Turkey

This preliminary study shows that a stage-by-stage analysis of value addition from raw materials to sales can help identify specific interventions for Turkey's upgrading in the textile GVC.

This initial analysis identifies that in textiles, Turkey can add more value to the production process by focusing on branding, process upgrading, considering interlinkages with other industries such as automotive and medical products, and can create a sustainable eco-system by reducing energy and water consumption, recycling waste in textile production and forming a circular value chain.

These recommendations can be substantiated with a detailed on the ground GVC analysis by meeting industry stakeholders from the public and private sectors.

22. Statistics: trends in demand for carbon fibre and carbon fibre composites, Technical Textile Markets, No 113, August 2019
23. Tomic-Reisel, Tjasa. Medical Textiles: Markets, Applications, Developments and Regulations, Technical Textile Markets, No 114, August 2019.

3.1.9. Box Article: Medical Textile and Carbon Fiber Opportunities for Turkey

With Turkey's increasing appeal for medical tourism, medical textiles offer an avenue to upgrade in the textile GVC. Medical textiles are used in non-implantable products such as adhesive tapes, compression garments/socks, surgical gowns, bedding, wound care dressings and even extra-corporeal organs such as artificial kidneys, livers, lungs, etc. For example, prosthetics and orthotics (body part braces) make up a US$2.8 billions global market. There are also implantable applications in areas such as surgical meshes and tissue engineering scaffolds. Because of factors such as ageing populations in developed countries, growing middle classes and rising disposable incomes in several developing countries, and increasing awareness among patients of new wound care applications, medical textiles is expected to be one of the fastest growing technical textiles category. In 2018, the largest exporters of medical textiles were China, followed by India, Germany and U.S.

Medical textile applications exist for all types of fabric, however nonwoven fabrics account for the largest share of demand by volume (64.3%), followed by woven fabrics with a 15.4% share. Global demand for nonwoven fabrics in medical textiles is expected to grow by 5% per year until 2025. Applications of nonwoven fabrics include diapers, drapes, feminine hygiene, incontinence products, medical gauze, surgical gowns and masks, wadding, wound care, and wipes. Applications of woven fabrics include hospital garments, surgical hosiery, fabrics for use in contact with wounds and other bandage types, and artificial tendons. Knitted fabric applications include bandages, devices for hernia repair, medical dressings, prolapse devices, and surgical, reconstructive and cosmetic surgery meshes. Furthermore, technological developments will continue to create new medical textile applications. Two key areas are materials whose properties can change in response to stimuli and nanocomposites.

Carbon Fiber Trends

Carbon fiber is a type of inorganic fiber. Polyacrylonitrile (PAN), a textile-based polymer, cellulose (rayon) and pitch are used as raw materials for medical applications among many other industries. Bitumen fibers are obtained from purified oil or coal tar. PAN-based fibers are mostly used (~ 90%) in the production of carbon fibers. Pitch-based fibers have a more resistant and brittle character. With their superior combination of high strength, low density, low friction and low weight properties, carbon composites are preferred materials in aerospace, defense, automotive industries, sports equipment, construction, and energy storage. Carbon fiber provides more energy storage and return (known as dynamic response) than any other material. Although carbon fiber is 4.5 times lighter and stronger than steel, it is mainly used in the aviation industry due to the lack of mass production and high prices. However, major producers, which account for 87% of the world market, continue to work towards improving the process, and prices are expected to decline in the coming years. Key manufacturers such as DowAksa, Hyosung, Teijin Carbon and Toray have substantial expansion plans. Many other carbon fiber producers are diversifying their product portfolio to supply a wider variety of carbon fiber composites manufacturers.

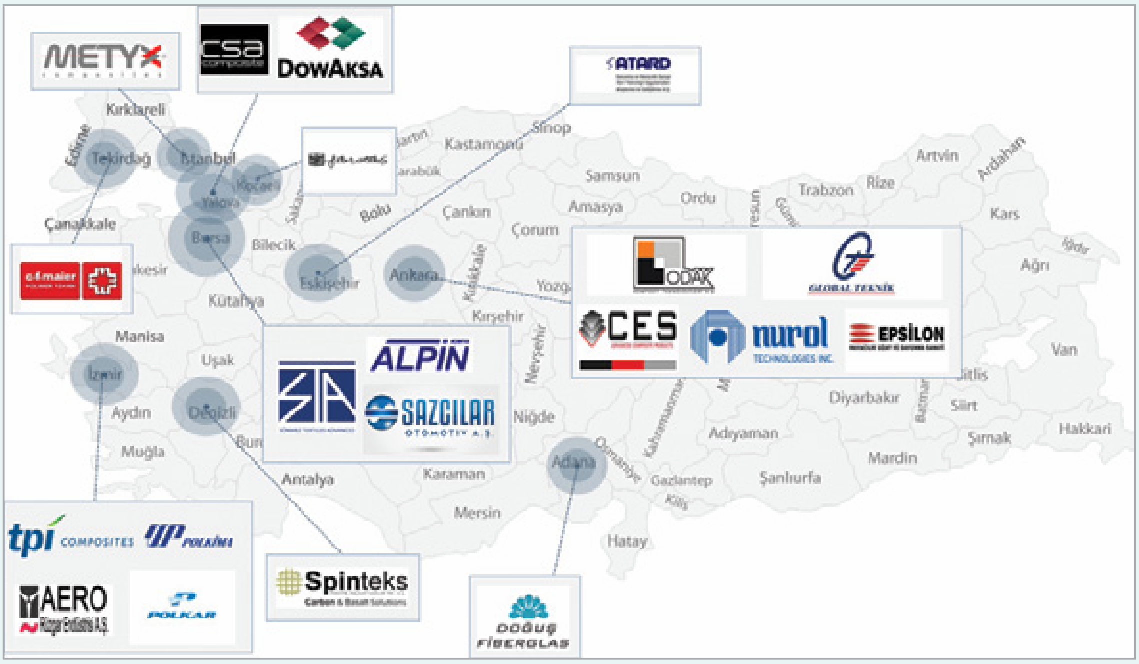
The Carbon Fiber Value Chain in Turkey

Globally, there are three types of carbon fiber manufacturers. The first type produces carbon fiber into yarn-shaped bobbins. The second type utilize carbon fibers as an input to manufacture goods. The third type combines the capabilities of the first two and performs all activities along the value chain under one roof. Turkey does not have any companies in the third category. Turkey has one company in the first category--DowAksa, which is joint venture of one of the biggest chemical company in the world, Dow Chemical, and Aksa, the top producer of acrylic fiber in Turkey. All the other Turkish players in the carbon fiber value chain are in the second category.

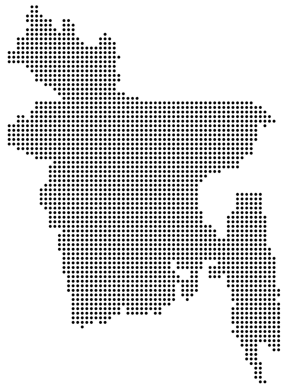
Turkish carbon fiber players serve mostly three industries: aerospace, defense, and the automotive, railway and marine industries. In terms of geographic distribution, the production is divided around three main clusters. The players around the Ankara area cater mostly toward the dominant market for carbon fibers in Turkey: the aerospace and defense industries. Turkey aims to leverage this supply chain position to become in the short term a tier 1 aerospace supplier. The players around Istanbul-Bursa primarily supply the automotive sector. This carbon fiber automotive subsector developed around the lead automotive firms present in the Bursa area. They supply the main auto manufacturers such as Ford, Daimler, Mercedes-Benz and BYD. The players around Izmir and Bursa mainly supply the construction industry. However, very few medical carbon fiber players are found in Turkey.

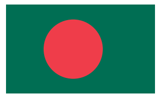
There are strict standards for medical textiles used with living substances such as tissues and blood. They need to be biocompatible, chemically inert, hypoallergenic, non-carcinogenic, non-toxic and sterile. Core physical properties include air permeability, durability, elasticity, moisture absorption and strength. Not all textile exporting countries can adhere to these standards, however, Turkey's experience serving other demanding technical textile markets is an advantage. This fact, combined with Turkey's capacity to produce carbon fiber, in addition to Turkey being a strong destination for medical tourism can help the country tap into medical textile markets.

Figure 9: Carbon Fiber Clusters in Turkey *(Source: DowAksa)*



3.2 BANGLADESH IN THE APPAREL GLOBAL VALUE CHAIN





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Summary

This Preliminary Global Value Chain (GVC) Analysis assesses the Bangladesh Apparel Industry from a GVC perspective to understand the emerging trends, dynamics, opportunities and challenges affecting the industry's growth and competitiveness. The apparel sector plays a pivotal role in Bangladesh's overall economy for contributing over 80% share in exports, driving the services sector, and creating many manufacturing jobs, mostly for women. In the last four decades, Bangladesh has achieved remarkable progress with its integration in apparel GVC, despite several setbacks, including the Multifiber Arrangement (MFA) phase-out in 2005 and the Rana Plaza factory collapse in 2013. It is argued that the abundance of cheap labor and other advantages, including preferential agreements, helped the industry in reaping its competitive advantage.

With almost all major global apparel brands and retailers sourcing from Bangladesh, its share of global apparel exports is growing in all categories of products. However, with the rise of new and more efficient competitors and growing technological developments, Bangladesh needs to review its apparel sector strategies to upgrade its apparel industry further and increase its share in the global apparel export market.

Several upgrading trajectories can be applied to advance the industry and improve its resilience, including (i) addressing critical skills gaps through training programs is required to enhance workers' productivity and managerial capacity of mid-level talents; (ii) the Bangladesh apparel industry can increase competitiveness through reducing lead times, faster technology adoption, and environmentally friendly production process; and (iii) a communications and policy advocacy campaign is required to attract more investment in the sector and show the industry's ability in meeting the increased demand from global brands. These upgrading strategies will help the Bangladesh apparel industry improve its competitiveness, attract high-quality investment, increase value-add and employment in the economy, and achieve environmentally sustainable development.

3.2.1. The Global Apparel Industry

Apparel production in the world is fragmented, covering both high-income and low-income countries, which produce high and/or low-end products. The industry is labor-intensive and provides employment opportunities for millions of workers, particularly for women and youth. The global apparel value chain is complex as it includes actors of various sizes and numerous steps and activities. The competition in the industry, which is buyer-driven, is high among lead firms and among manufacturers who always seek to increase productivity, decrease cost, enhance quality and delivery speed, and ultimately increase profitability using various upgrading dimensions and trajectories.

The Global Apparel Industry – Key Trends

The dynamics in the global apparel industry are continuously changing. The industry's nature of being consumer-driven, with a growing world population and buying power, plays a role in shaping its conditions and products. While the actors' capacity and ability to upgrade and adapt drive the competition, the global actors' agreements can determine the distribution or concentration of benefits and participation in the market. With the spread of COVID-19 and the increasing concerns about climate change, new trends in environmental sustainability and technology-driven innovations are emerging. In this paper, we have identified five main trends that currently affect and shape the industry.

Bangladesh increased its share from **4.2%** to **6.4%**, while Viet Nam's share increased from **2.9%** to **6.2%** in 2018

1. China will continue to lead the world exports. China is currently the leading supplier of apparel globally, with a total value of exports at US$145 billions in 2018 (ITC Trade Map, 2020). China has diversified its apparel products and materials and strengthened its capabilities to products across various categories. Also, it shifted its focus towards products with high value-add such as coats, dresses, skirts, and knitted shirts (Frederick & Daly, 2019). China's global apparel exports fell from 35% in 2010 to 30% in 2018 (ITC Trade Map, 2020). However, China did not lose its share to one single country but to a group of countries. For example, during the same period (from 2010 to 2018), the third and fourth leading exporters, Vietnam and Bangladesh, gained limited shares in the market. Bangladesh increased its share from 4.2% to 6.4%, while Viet Nam's share increased from 2.9% to 6.2% in 2018, and a group of countries like the European Union (EU 28), which is the second leading exporter of apparel in the world, did not increase its share, during the same period, and remained at 28.4% (WTO, 2019). This suggests that the other exporters' capacity is limited, and no single country could absorb China's lost shares and emerge as the new leader of the apparel exports. And since China upgraded into higher value-adding activities, this might also suggest the loss of low value-adding shares in total exports. Accordingly, some of Chinese share loss was absorbed by low-end product manufacturers such as Bangladesh.

2. There is an increasing demand for apparel in Asian countries, suggesting a shift in imports from western countries to eastern ones. In 2018, the United States, Germany, Japan, United Kingdom, and France topped the list of the leading importers of clothing (ITC Trade Map, 2020). Nonetheless, while the world average annual economic growth is 2.9%, the Asian countries' compound annual growth rate is 7.6%, making them the fastest-growing consumer market. According to McKinsey & Company (2020), it is stipulated that Saudi Arabia and the United Arab Emirates (UAE) have big potential as consumers in UAE crave style and tend to spend more, while Kingdom of Saudi Arabia (KSA) new government policies encourage change of spending habits, which proposes an interesting opportunity for global players. Key global players, including Chinese manufacturers, have already started to invest and produce for the regional markets in Asia to meet the growing demand for clothing and benefit from low production and labor costs. It is predicted that the sales of clothing in Asia will account for 40% of the global market share by 2025 (International Labor Organization [ILO], 2019).

3. Preferential Agreements and Tariffs Influence Access to Market. From 1974 to 2004, the global apparel industry was governed by the Multifiber Arrangement (MFA) / Agreement on Textiles and Clothing (ATC)[1], under which the clothing quotas were negotiated bilaterally (The World Bank [WB], 2012). After the end of the MFA, operating under free import quotas did not go well with some developed countries in competition with developing countries such as China, one of the biggest winners as it exploited its massive production scale. Hence, some countries received advantages by tariff preferences and Preferential Trade Agreements (PTAs) imposed by the U.S.and the EU to influence who is granted access to their markets. For example, Bangladesh was preferred by the Generalized Scheme of Preferences (GSP), which granted it tariff and quota-free access to the EU (Fernandez-Stark et al. 2011). Therefore, tariff and bilateral agreements play a role in determining who and where to participate in the value chain.

4. High-tech production and automation might be expedited due to COVID-19. According to ILO (2019), the apparel value chain is slowly absorbing the automation and technological advances such as laser cutters, 3D-printing, sewbots, and knitting machines. It is suggested that these rapid advances will transform the industry and bring disruptive change through growing, speeding, and lowering the cost of production. Nonetheless, the ILO (2019) does not foresee that the expensive high-tech will necessarily replace low-tech production in developing countries due to the low cost of labor and production in these countries, but rather a high-tech production might be widespread in high-income countries with large markets. The ILO report also suggests that a combination of high-tech and low-cost labor and production might co-exist in countries that invested in its industrial capacity and new technologies such as China. However, the interruption of supply chains all over the world due to COVID-19 could affect GVCs since some political leaders in the developed countries are supporting simplifying GVCs through moving to manufacture back home and increasingly depending on automation (Crabtree J., 2020) to overcome the challenges related to working standards and lead time. Despite the expectation that increased automation and use of technology might decrease direct employment opportunities, this step is essential for developing countries to mitigate global shocks to the industry.

The industry can no longer thrive without a social and environmental purpose and sustainability, especially post COVID-19. In the past few years, workplace safety and work conditions were the biggest concerns in the industry. These concerns appeared after incidents[2] that happened in different countries in the world, which resulted in consumers preferring companies with a social purpose. The preference for such companies is increasing after the spread of COVID-19. According to Deloitte & Touche (2020), the pandemic's spread has made the inter-relationships between companies, communities, employees, customers, and other stakeholders completely clear, which prompted purpose. The pandemic made it clear that companies and industries cannot survive and thrive without all stakeholders and without managing both financial and non-financial goals.

1. The MFA was established in 1974, and in 1995, it was replaced by the ATC, which brought the MFA under the rules of the World Trade Organization (WTO). The ATC was introduced as a transitional instrument to bring the industry under the normal rules of the General Agreement on Tariffs and Trade (GATT) by 2005 (WB, 2012).
2. For example, the fire at the textile factory in Pakistan in 2012, and the collapse of a garment factory in Bangladesh in 2013.

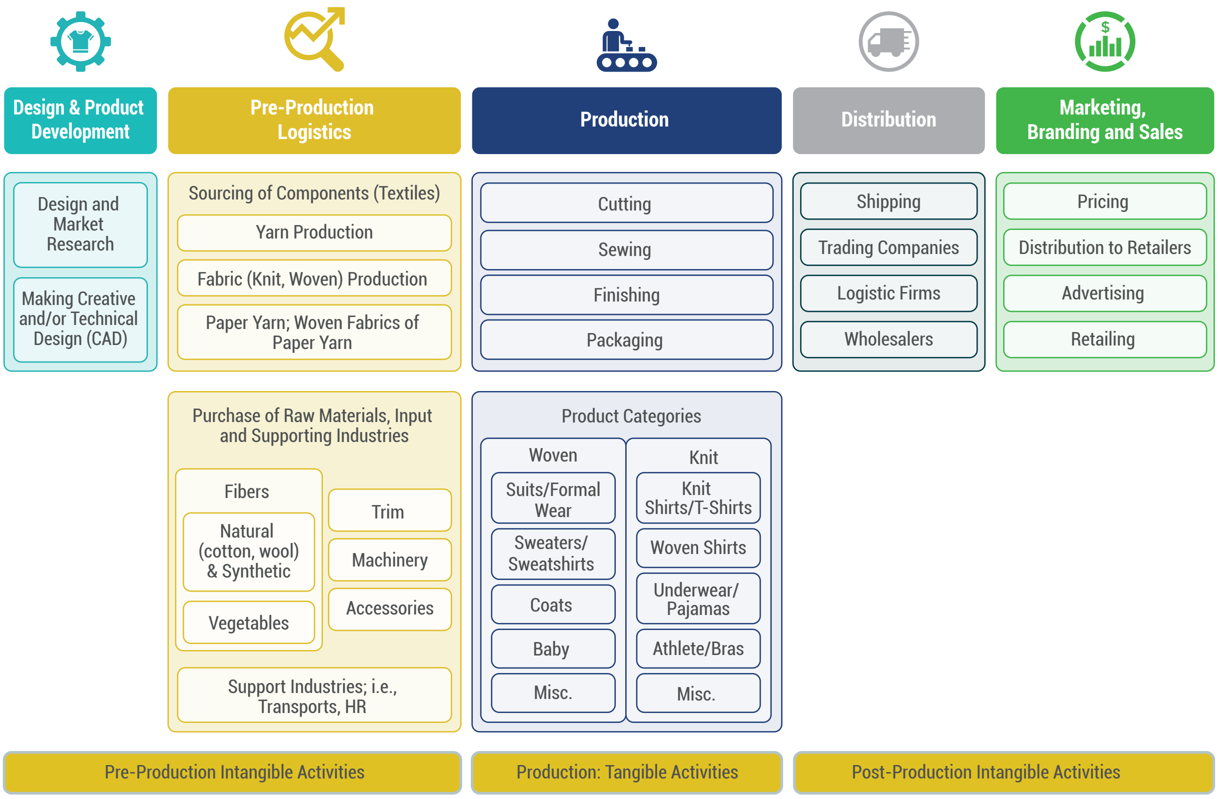
In addition to the social purpose, McKinsey & Company (2020) found that sustainability topped the list in their surveys for the first time in the past four years as the biggest concern facing the apparel industry now. There is a growing concern among governments, consumers, and civil society organizations about the apparel industry's impact on the environment and climate change. These concerns provoked key players to rethink their business models and processes and adopt new technologies to respond to demands in protecting the environment and mitigating the industries' negative impact on global warming (ILO, 2019). On the one hand, these new green models and processes are costly, especially for developing countries, and their uptake is very slow in the industry till now, and players in the industry must find solutions to address the growing concerns if they want to survive in the future (McKinsey & Company, 2020). On the other hand, innovative technologies and Research and Development (R&D) can play a significant role in introducing sustainability solutions. For example, new materials are under development now to address environmental concerns. The research for new materials went beyond replacing natural resource-consuming raw materials to developing materials that can protect the consumers from climate change, aging, and hazards such as radiation (ILO, 2019), which creates opportunities to introduce new products in the market.

5. E-commerce is driving apparel growth. The fast-growing apparel market is reaping opportunities with rapidly expanding e-commerce and easy digital payments, especially in those places where a fusion of fast economic growth and a young consumer base comes together. With young people spending increasing amounts of time online, e-commerce in the fashion sector is also advancing in rapidly growing economies. In 2019, the global size of the apparel e-commerce was estimated at US$396.6 billions (Statista, 2020). Among major economies, China leads the world in apparel e-commerce with an estimated size of US$193.9 billions in revenues. The corresponding number was US$67.8 billions in the U.S. and US$66.2 billions in Europe. In 2019, most apparel e-commerce users lived in China (466.7 million), followed by Europe (342.2 million) and the U.S. (173.4 million). It is anticipated that E-commerce will grow by at least 20% as the pandemic has expedited the shift away from physical stores to digital shopping by roughly five years, according to IBM's U.S. Retail Index 2020.

Mapping the Apparel Global Value Chain

Nowadays, the production of goods is increasingly structured through global value chains (GVCs). The value chain can be simply described as the "full range of activities that firms and workers do to bring a product from its conception to its end use and beyond" (Gereffi and Fernandez-Stark, 2011). In apparel GVCs, the production of components and assembly into final products is also carried out via intra-firm networks spreading worldwide. A suggested mapping of apparel GVCs is given in Figure 1, basically identifying the main activities and stages of the apparel GVC.

Figure 1: Apparel Global Value Chain Map



Source: Authors based on exiting literature, including Fernandez-Stark et al. (2011); Frederick and Daly (2019)

As shown, the whole apparel GVC activities is conducted in three broad stages: (i) pre-production intangible activities, (ii) production-related tangible activities, and (iii) post-production intangible activities (Staritz and Morris, 2016). The 'tangible' activities are steps and functions directly related to production/manufacturing in the apparel global value chain. The 'intangible' activities include design and product development, pre-production logistics, distribution, marketing, branding, and sales. These 'intangible' activities are generally controlled by a combination of lead firms, intermediaries and supplier firms. In reality, the most important stages that add the highest values in the whole value chain are 'intangible' services that occur before and after the apparel production process. Thus, the apparel value chain can be broken up into the following five stages: (i) design and product development; (ii) pre-production logistics; (iii) production; (iv) distribution; and (v) marketing, branding and sales.

Design and Product Development: Design and development (or Research and Development – R&D) is one of the dominant activities in the pre-production intangible activities retaining a large part of value-added in the apparel value chain (Hester, 2013). This value-adding stage includes firms that engage in R & D, develop conceptual and physical products, and research on products, markets and consumers. Activities related to conducting research through a survey on consumer satisfaction, revising product design, cutting production costs, and giving the product a strong competitive advantage in the target market are the dominant part of this stage (Fernandez-Stark et al., 2011). Here, there are two kinds of designs: creative design- that traditionally involves human designers for sketching and generating fashion ideas- and technical design- that involves translating ideas into garments (Frederick and Daly, 2019). Design software is increasingly being used for the chain's design segment to accommodate ideas aligning customer choices. Usually, firms operating in the high-end segment of the market retain research and design functions in-house, while consumer brands and retailers follow the design tendencies set by those firms. Producers with high economies of scale may also maintain their fashion lab for design and product development.

Pre-Production Logistics: This stage refers to critical pre-production activities, which can be grouped into two categories: (i) purchasing of raw materials, inputs and support industries, and (ii) sourcing of production components, including purchasing and transporting textile products. Purchasing inputs, such as natural and synthetic fibers (i.e., cotton, wool, silk, flax and chemicals), apparel trim and accessories (buttons, zippers, hangers, tags and packaging), capital equipment and machinery parts, is a critical step. Arranging a broad range of services applicable to vital support industries, such as transportation, logistics, catering, information technology (IT), construction, cleaning, security, and human resources, is part of this stage. The inputs must align with the design provided by the lead firms. Activities for sourcing of production components include arranging and physically transporting textile products (Fernandez-Stark et al., 2011). In evaluating manufacturers' performances, price, quality, reliability and lead times are critical factors to the lead firms. Managing logistics usually requires strong domestic and/or overseas coordination.

Production: The production stage includes cutting, sewing and finishing activities, including buttonholing and ironing. Before shipping, packaging in a prescribed shape is the final step of the production stage, performed by manufacturers. Apparel products that can be broadly categorized into woven and knit include shirts, trousers, hosiery, coats, undergarments, suits, and these products differ in gender and age. Usually, producers/manufacturers cut and sew woven or knitted fabric or knit apparel. However, this stage may have a diverse range of establishments. For example, apparel manufacturers can be contractors, performing cutting or sewing operations on materials owned by others, or tailors who manufacture custom garments for individual clients (Fernandez-Stark et al., 2011). Manufacturers can either purchase textiles from another establishment or make the textile components in-house, depending on buyers' demand and choice. In this stage, a large portion of the work is still labor-intensive. With low fixed costs, straightforward technology and low skills, the production phase moves to low-cost locations, primarily in developing countries. However, significant and fast automation is currently taking place in this stage, especially for repetitive tasks, prompting the possibility of shifting production to high-income and middle-income countries (McKinsey & Company, 2018).

Distribution: The distribution stage is post-production logistics, which leads the product transfer from garments to customers. The product is distributed via a network of wholesalers, trading companies, logistics firms, and other companies such as shipping responsible for value-adding activities outside of production (Fernandez-Stark et al., 2011). While sourcing, apparel buyers usually evaluates the ability of producers in terms of cost, quality, lead time, reliability as well as social, political and environmental compliance, depending on gender-based wear, apparel sub-sectors and categories of materials (cotton vs. human-made fibers) (Frederick and Daly, 2019).

Marketing, Branding, and Sales: This stage includes all activities and firms associated with pricing, distribution to retailers and selling a product, utilizing marketing/advertising and branding. Usually, the firms that participate in these activities are the lead firms in the chain and, with the power of determining retail prices of the product, this stage accounts for the highest value addition in the chain (Frederick and Daly, 2019). On rare occasions, firms make physical alternations of a product once they receive the final one. The final apparel product is marketed and sold to final consumers (via retail channels including e-commerce sites), institutions or the government. The lead firms either sell the product through its chain stores or collaborate with department stores, factory outlets, specialty stores, discount chains, etc. A large part of sales, including e-commerce, targets country-specific seasonality, occasions, holidays, etc.

Global Supply and Demand in the Apparel GVC

With about 30% of global exports, the Chinese supply dominates the global trade in the apparel industry; European and American consumers are largely controlling demand. However, current dynamics in the supply side are evolving fast with a declining share of China and a rising share of countries like Cambodia, Bangladesh and Vietnam.[3]

The global apparel export industry can be divided into 12 categories as listed in Table 1.[4] Suits, formal wear, trousers, dresses and skirts are the largest export category with about 35% share of the world market in 2018. Knit shirts and T-shirts were the second largest with a 12.7% share in the global market. However, coats, athletic, miscellaneous apparel, suits, formal wear, trousers, dresses, and skirts lead to global apparel growth. In terms of Compounded Annual Growth Rates (CAGRs), coats posted the highest growth of 6.0% for the value of exports during the ten years (2009-2018).

Global Supply. During the past decade, China has been the clear winner by far, with at least a 30% share in apparel products' global exports (Table 2). China has regularly outpaced other apparel exporters with substantial production capabilities across various product categories by a significant margin. Bangladesh has been able to advance its position as a leading exporter with a more than threefold increase in the value of its apparel exports, from US$12 billions to US$39 billions, and currently, it holds the second position among global apparel exporters.

Despite China's dominant position in the apparel supplies, the growth of the value of China's apparel exports has largely stagnated in the last decade, indicating the country's rising labor costs and policy focus on higher value-added industries/ products (Frederick, 2016; McKinsey & Company, 2013). While the CAGR of global apparel exports was 2.8%, China posted only 2.5% CAGRs for the value of its exports in the ten years (2008-2018). Countries with the highest CAGRs, such as Cambodia

Table 1: World Apparel Exports by Year, Product Category[5], World Share and Compound Annual Growth Rate (CAGR), 2008-2016

Product Category	Value (US$ billions)						World Share (%)	CAGR (%)
	2008	2010	2012	2014	2016	2018	2018	2009-18
Total	361	347	403	470	430	478	100.0%	2.9%
Suits, Formalwear, Trousers, Dresses, Skirts	125	122	150	173	158	171	35.8%	3.2%
Knit shirts, T-shirts	52	48	53	61	56	61	12.7%	1.5%
Sweaters, Sweatshirts	45	44	47	54	48	57	11.9%	2.2%
Coats	24	24	28	37	34	43	9.0%	6.0%
Woven shirts	24	23	26	30	28	29	6.1%	1.8%
Athletic	18	17	20	24	23	27	5.6%	4.0%
Underwear, Pajamas	20	19	20	24	23	24	5.1%	2.0%
Misc. Apparel	16	18	22	26	22	23	4.8%	3.5%
Hosiery, Socks	11	12	13	14	12	14	3.0%	2.2%
Bras	11	9	10	12	11	12	2.6%	1.4%
Baby	8	7	8	10	9	10	2.2%	2.8%
Accessories	5	5	5	6	6	6	1.3%	2.6%

Source: ITC Trade Map (1 April 2020). Note: HS02, 61+62 codes.

3. The source for all trade data is the ITC Trade Map (2020).
4. The categorization of products was done for ease of analysis and focusing on major products in terms of export values.
5. product categories are defined based on HS02 codes shown in the bracket as the following: Suits, Formal wear, Trousers, Dresses, Skirts (6103+6104+6203+6204); Knit shirts, T-shirts (6105+6106+6109); Sweaters, Sweatshirts (6110); Coats (6101+6102+6201+6202); Woven shirts (6205+6206); Athletic (6112+6114+6211); Underwear, Pajamas (6107+6108+6207+6208); Misc. Apparel (6113+6116+6210+6213+6214+6215+6216); Hosiery, Socks (6115); Bras (6212); Baby (6111+6209); and Accessories (6117+6217).

Table 2: Top 10 Apparel Exporters by Year, Value and World Share, 2008-2018

	Value (US$ billions)						World Share					
Partner	2008	2010	2012	2014	2016	2018	2008	2010	2012	2014	2016	2018
WORLD	362	348	404	472	432	479	100%	100%	100%	100%	100%	100%
China	113	121	148	173	146	145	31%	35%	37%	37%	34%	30%
Bangladesh	12	15	19	-	33	39	3%	4%	5%	-	8%	8%
Viet Nam	8	10	14	20	22	28	2%	3%	3%	4%	5%	6%
Germany	19	17	18	19	17	23	5%	5%	4%	4%	4%	5%
Italy	24	19	20	23	20	23	7%	5%	5%	5%	5%	5%
India	10	11	13	17	17	16	3%	3%	3%	4%	4%	3%
Turkey	13	12	14	16	15	15	4%	4%	3%	3%	3%	3%
Spain	7	7	9	12	12	14	2%	2%	2%	3%	3%	3%
Hong Kong, China	26	23	21	19	15	13	7%	7%	5%	4%	3%	3%
Cambodia	3	3	4	5	7	13	1%	1%	1%	1%	2%	3%
Top 5	176	182	220	236	239	259	49%	52%	54%	50%	55%	54%
Top 10	236	238	281	305	304	330	65%	68%	70%	65%	71%	69%

Source: ITC Trade Map (31 March 2020). Notes: (i) HS02, 61+62 codes; and (ii) (-) indicates missing data.

(15.7%), Vietnam (12.7%), and Bangladesh (12.6%), experienced the largest growth in global supply markets during the same period.

Although, in 2018, China's top three exports by product category are suits / formal / wear/trousers/dresses/ skirts, and sweaters/sweatshirts and coats, in terms of world market share, China accounts for the highest percentage of bras (44%), miscellaneous apparel (42%), underwear/pajamas (38%), and coats (36%) (Table 3). Bangladesh's top two exports are suits/ formal wear/trousers/dresses/skirts, and Knit shirts/T-shirts, however country's highest percentage contribution to global exports is for Knit shirts/T-shirts (13%), baby (13%), and woven shirts (12%).

Table 3: Apparel Exports of China and Bangladesh by Product Category[6], 2008-2016

Product Category	Value (US$ billions)			World Share (%)	
	China	Bangladesh	World	China	Bangladesh
Total	145	39	478	100%	100%
Coats	15	2	43	36%	5%
Suits/Formalwear/Trousers/Dresses/Skirts	56	15	171	33%	9%
Knit shirts/T-shirts	9	8	61	15%	13%
Woven shirts	5	3	29	17%	12%
Underwear/Pajamas	9	2	24	38%	8%
Sweaters/Sweatshirts	18	5	57	32%	10%
Athletic	7	1	27	27%	3%
Hosiery, Socks	6	0	14	44%	0%
Baby	3	1	10	28%	13%
Bras	4	1	12	32%	5%
Accessories	2	0	6	34%	0%
Misc. Apparel	10	1	23	42%	2%

Source: ITC Trade Map (31 March 2020). Note: HS02, 61+62 codes.

6. As defined previously in footnote

Global Demand. During 2008-2018, the value of global apparel imports rose from US$353 billions to US$429 billions (Table 4). Major economies in Europe and the United States have been dominating the global demand for apparel products. In 2018, the United States and the top 6 countries (Germany, United Kingdom, France, Spain, Italy and Netherlands) from Europe together generated more than 50% of the global import market. South Korea is the only country from Asia that remained in the top 10 apparel importers while steadily growing its share globally. Bangladesh is a small importer of apparel products, as reflected in its apparel imports' declining value, possibly due to the expansion of apparel production to meet domestic demand.

The largest and the fastest-growing import markets include China, South Korea, Poland, UAE, Russian Federation, Netherlands and Australia. Despite the United States and major European economies being the largest importers, emerging markets, especially those in the Asia Pacific, are contributing largely to the growing demand for apparel products with their faster economic growth and rising consumer demand. This is probably bringing opportunities for further market diversification.

Table 4: Top 10 Apparel Importers by Year, Value and World Share 2008-2018

	Value (US$ billions)						World Share					
Partner	2008	2010	2012	2014	2016	2018	2008	2010	2012	2014	2016	2018
WORLD	353	342	374	411	385	429	100%	100%	100%	100%	100%	100%
United States	76	76	81	86	84	87	22%	22%	22%	21%	22%	20%
Germany	33	32	34	38	35	40	9%	9%	9%	9%	9%	9%
Japan	24	25	32	29	26	28	7%	7%	9%	7%	7%	7%
United Kingdom	27	25	24	28	25	25	8%	7%	6%	7%	6%	6%
France	22	20	21	24	22	24	6%	6%	6%	6%	6%	6%
Spain	15	13	13	16	17	19	4%	4%	4%	4%	4%	4%
Italy	17	16	15	16	15	17	5%	5%	4%	4%	4%	4%
Netherlands	8	9	10	11	11	14	2%	2%	3%	3%	3%	3%
Hong Kong, China	18	16	15	15	12	12	5%	5%	4%	4%	3%	3%
Korea	4	4	6	8	8	10	1%	1%	2%	2%	2%	2%
Bangladesh	0.53	0.60	0.70	0.00	0.33	0.23	0.15%	0.18%	0.19%	0.00%	0.08%	0.05%
Top 5	183	179	191	205	192	204	52%	52%	51%	50%	50%	48%
Top 10	244	236	250	272	255	276	69%	69%	67%	66%	66%	64%

Source: ITC Trade Map (2 April 2020). Note: HS02, 61+62 codes.

Lead Firms and Governance Structures in the Apparel GVC

The apparel sector's GVC activities are controlled by a combination of lead firms, manufacturers, and intermediaries, including those working as suppliers of textiles and other raw materials. However, the apparel industry is a buyer-driven chain marked by power asymmetries between producers and global buyers, i.e., retailers, of final products. In globally dispersed apparel firm networks, lead firms control the activities that add the most value to products (e.g., branding, marketing, design), and outsource all or most of the manufacturing process to a global network of suppliers (Gereffi, 1999). Lead firms, through utilizing their market power of controlling the branding and marketing, which primarily take place in the United States and Western Europe, accrue the majority of the value-added in the value chain, accounting for roughly 60%-75% of the final retail price of apparel products (Frederick, 2015).

Clear power asymmetry between the lead firms and suppliers is often evidenced, especially during a global crisis, including the ongoing COVID-19 pandemic. Since the outbreak of the COVID-19, many lead firms either canceled or postponed confirmed procurement orders of US$3.16 billions involving 1,142 factories affecting 2.26 million workers in Bangladesh (ADB, 2020). Many lead firms did not pay for their orders or canceled them without compensating for suppliers' losses. This had put the RMG sector in Bangladesh on the verge of an unprecedented humanitarian and business catastrophe.

The types of lead firms vary depending on the kind of retailers (mass merchant vs. specialty) and brands (marketers and manufacturers). Retailers own private label brands based on products manufactured by others but are involved with those products' branding and marketing. Brand lead firms in general control marketing and branding activities with several own manufacturing factories and coordinate sourcing. For example, brands such as Inditex (Zara) and VF have their own manufacturing factories and collect products from hundreds of suppliers. On the other hand, brands like Nike, Levi's, Adidas, and Hugo Boss rely on suppliers for products and focus on branding and marketing. However, even brand manufacturers are increasingly focusing on outsourcing production level activities for gaining more from higher-value segments of the chain.

Table 5: Shares of Global Apparel Brand Owners, 2014, 2016, and 2018

Global Brand Owner	Revenue (US$ billions)			World Share (%)			Key Sourcing Markets
	2014	2016	2018	2014	2016	2018	
TJX Companies	29.1	33.2	39.0	2.2	2.3	2.5	Bangladesh, China, Indonesia, India, Vietnam
Inditex Group	24.1	25.9	29.8	1.8	1.8	1.9	Spain, Portugal, Morocco and Turkey, Bangladesh, India
H&M	19.3	21.1	23.2	1.5	1.5	1.5	Bangladesh, China, Cambodia, Bulgaria, Denmark, Estonia
LVMH	14.4	14.2	20.9	1.1	1.0	1.3	
Fast Retailing	13.3	17.3	19.1	1.0	1.2	1.2	China, Vietnam, Bangladesh, Indonesia, Turkey
Gap Inc.	16.4	15.5	16.6	1.2	1.1	1.1	Bangladesh, China, Cambodia, Egypt, Guatemala, Haiti
Kering	13.3	13.7	15.4	1.0	1.0	1.0	
Ross	11.0	12.9	15.0	0.8	0.9	1.0	
VF	11.9	12.0	12.3	0.9	0.8	0.8	China, Vietnam, Bangladesh, Cambodia, Indonesia, Jordan
Nike	8.1	9.1	10.7	0.6	0.6	0.7	China (26%), Vietnam (18%) and Thailand (10%)
PVH	8.2	8.2	9.7	0.6	0.6	0.6	China, Ethiopia, Bangladesh, Cambodia, India, Vietnam
Adidas	8.4	8.3	9.3	0.6	0.6	0.6	Cambodia (24%); China (19%); Vietnam (18%)
Hermes	5.5	5.8	6.7	0.4	0.4	0.4	France
Next	6.1	5.6	5.3	0.5	0.4	0.3	China, Turkey, Bangladesh, Cambodia, Great Britain, India, Myanmar, Pakistan
Levi Strauss & Co.	5.6	4.8	4.6	0.4	0.3	0.3	China, Japan, Italy, Argentina, Bangladesh, India
Top 10 companies	161.0	174.9	202.1	12.2	12.1	12.8	
Top 15 Companies	194.8	207.6	237.6	14.8	14.4	15.1	

Source: (i) Annual Reports of Brands; (ii) Marketline, 2018 for Global Apparel Retail Industry Value. Note: Companies are by Global Brand Owner.

Box 1: E-commerce Driving Apparel Growth

Apparel sector e-commerce includes the digital sale of almost all types of clothing articles (e.g. t-shirts, coats, pants, underwear), and the main sales channels are multi-brand merchants (e.g. Asos, Nordstrom) and online shops of individual fashion retailers (e.g. Zara). From a global perspective, macys.com is the biggest online retailer specialized in Fashion products, followed by Next and Zalando (Table B-1).

Table B-1: Major Online Retailer specialized in Fashion Products

Online Retailer	E-commerce net sales (US$ billions)			
	2016	2017	2018	2019
Macys.com	4.10	4.72	5.25	5.62
Next	1.74	1.77	2.08	2.20
Zalando	1.23	1.45	1.70	1.78

Although apparel sector e-commerce is not dominated by brands, the established brands and retailers are increasingly taking advantage and boosting share of their Direct-to-Consumer (DTC) from sales through e-commerce, with relatively low cost (compared with brand-owned websites and physical retail). In consequence, revenues from online sales of those brands have been rapidly rising for some brands (Table B-2). For example, Nike's revenue from online sales rose from US$0.24 billions in 2014 to US$2.8 billions in 2018.

Table B-2: Revenues of Online Sales by Global Apparel Brands

Global Apparel Brands	Revenues from Online Sales (US$ billions)		
	2014	2016	2018
Nike	0.24	9.52	2.8
Adidas	0.56	1.27	2.64
VF	-	0.60	0.81
Fast Retailing	0.48	0.91	1.40

IBM's U.S. Retail Index 2020 projects that, due to COVID-19, the department stores to decline by over 60% in 2020, while e-commerce is projected to grow by nearly 20%. This trend is expected to continue and grow as the same report indicated that the pandemic has expedited the shift away from physical stores to digital shopping by roughly five years. Hence, retailers need to adapt and accelerate their transformation in order to remain competitive in the new environment post-COVID-19.

Sources: (i) Statista, 2020; (ii) Annual Reports of Global Apparel Brands; and (iii) BQF, iv) McKinsey & Company, 2020, and v) Fiber2Fashion, 2020b.

Categories of Apparel Lead Firms.

The global apparel industry is expanding, with lead firms increasing their revenues and increasing their markets through opening new stores and online sales.[7] The global apparel retail market is quite a fragmented market due to its highly competitive and saturated nature. With rapid customer demand and taste changes toward versatility, even the most popular brands must work hard to maintain their market share. In 2017, Nike held the largest market share of 2.8% within the global apparel market. ZARA, Adidas, and H&M are some of the other most valuable apparel brands worldwide. In 2019, Nike, with a US$47.4 billions brand value, is enjoying the leading apparel brand worldwide, followed by Zara (US$22.6 billions) and Adidas (US$13.4 billions) (Kantar Millward Brown, 2019).

However, in terms of revenue, the picture is slightly different, as many of the biggest brands in the apparel market are design and manufacturing companies (see Table 5). TJX Companies, Inditex, H&M and LVMH were the leading apparel retailers in the world in 2018. TJX Companies led the way with revenue of about US$39.0 billions in 2018. In terms of revenue, the top ten global apparel companies hold about 12.8% of the market in 2018, up from 12.2% in 2014.

7. E-commerce is driving the growth of the apparel sector and increasingly exerting power in the apparel GVC. Retailers that focus on e-commerce for sales are increasingly taking over the dominant position in the market (See, Box # 1).

Lead firms can be categorized in terms of employment generation and possessing several retail stores. In 2018, the top 15 global apparel brand companies held a total of 38,677 retail stores, with direct employment of over 1.3 million people (Table 6). With their respective business expansion, global apparel brands are contributing to economies through generating high-end employments. In 2018, TJX Companies, Inditex Group, LVMH, Gap Inc., and H&M were the leading brands, employing nearly 0.9 million people. Global apparel brands and retailers are also diversifying into new retail outlets and introducing their brand names into new emerging international end markets for growth opportunities. In terms of retail stores, Inditex Group, H&M, and TJX Companies were the leading apparel brands in 2018.

Relative revenue is a good indicator to understand the dominant nature of lead firms. In terms of revenue-per-employee and revenue-per-store, global apparel brands retailing high-end apparel products are the leading companies. For example, Hermes, PVH and Gucci were the leading apparel brands in terms of revenue-per-employee, and Harmes, LVMH and Kering were dominant brands in revenue-per-store in 2018.

Table 6: Employment and Retail Stores of Global Apparel Brand Owners, 2018

Global Brand Owner	No. of Employees	Revenue/Employee (US$ million)		Global Brand Owner	No. of Retail Stores	Revenue/Store (US$ million)	
	2018	2018	Ranking		2018	2018	Ranking
TJX Companies	270,000	0.144	14	Nike	1182	9.08	4
Inditex Group	174,386	0.171	7	Adidas	2319	4.01	13
LVMH	136,633	0.153	11	VF	1551	7.94	8
Gap Inc.	135,000	0.123	14	Ross	1717	8.74	6
H&M	123,283	0.188	6	Fast Retailing	3445	5.55	10
Ross	88,100	0.170	8	Inditex Group	7490	3.98	14
VF	75,000	0.164	9	LVMH	1852	11.26	2
Nike	73,100	0.147	12	TJX Companies	4300	9.06	5
Adidas	57,016	0.163	10	Kering	1439	10.73	3
Fast Retailing	52,839	0.362	4	Hermes	310	21.75	1
Next	44,682	0.119	15	H&M	4968	4.68	12
Gucci	34,795	0.444	3	Gap Inc.	3194	5.19	11
PVH	20,500	0.471	2	PVH	1150	8.40	7
Levi Strauss & Co.	15,100	0.301	5	Levi Strauss & Co.	3000	1.52	15
Hermes	14,284	0.472	1	Next	760	7.02	9

Source: 2018 Annual Reports of Global Apparel Brands. Companies are by Global Brand Owner.

3.2.2. Bangladesh and the Apparel Global Value Chain

The apparel sector plays a pivotal role in Bangladesh's overall economy for many reasons. For years, the sector has been leading the country's export sector. From only a share of 3.9% in total exports in 1984, the apparel sector has rapidly increased its share to 83.5% of total exports in 2018. During the decade of 2008-2018, the apparel exports grew rapidly by 225.4%, from US$11.9 billions to US$38.8 billions. The apparel sector is said to employ about 3.5 million – 4.5 million people, 60% of females (Centre for Policy Dialogue, 2019). The number of apparel factories has been steadily rising since the early 1980s; it stood at 4,621 in 2019[8] on the official list, with an average of 650 workers per factory. It is estimated that 32% of the subcontractors/factories are informal, with an average of 55 workers employed in each factory (Center for Business and Human Rights, 2015). Around 40% of factories are knitwear and sweater manufacturers, and the rest 60% are woven garment manufactures.

Taking advantage of its low cost but ample production capacity driven by cheap labor costs and a large number of factories, major global apparel brands including H&M, Zara, Gap, Walmart and Uniqlo are increasingly sourcing from Bangladesh (Posner, 2020).

Bangladesh's journey in the apparel world started in 1978-79 with a joint-venture that was a 100% export-oriented company (World Bank, 2014). Although the apparel sector established a growing foothold in the 1980s, it grew rapidly since the beginning of the 1990s when economic and trade liberalization took place (World Bank, 2014). Steadily, the sector took the lead of the country's manufacturing industries in terms of rapid production and employment generation. With the production cluster in Dhaka and Chittagong, Bangladesh is the second-largest apparel exporting country in 2018, accounting for more than 8% of the global share.

Bangladesh's apparel sector has been benefiting from its least developed country (LDC) status. Until 2005, it enjoyed quotas under the Multi-Fiber Arrangement (MFA) by the U.S. The country still qualifies for duty-free market access or reduced tariff facilities to many developed and developing nations, such as the Generalized Scheme of Preferences (GSP) of the European Unit (EU), through getting preferential access to EU markets. Also, bilateral trade agreements with several countries, including China and India, have been helping the country to diversify its apparel export destinations. Currently, the country enjoys duty-free access to about 52 countries. However, the journey was not as smooth as it looks like. Several setbacks, especially the Rana Plaza factory collapse in 2013, have put the industry in a challenging position to reframe itself in terms of improving factory safety and standard, which has been a long-neglected issue to industry owners.[9] Lack of unskilled workers and poor infrastructures are major binding constraints hindering Bangladesh's apparel industry's further growth.

Box 2: Recent Key Events Affected the Industry

Since the late 1970s, the Bangladesh apparel industry has been going through rapid growth on the one hand, and unexpected incidents on the other. The following are two significant events that changed the industry to what it is now.

A Fire at Tazreen Fashions on 24 November 2012. The fire resulted in the deaths of 112 workers. In response, the National Tripartite Plan of Action on Fire Safety (NTPA), among the Government of Bangladesh (Ministry of Labor and Employment) and representatives of Bangladesh employers' (BGMEA and BKMEA) and workers' organizations (NCCWE and IBC)), in the apparel sector was developed to ensure fire safety in the workplace on 25 July 2013. The NTPA outlines initiatives covering three areas: i) Policy and legislation, ii) Administration, iii) Practical activities. It foresees establishing a National Tripartite Committee (NTC) to ensure and monitor the implementation of the NTPA. The ILO assisted in the implementation and coordination of the NTPA.

The Rana Plaza building collapse on 24 April 2013. The building collapse led to a loss of 1,135 lives and more than 2,000 injured. Most of the victims were workers from apparel factories housed in the building. In the aftermath of the incident, local and international reaction was massive. As a result, two global unions (IndustriAll, UNI Global) and international brands and retailers sign the Accord on Fire and Building Safety in Bangladesh. And the Alliance for Bangladesh Worker Safety was launched by 26 North American retailers and brands, under which factories commit to ensuring the implementation of health and safety measures. The Government of Bangladesh adopted amendments to the Bangladesh Labor Act, the first step towards fulfilling the Government's obligation to fully respect the fundamental right to freedom of association and collective bargaining and address the critical need to bolster occupational safety and health. As a result of the Rana Plaza collapse, the factory environment's improvement took place in the industry, with a significant drop in the number of vulnerable factories.

8. The data source for number of factories is the following website of the Bangladesh Garment Manufacturers and Exporters Association: https://www.bgmea.com.bd/home/pages/TradeInformation
9. The collapse of the eight-story Rana Plaza building on 24 April 2013 was the deadliest accident which caused the death of more than 1,100 workers (Jacob and Singhal, 2017).

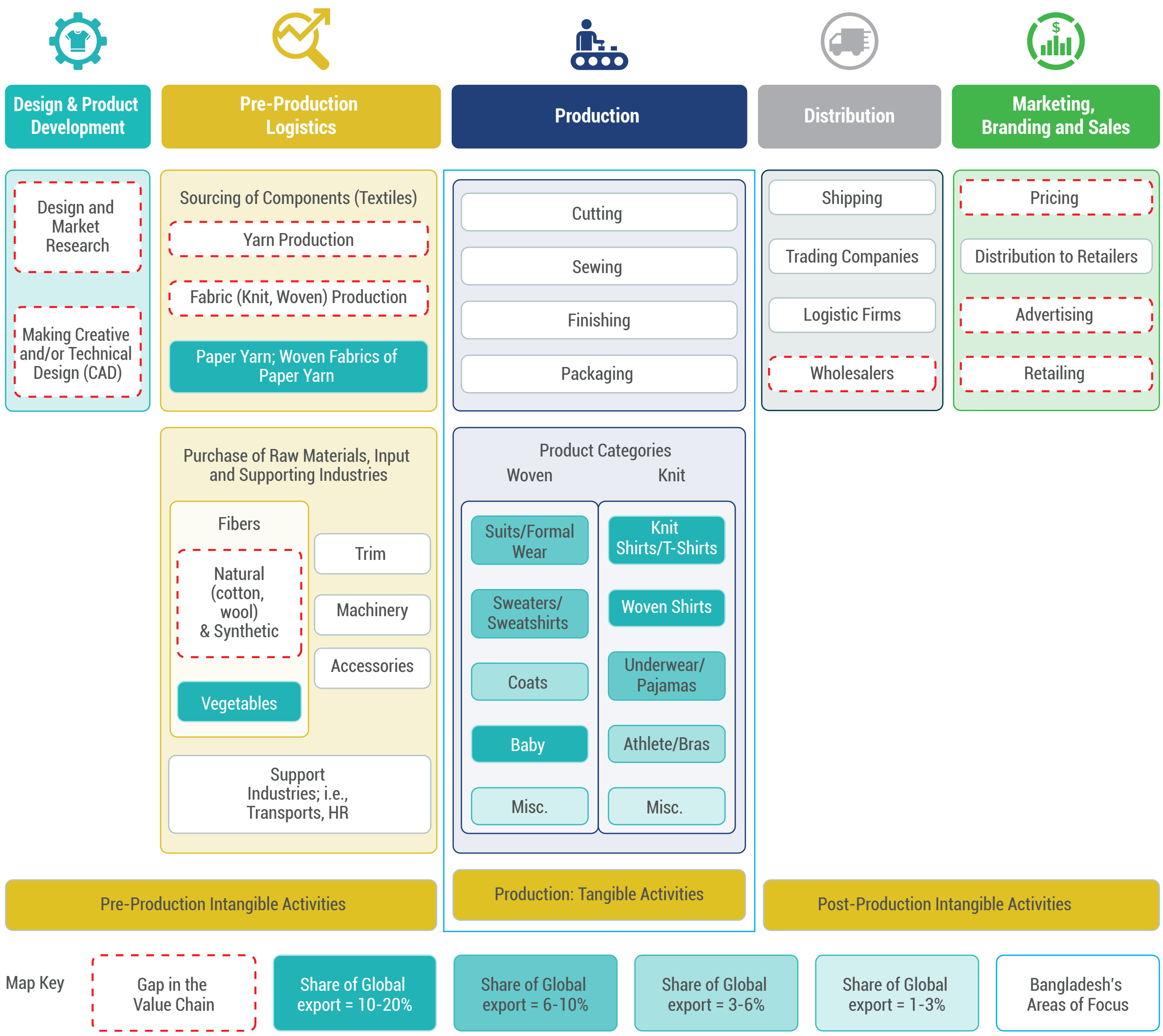
Current Participation of Bangladesh in the Apparel GVC

With over 4 decades of experience in apparel manufacturing and exports, Bangladesh reached a strong global apparel export market position. The country utilizes its main comparative advantages, such as an abundance of cheap labor, duty-free access, and capacity to produce amply to provide global markets with final apparel products and a few specialized intermediate (vegetable fibers and paper yarn) products. Although domestic companies mainly led the sector initially, since the early 2000s, foreign direct investment (FDI) started to come into the sector, and the FDI stock in the sector stood at about US$3.3 billions in 2019 (Bangladesh Bank, 2019). Currently, Bangladesh's downstream apparel products are concentrated in almost all categories.

A visual representation of Bangladesh's level of activity in the apparel GVC is shown in Figure 2. This is based on export data, both for Bangladesh and the World, collected from ITC Trade Map. Boxes depicted in green are where the country has the highest shares of the global market. For example, knit shirts and T-shirts; woven shirts; baby clothing are the three final product categories where Bangladesh exceeds 10% of exports. Also, Bangladesh has more than 10% of the global share in exports of vegetable fibers, paper yarn, and woven fabrics of paper yarn.

Suits/Formalwear/Trousers/Dresses/Skirts/Sweaters/Sweatshirts; and Underwear/Pajamas are areas where Bangladesh holds a 6-10% of the global market share. Coats, Athlete and Bras are the categories where Bangladesh holds a 3-6% global market share. Bold red circles indicate gaps in the chain, where Bangladesh depends mainly on imports.

Figure 2: Bangladesh in the Apparel GVC



Source: Authors. Note: The value chain's product categories are in order of the approximate size of the global market in 2018 based on ITC Trade Map.

Product Profile. For years, the growth of Bangladesh's apparel production has been vibrant around key products (Table 7). Exports are expanding in all categories of products with a growing share in global apparel exports. Among Bangladesh's product categories, the share of knit shirts and T-shirts in the world's apparel exports is the highest at 13.5% in 2018, increased from 7.1% in 2008. Simultaneously, the share in the world's apparel exports for baby dresses stood at 13.3% (increased from 1.3% in 2008) and 11.5% for woven shirts (increased from 4.9% in 2008).

Similarly, the export share of all other product categories increased significantly in global apparel exports. The annualized growth rate of Bangladesh's apparel exports, or CAGR, shows that almost all categories of products have experienced significant and broad-based growth. Products with the highest CAGRs, such as coats (38.8%), baby (29.9%), athletic (27.8%) and Bras (24.1%) have experienced the largest growth in apparel exports during 2008-2018, although their share in total exports is relatively low.

Table 7: Bangladesh's Apparel Exports by Product Category[10], 2008-2018

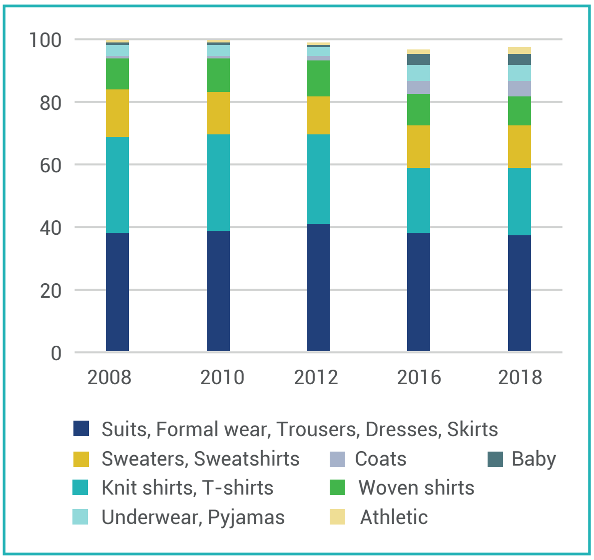
Product Category	Export Value (US$ billions)				Share in World's Total Apparel Exports				CAGR (%)
	2008	2012	2016	2018	2008	2012	2016	2018	2008-2018
Total	11.92	19.19	32.75	38.80	-	-	-	-	12.5
Suits, Formalwear, Trousers, Dresses, Skirts	4.51	7.88	12.33	14.60	3.59%	5.25%	7.83%	8.53%	12.5
Knit shirts, T-shirts	3.72	5.47	6.83	8.19	7.09%	10.26%	12.15%	13.47%	8.2
Sweaters, Sweatshirts	1.75	2.33	4.52	5.39	3.85%	4.93%	9.46%	9.51%	11.9
Woven shirts	1.19	2.16	3.33	3.35	4.89%	8.17%	11.87%	11.53%	10.9
Coats	0.08	0.24	1.41	2.11	0.33%	0.84%	4.14%	4.89%	38.8
Underwear, Pyjamas	0.43	0.68	1.49	1.87	2.17%	3.51%	6.47%	7.68%	15.8
Baby	0.10	0.11	1.18	1.37	1.29%	1.44%	12.43%	13.33%	29.9
Athletic	0.07	0.12	0.65	0.83	0.39%	0.61%	2.78%	3.08%	27.8
Bras	0.06	0.15	0.42	0.56	0.60%	1.46%	3.63%	4.52%	24.1
Misc. Apparel	0.00	0.06	0.59	0.52	0.02%	0.28%	2.73%	2.26%	62.9

Source: ITC Trade Map (18 April 2020). Note: (i) HS02, 61+62 codes.

Driven by CAGRs of 12.5% from 2008-2018, suits, formal wear, trousers, dresses and skirts are Bangladesh's largest export product category, accounting for 38% of the value of all apparel exports in 2018 (Figure 3). With a 21.1% share in total apparel exports, knit shirts and T-shirts are the second-largest export product category throughout 2008-2018, followed by sweaters and sweatshirts (13.9%), and woven shirts (8.6%). As a whole, the share of the four largest product categories in total apparel exports was 81.3% in 2018, declined notably from 93.7% in 2008, indicating gradual export diversification among apparel product categories. This also reflects the possibility of moving up through the value chain toward more high-end garments, which has not happened fast enough in part because the buyers/retailers still look to Bangladesh for basic garments.

Destination. The destination of Bangladesh's apparel products reaches over almost all continents of the globe (Figure 4). In terms of country destination, with 16.6% of total US$39.0 billions apparel exports in 2018, Germany was the largest importer of Bangladeshi apparel products, followed by the U.S.A. (13.9%), U.K. (9.8%), France (7.3%), Spain (7.0%), and Netherlands (6.4%). In terms of region, 62.5% of total exports went to European Union countries, 17.8% to the U.S.A., 3.2% to

Figure 3: Share of Total Export Value for Leading Product Categories, Bangladesh



Source: ITC Trade Map (18 April 2020).

10. As defined in footnote 6.

Canada, and the rest 16.5% to non-traditional markets including Japan, Australia, Russia, China, India and South Korea.[11] Initially, the country was benefiting from MFA facilities until 2004 to get quota bases access to the developed countries' markets.[12] However, Bangladesh is still benefiting mostly from GSP facilities extended by the European Union to its apparel exports. With rapid income and spending growth, non-traditional markets provide new opportunities for Bangladesh's apparel to diversify in terms of product destination.

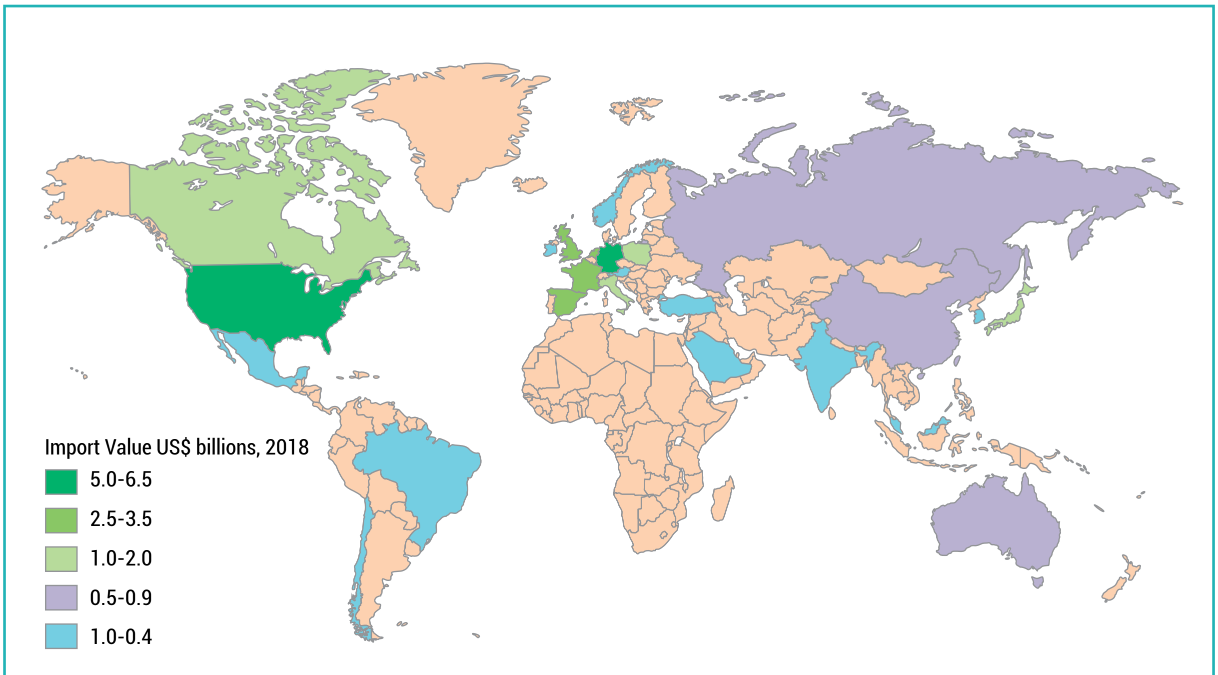
Employment and Human Capital

Bangladesh's apparel industry is largely a labor-intensive sector and has been one of the biggest contributors to the country's employment generation. Of the 63.5 million total workforce of the country, the apparel industry alone generates almost 4.5 million employment.[13] The apparel industry's huge growth also provided the first mass formal employment for women, mostly unskilled. The mass employment also helped laborers by transferring them from rural areas and peri-urban areas to urban areas. In the beginning, 90% of workers were women. However, the share of women workers has declined to around 65% since the early 2010s due to rapid automation in repetitive works in sweater factories (CPD, 2019).

Nonetheless, the gender gap narrowed in many ways through employing women in the apparel sector in Bangladesh, including the increase of women's participation in the labor force and a change in women's status in their communities as they have control over income. The apparel industry is one of the primary sources of employment for women in Bangladesh. 85% of the production workers are females (Mustafa et al., 2016). The majority of these female workers are disadvantaged and poor women from rural areas (Mia and Akter, 2019). Employers prefer female workers as cheap labor, abundantly available, flexible, and more manageable than male workers, and seen as less likely to be organized to participate in protests and strikes. Besides, female workers' average age is below 30-year-old, making them a vibrant labor force (Farhana et al., 2015). Nonetheless, this sector pays them wages that are, on average, higher than what other opportunities would pay them in the rural areas, and therefore the families are proud of their daughters being employed in this sector and able to enhance the living conditions of their families (Mustafa et al., 2016).

Due to bad work conditions and low wages, the employee turnover in the apparel sector is high. According to the Center for Policy Dialogue (CPD) (2016), the workers in the ready garment

Figure 4: Top Importers of Apparels from Bangladesh Map, 2018



Source: ITC Trade Map (18 April 2020)

11. Bangladesh is still benefiting largely from GSP facilities extended by EU countries to the country's apparel exports.
12. The rise of the apparel industry in Bangladesh was mainly because of MFA (an international trade agreement on textile and clothing that imposed quotas on the amount that developing countries could export in the form of yarn, fabric and clothing to developed countries) quotas, which came into force between 1974 and 2004. MFA was phased out by 31 December 2004, based on the decisions in the Uruguay Round negotiations in the 1990s (Ahmed, 2012)
13. The said data on apparel industry employment is not official but provided by apparel trade bodies. Centre for Policy Dialogue (2018) estimates that there are 3,596 active apparel factories with 3.5 million workers, of which 60.8% are female and 39.2% are male..

made sector, on average, work for 7.4 years only, especially females who constitute most of the production workers. According to the same survey, it is very rare that production workers work until the age of retirement (less than one-tenth), which is around 60-year-old. Also, the employers tend to prefer young people over-aged and experienced workers in the factories to reduce cost by employing fresh workers without experience, and sometimes without proper skills or training, at low wages (Farhana et al., 2015). The average monthly wage in the apparel industry in Bangladesh is US$163 and the monthly minimum wage in the industry is US$71, which is significantly less than the rate in China, where apparel workers are paid on average US$491 (ILO, 2016).

While non-wage factors also drive the leading firms' purchasing and decisions globally, lack of workforce competency in Bangladesh affects product quality and production efficiency. According to ILO (2016), In Bangladesh, the garment sector labor productivity was less than US$991 in 2013, while in Thailand, labor productivity was around US$8,000 and more than US$4,000 in Indonesia and the Philippines. Factories provide on-the-job training to newly recruited workers on the skills factories demand. According to CPD (2016), on-the-job training is insufficient and limits workers' scope to diversify their skills on other technologies and machinery.

Bangladeshi factories need well-trained and skilled staff in various management and professional positions, and the gap is often filled by hiring foreign professionals with the required skills and knowledge. Currently, roughly about 13% of all enterprises (and 47% of large enterprises) were reported to have foreign staff (CPD, 2019). Foreign staff contributes largely to comprehending the operational process, presenting and discussing various company-related information as per the buyers/brands' requirement, better English proficiency, and better cross-country experience in dealing with management-related complexities. Without generating skilled home-grown management professionals, dependence on foreign professionals is likely to persist or increase in the coming years. Developing talent domestically with appropriate skills and training will significantly contribute to industry upgrading and also value addition to the economy (CPD, 2019).

Women workers who constitute most of the apparel production workers in Bangladesh are usually illiterate, unskilled workers, which constrains the industry (Mia and Akter, 2015; CPD, 2016). In addition to constraining the industry's development, lack of skills slows women's participation in higher-grade positions and limits their role to the production process phase. Women work in sections that are less skill-based, where they operate a limited number of simple machines. According to CPD-RMG Survey 2016, the sector's training is gender blind; attention is not paid to female workers' specific needs. This resulted in unequal access to training, skills development, information, and networks as women face time-constrains due to their cultural roles and work responsibilities. There is a need for capacity development training and re-training programs for employers and workers in the ready-made garment sector to improve production quality and efficiency (Mia and Akter, 2015). Besides, gender dimensions should be taken into consideration during any process, product, or social upgrading.

Key Firms

Almost all major global apparel brands and retailers operate in Bangladesh. Brands and retailers such as H&M, Walmart, Gap, Zara (Inditex) are actively sourcing from Bangladesh. Bangladesh puts itself in a better place in terms of cost of labor, power and water compared to other competitor countries such as India and China (Fibre2Fashion, 2020). For example, water cost in Bangladesh is significantly lower than other competitor countries except for India, and power cost is quite competitive compared to China and Cambodia. Also, Bangladesh still enjoys duty-free access to EU countries, which helps the country be a natural choice for European brands and retailers. Also, Bangladesh is preferred mainly for its comparative advantage and specialization in producing basic low-end products (World Bank, 2014). Lu (2019) finds that many respondents (80%) express interest in expanding sourcing from the country in the next two years. Companies are actively seeking China's alternatives, and Bangladesh also offers the most competitive price, followed by Vietnam, Indonesia, and India.

On local apparel enterprises, despite being large production factories, apparel enterprises are mostly governed under a private limited company with a dominant presence of family members in the management (CPD, 2018). However, further concentration is taking place; small enterprises are becoming part of group enterprises and a limited number of large entrepreneurs. Such concentration is beneficial for producers as it creates opportunities for cross-subsidization of various fixed costs and helps reduce risks. In terms of labor, while factories rely largely on local low-skilled laborers for basic production activities such as cutting, sewing and finishing, they are increasingly relying on skilled foreign workers for managerial positions coming from India and Sri Lanka. The demand for workers with low skills and repetitive works is declining as automation has been increasing by using specialized machines in different production sections. A large section of enterprises has a major share of contracts with brands and retailers; international buyers' share has been increasing while sub-contracting has been declining. The upgrading has a link with enterprises' size where large enterprises are found to be ahead of medium and small enterprises regarding economic, social, and gender-related upgrading. In the case of social upgrading, all types of enterprises are in a better position regarding standards, non-discrimination and employability.

Key Actors in the Country

The Industry in Bangladesh is characterized by proactive business bodies and strong labor unions, in addition to governmental organizations that are working with multiple local and international actors to advance the industry and increase growth. The following table summarizes the main actors, local and international, operating in the country.

Table 8: Key Institutional Actors in the Apparel Industry in Bangladesh

Key Actors	Names of Agencies	Role in Bangladeshi Apparel GVC
Government organizations	Ministry of Industries	Accelerating industrialization through formulating appropriate industrial policy, developing SMEs, micro & cottage industries, protecting standards of products and intellectual property rights and enhancing productivity.
	Ministry of Labor and Employment	Creating a friendly working environment between workers & employers; ensuring the welfare of workers in a different industrial area; implementing Labor-Laws; fixing minimum wages of labor; and ensuring justice through Labor Court.
	Bangladesh Investment Development Authority	Providing diversified promotional and facilitating services to accelerate the industrial development of the country.
	Bangladesh Export Processing Zones Authority (BEPZA)	Promote, attract and facilitate foreign investment in the EPZs; providing plots/ factory buildings, infrastructural facilities, administrative facilities, fiscal & non-fiscal incentives
Business bodies	BGMEA	Provides policy advocacy, negotiates quotas with importing countries, ensures workers' rights and social compliance at factories; runs educational institutions on fashion and technology.
	BKMEA	Facilitates and promotes knitwear business, and cater the demand generated from the changing apparel global value chain
Labor unions	NCCWE IBC	Improves workers' capacity through education programs in helping workers for collective bargaining at the factory level; and provide improved skills to workers.
NGOs/ Civil Societies	Centre for Policy Dialogue	Leads civil society initiative to establish accountability on the part of key actors, including the government and major buyers
Brands/ Retailers	The Accord	It is an independent, legally binding agreement between brands and trade unions to work towards a safe and healthy garment and textile industry in Bangladesh.
	The Alliance	Works to improve worker safety in the ready-made-garment (RMG) industry by upgrading factories, educating workers and management, empowering workers, and building institutions.
	United States Green Building Council (USGBC)	Provides LEED certificate to green garment factories. As of May 2019, the total number of LEED-certified garment factories in Bangladesh is 90, including the 24 platinum-rated buildings. More than 250 garment factories also applied for LEED certification.
	Export Promotion Bureau (EPB) / Registered Exporter System (REX)	It is a system of certification of origin of goods based on a principle of self-certification. The EU made it mandatory to comply with the REX certification system of origin of goods to retain the GSP facility there. Under the REX system, Bangladeshi products will continue to get duty-free access facility. As per the EU directive, Bangladesh's EPB introduced REX for the country's exporters who make their shipment to the European Union. As of January 2020, EPB has registered some 1,904 local apparel exporters.
Multilateral organizations	ILO	Initiates programs to support actions on Fire Safety & Building Integrity in close collaboration with the Government of Bangladesh along with employers' and workers 'organizations.
	GIZ	Financial institutions and textile factories in Bangladesh take advantage of newly created training opportunities and information services that focus on investments in safety and environmental measures.
	ADB	Through commercial banks, the financing facility is being used to finance socially and environmentally sustainable projects in Bangladesh's textile and garment sectors.

Evidence of Upgrading

The apparel industry in Bangladesh has experienced a noteworthy shift in exports of product categories and destinations in the last decade (Table 9). During 2008-2018, while the share of knit shirts and T-shirts in total exports has declined significantly from 31.2% to 21.12%, the share of coats, baby and athletic exports sharply increased. The share of other categories of products has roughly remained the same. The apparel exporters have successfully increased the share of all product categories in the world's apparel exports during the last decade. The share of knit shirts and T-shirts in the world's apparel exports is the highest at 13.5% in 2018, increased from 7.1% in 2008. Similarly, the export share of all other product categories increased significantly in global apparel exports.

The evolution also took place in terms of the destination of Bangladesh's apparel products. In terms of destinations, exports were more concentrated in the European Union markets; exports increased from 55.0% in 2008 to 62.5% in 2018. Apparel exports were also concentrated in the U.S., where its total share of exports has increased from 13.2% to 17.8%. However, Canada experienced less concentration, although the share of total exports to Japan, Australia and China increased significantly. Three factors are likely to contribute to such trends. First, the EU's duty-free access facility is helping Bangladeshi apparel products enter EU countries with zero tariffs. Second, for U.S. buyers, Bangladesh is still considered the low-cost sourcing country for low-end products (World Bank, 2014; Lu, 2019). Third, as income and consumer spending rise, countries in the Asia-Pacific region are increasingly sourcing from Bangladesh.

Noteworthy Certifications:
The Bangladeshi apparel factories have been going through certifications and compliances to make it competitive and relevant in the global context. These certifications are Accord and Alliance, The registered Exporter System Certification (REX), Leadership in Energy and Environmental Design Certification (Leed) and Global Organic Textile Standard (GOTS).

Table 9: Industry Evolution Over Time, 2008-2018

Product Category	Share in Total Export Value (%)		Share in World's Total Apparel Exports (%)		Top Apparel Destinations (% of total exports)		
	2008	2018	2008	2018	Region/Country	2008	2018
Suits, Formalwear, Trousers, dresses, skirts	37.81	37.64	3.59	8.53	**EU**	55.0	62.5
Knit shirts, T-shirts	31.20	21.12	7.09	13.47	**U.S.**	13.2	17.8
Sweaters, Sweatshirts	14.67	13.90	3.85	9.51	**Canada**	3.9	3.2
Woven shirts	10.01	8.62	4.89	11.53	**Japan**	0.14	3.1
Coats	0.67	5.44	0.33	4.89	**Australia**	0.28	2.1
Underwear, Pajamas	3.62	4.81	2.17	7.68	**China**	0.04	1.5
Baby	0.84	3.54	1.29	13.33	**Others**	27.4	9.8
Athletic	0.60	2.15	0.39	3.08			
Top Four	**93.70**	**81.27**	-	-			

Source: ITC Trade Map (18 April 2020).

3.2.3. Advantages, Challenges and Recommendations

The Bangladesh apparel sector has its strengths and opportunities, with an abundant supply of cheap labor, versatile factories, and duty-free access to EU countries and preferential trading agreements (PTA) with countries like India, China and Korea. The high rate of domestic ownership also offers potential for future upgrading. However, there are several challenges, including insufficient infrastructure and weak factory standards. Table 10 summarizes both strengths and weaknesses.

Advantages. A significant portion of Bangladesh's advantage is still related to its comparative advantage of employing labor at a low cost. Among leading countries with large-scale production capabilities, Bangladesh's apparel factories' monthly labor cost is significantly lower than that of other competitor countries such as China, India and Vietnam. Although banks' lending rate is relatively high in Bangladesh, Bangladeshi apparel factories remain competitive in terms of power cost and water costs. Bangladesh is also a home of more than 4,000 apparel factories, the largest after China, providing opportunities for them to take large scale production orders on diverse sets of products. The EU remains the largest destination of products producing in Bangladeshi factories. The main reason for that is Bangladeshi apparel products' access to EU countries at zero tariff rate, whereas products from competitor countries China, India, and Vietnam experience high tariff rates.

Key Challenges. Despite the country's strengths, Bangladesh faces many challenges in the apparel industry. Industry stakeholders often face challenges related to Bangladesh's inadequate infrastructure, such as energy, transport, and port services. Despite the rapid increase in electricity production capacity, production cannot meet the rapidly rising demand for energy. On transport, 88% of passengers and 80% of freight traffic rely on roads, while the railway carries 4% of both passengers and freight traffic (8% passengers and 16% of freight traffic rely on inland water transport). Also, almost 90% of international trade takes place through the Chittagong Sea Port, which needs improvement to deliver quality services. Therefore, investments should be increased in the energy sector and seaports.

Table 10: SWOT of Bangladesh's Apparel Industry

Strengths	Weaknesses
• Rich experience in manufacturing with versatile factories • Competitive price based on an abundant supply of cheap labor • Full-package suppliers with strong backward linkage • Duty-free market access in Europe & PTA in India, China, Korea, Malaysia • The rapid adoption of environment-friendly concepts • Favorable policy support to attract FDI • Strong direct sourcing by local liaison offices at Dhaka • Affirm political will to support the industry • Availability of higher education in textile engineering • Preferential location in the heart of the Asia-Pacific region	• Low domestic value addition • Large dependency on imported raw materials • A large number of unskilled workers and a shortage of skilled managers • High employee turnover • Inadequate vocational training programs • Insufficient infrastructures such as energy, inefficient port, transport • Weak factory standard • Frequent labor unrest for poor work conditions and low wages
Opportunities	**Threats**
• More diversification toward high-end products • More market diversification toward emerging markets like South East Asia • Brands and retailers are rethinking their strategies to decrease dependency on China due to the COVID-19 crisis.	• More efficient manufacturers for high-end products in countries like Vietnam, Cambodia • Rise of cheaper manufacturers in countries like Myanmar and Ethiopia • COVID-19 interrupting the supply chain • Weak political consensus and poor governance • Extremely vulnerable to climate change

The apparel industry still relies on low-skilled workers and foreign mid-level managers, requiring skills advancement of the local workforce. The import of raw material and inputs from other countries resulted in i) high lead time (e.g., 125 days in Bangladesh and 40 in Turkey)[14], ii) increased costs, iii) low value-added, and consequently, iv) relatively low competitiveness comparing to rising competitors who are becoming efficient with lower costs such as Viet Nam, Cambodia, Ethiopia and Myanmar.

14. Lead Time = Manufacturing Time +Transportation Time. In Bangladesh Lead Time = 90 days + 35 Days, while in Turkey, Lead Time = 3 to 6 weeks (2-3 weeks for manufacturing and 3-5 days for transportation (Enclude BV and CMC, 2019).

Table 11: Tariff Comparison (%) Among Various Apparel Products

Importing Destination	U.S.		Europe-27	
Products	**Knitted-61**	**Woven-62**	**Knitted-61**	**Woven-62**
Exporting Country				
China	14.33	10.82	11.79	11.52
Bangladesh	14.33	10.82	0	0
India	14.31	10.74	9.43	9.22
Turkey	14.31	10.74	0	0
Vietnam	14.33	10.82	9.43	9.22
Brazil	14.31	10.74	11.79	11.52
Cambodia	14.31	10.74	0	0
Indonesia	14.31	10.74	9.43	9.22
Sri Lanka	14.31	10.74	0	0
Myanmar	14.31	10.74	0	0

Source: Fibre2Fashion (2020)

Besides, Bangladesh's reputation as a preferred location for sourcing apparel can be negatively affected by the quality of the factory safety standards, health and work conditions, and vulnerability to climate change. These issues combined can exacerbate the situation and discourage FDI and sourcing from Bangladesh unless adequately addressed.

The concentration of markets and products is one of the main challenges as well. Bangladesh relies on preferential agreements to access markets. This resulted in exports to a limited number of end markets, mainly the U.S. and the EU. Moreover, Bangladesh produces low to medium value product categories, constituting around 80% of its total exports. Weak diversification of markets and products could make Bangladesh vulnerable to global shocks such as recessions and pandemics and limit the transfer of knowledge and experience to local actors.

A more recent challenge is the spread of the COVID-19 pandemic, which interrupted global supply chains. The government in Bangladesh tried to overcome the challenge by providing low-interest loans to factories to pay for salaries. However, the manufacturers are facing a bigger challenge, which the cancelation of orders from buyers and the need to work under social distancing conditions to deliver commitments and not lose further contracts, which might push manufacturers to work in shifts to provide the needed space for social distancing (Woodruff C., 2020). This will result in an increased cost of labor and production.

Recommendations. The following upgrading strategies are suggested to address the identified challenges and help position Bangladesh to maintain its current level of participation even in the post-COVID-19 world.

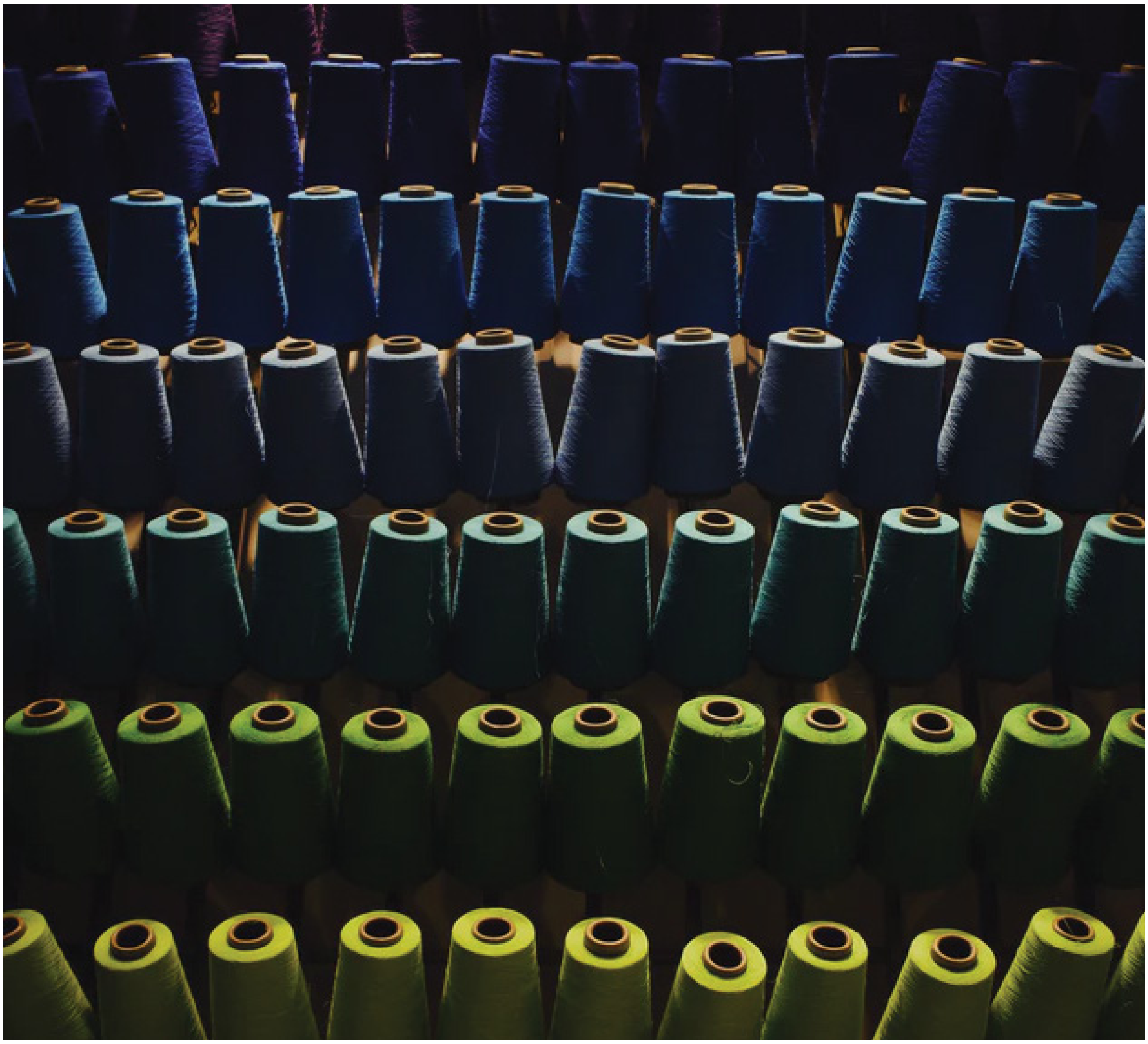
Process and Product Upgrading. Develop a working group with representatives from key local apparel manufacturing firms, industry associations, and NGOs to address critical knowledge gaps among the workforce and develop training programs, preferably in collaboration with the private sector. Two types of training needs are to enhance productivity and product quality. First, training for workers to enhance the skills required by factories and diversify their skills to operate multiple machines to cope with the changing demand for skills. Second, managerial capacity development training for domestic mid-level talents to comprehend the operational process, manage complexities, and take a bigger role in presenting and negotiating various issues with the buyers/brands.

Linkages and Market Upgrading. Launch a local and global communications and policy advocacy campaign, supported by the Government, to build Bangladesh's image as a preferred partner and publicize the advantages of investment opportunities in the apparel sector in Bangladesh. As the factories' inadequate health and safety standards might discourage new investments in the apparel sector, Bangladesh needs to work on image building and publicize the advantages of investment opportunities in apparel through awareness campaigns targeting both local and global actors. There is also a need for global campaigns to raise awareness on actual climate change impact on the industry, measures taken by the government and industry actors to mitigate the impact and enhance the resilience of apparel infrastructure and push for more preferential agreements with countries most vulnerable to climate change, such as Bangladesh. These campaigns should also include creating linkages between Bangladesh and other IsDB MCs, especially where there is an increasing demand for global brands and high-quality modest-fashion (Islamic fashion) for attracting FDI in design and new products in Bangladesh.

Functional Upgrading. EPZ (Exports Processing Zone) and leading exporters to develop strategies and best practices to reduce lead times and increase competitiveness in key markets (i.e., EU and China). Comparing to other competitors, the manufacturing lead time in Bangladesh is still relatively high; it takes around 90 days in Bangladesh against 2-5 weeks in Turkey. A project could be established for the apparel industry to develop strategies and best practices based on the transferred knowledge. The Islamic Corporation for Private Sector Development (ICD) can play a significant role here utilizing its specialization in business environment support, cluster policies, value chain enhancements and business linkages support.

Process, Product and Functional Upgrading – Technology Adoption. Create a special Fund for Technology Adoption in the apparel sector to enhance efficiency and productivity (decrease lead time), move to activities with higher value addition, and mitigate the impact of COVID-19 on the industry. For Bangladesh to remain competitive, there is a need to increase technology usage in apparel production and design to speed up productivity, enhance quality, and move to high-value activities. A Fund for Technology Adoption with a focus on three strands of initiatives can be established. First, initiatives related to expediting delivery of products through automation and other technologies. Second, initiatives related to building the country's capacity in apparel design and branding through using technology. Third, initiatives to move to new products with higher value add.

Environmental Upgrading. Provide loans with low interest to factories to replace electricity generators with renewable energy sources. Despite a significant rise in energy production in the country, the large factories use private fuel-based electricity generation facilities, leading to a higher production cost. The Government should collaborate with development partners to provide low-cost loans to apparel factories to shift from fuel-based electricity generation facilities to renewable energy solutions.



Chapter 4

THE GLOBAL MINING AND PETROCHEMICALS VALUE CHAINS

4.1 GUINEA IN THE BAUXITE ALUMINUM GLOBAL VALUE CHAIN

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Summary

Guinea, which has the world's largest bauxite reserves is set to continue playing a leading role as producer and exporter of the raw material. However, to improve the processing capacity of the raw material, the Guinean authorities could seek to develop supply chain linkages in the local industry to increase the domestic value-added through creating opportunities for alumina production with the direct investment of foreign companies.

Guinea has the world's largest reserves of bauxite (about 25 % of the total world reserves) which is the primary ore for aluminum extraction. Australia remained the world's top bauxite producer with 29% of world output, followed by China (23%) and Guinea (15%). Fortunately, Guinea's share in world production jumped from 5% in 2015 to 15% in 2017, reflecting a surge in the country's production, as new players entered the domestic industry with significant investments.

The bauxite/aluminum global value chain spans a large number of sectors and products, which are subsumed under four broad segments:

(i) the upstream segment: mining of bauxite and production of alumina

(ii) the middle segment: smelting of primary aluminum and the production of secondary (recycled) aluminum

(iii) the downstream segment: the production of semi-fabricated aluminum products and trading and their use in manufacturing processes further down the chain

iv) final product in these sectors: transportation, construction, packaging and foils, electrical engineering, and machinery and equipment

There is high competition in the global bauxite mining market. Bauxite and alumina production is a vertically integrated market. This is illustrated by the fact that the top ten companies in bauxite mining and alumina production are usually the same. Although most of these companies use their bauxite for internal consumption in their alumina production refineries, there has been a growing trend for a third-party market for bauxite since global demand for bauxite increases globally, especially in China. As a result, the price of bauxite and alumina has become more volatile through spot markets.

Three countries in sub-Saharan Africa (Guinea, Sierra Leone, and Ghana) appears among the top exporters of the raw material only, illustrating their specialization in primary commodities with low value-added. There has been a growing trend in trade concerning the different products of the bauxite/aluminum GVC, consistent with the expected high demand for aluminum.

Guinea's constraints to upgrading in the GVC include power supply shortage, poor logistics performance, weak institutional capacity, low human capital, and a weak investment climate. However, the government of Guinea could overcome these challenges by fostering green process upgrading through supporting engagement models based on public-private-local communities' partnerships, encouraging the construction of alumina refineries, improving public-private partnership regulations, enhancing foreign direct investment schemes, prioritizing the investments in transportation and logistics, and enhancing technical training in the aluminum industry.

4.1.1. The Global Bauxite/Aluminum Industry

The Global Bauxite/Aluminum Industry: An Overview

Bauxite is the primary ore from which aluminum is extracted. Bauxite ore is refined into alumina, which is the feedstock for aluminum smelters. Smelting produces liquid aluminum, which is cast into a wide range of primary aluminum products. In recent years, global markets for bauxite and aluminum experienced significant growth, both in volume and value.

The global Bauxite Mining market is estimated to have been valued at US$12.4 billions in 2018. Before the COVID-19 outbreak, this global market was projected to grow at an annual average of 6.6% and reach a value of US$20.7 billions by the end of 2026[1]. Likewise, the global Aluminum[2] Market was valued at US$163.5 billions in 2018 and was expected to grow at an annual average rate of 6.5% to reach a value of US$235.8 billions by 2025[3]. Key factors driving the recent trends in world aluminum markets include growth in demand for automotive and construction industries, but also increasing demand for the packaging industry. These growth projections could be negatively impacted by the large economic shock caused by the COVID-19 outbreak.

Before the COVID-19 outbreak, this global market was projected to grow at an annual average of **6.6%** and reach a value of **US$20.7 billions** by the end of 2026

1. https://www.persistencemarketresearch.com
2. Aluminum is produced from bauxite through multiple processes.
3. https://www.marketresearchfuture.com/reports/aluminum-market-2031

According to the U.S. Geological Survey data, Guinea has the world's largest reserves of bauxite (about 25 % of the total)[4]. Fortunately, Guinea's share in world production jumped from 5% in 2015 to 15% in 2017, reflecting a surge in the country's production, as new players entered the domestic industry with significant investments. Based on current trends, the country could further increase its production. However, as of 2017, Australia remained the world's top bauxite producer with nearly 88 million metric tons or 29% of world output (Table 1), followed by China (23%) and Guinea (15%).

The world production of alumina followed an upward trend over recent years, increasing from 106 million metric tons in 2013 to 129 million in 2017. This upwards trend was mainly driven by China and India. As of 2017, China accounted for 54% of the global alumina production, followed by Australia (16%), Brazil (8%), and India (5%). Countries' shares in world production have remained relatively stable over recent years (Table 2).

Table 1: Top Ten Countries in Bauxite Production

	Thousand Metric Tons					Total World Production (%)				
	2013	**2014**	**2015**	**2016**	**2017**	**2013**	**2014**	**2015**	**2016**	**2017**
Australia	81,119	78,632	80,910	83,517	87,898	27 %	30 %	27 %	30 %	29 %
China	50,400	59,200	65,000	65,000	70,000	17 %	23 %	22 %	23 %	23 %
Guinea	16,900	17,258	16,300	31,500	46,160	6 %	7 %	5 %	11 %	15 %
Brazil	33,896	36,308	37,057	39,244	38,500	11 %	14 %	12 %	14 %	13 %
India	20,664	22,636	27,757	23,886	22,909	7 %	9 %	9 %	8 %	7 %
Jamaica	9,435	9,677	9,629	8,540	8,245	3 %	4 %	3 %	3 %	3 %
Russia	6,028	6,293	5,900	5,431	5,523	2 %	2 %	2 %	2 %	2 %
Kazakhstan	5,192	4,516	4,683	4,801	5,000	2 %	2 %	2 %	2 %	2 %
Saudi Arabia	1,044	1,096	1,148	3,843	4,125	0 %	0 %	0 %	1 %	1 %
Indonesia	57,024	2,555	472	1,400	2,900	19 %	1 %	0 %	0 %	1 %

Source: U.S. Geological Survey, 2017

Table 2: Top Ten Countries in Alumina Production

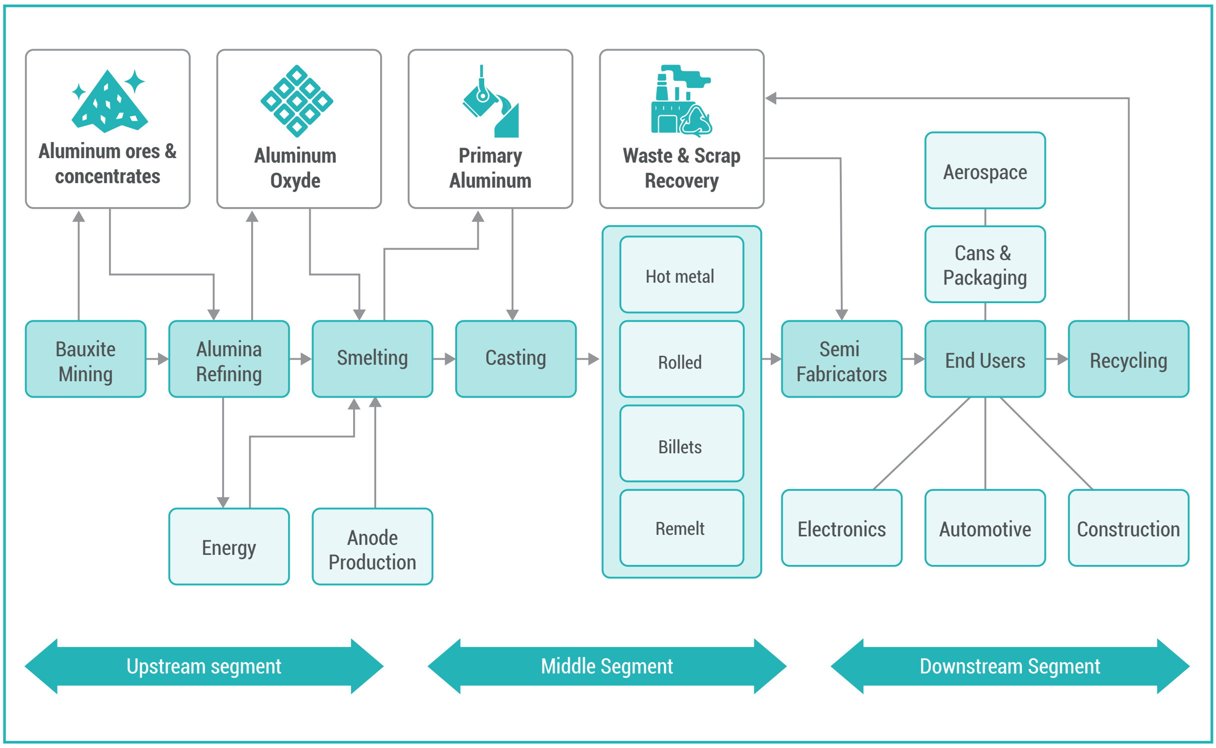
	Thousand Metric Tons					Total World Production (%)				
	2013	**2014**	**2015**	**2016**	**2017**	**2013**	**2014**	**2015**	**2016**	**2017**
China	47,000	51,300	58,978	60,907	69,017	44 %	46 %	50 %	50 %	54 %
Australia	21,528	20,474	20,097	20,681	20,486	20 %	18 %	17 %	17 %	16 %
Brazil	9,942	10,404	10,452	10,886	10,900	9 %	9 %	9 %	9 %	8 %
India	4,040	5,060	5,512	6,028	6,060	4 %	5 %	5 %	5 %	5 %
Russia	2,659	2,572	2,593	2,682	2,822	3 %	2 %	2 %	2 %	2 %
Ireland	1,935	1,951	1,983	1,967	1,937	2 %	2 %	2 %	2 %	2 %
Germany	2,244	1,910	1,910	1,900	1,900	2 %	2 %	2 %	2 %	1 %
Jamaica	1,855	1,851	1,865	1,865	1,782	2 %	2 %	2 %	2 %	1 %
Ukraine	1,494	1,457	1,481	1,510	1,676	1 %	1 %	1 %	1 %	1 %
Spain	1,570	1,520	1,630	1,579	1,588	1 %	1 %	1 %	1 %	1 %

Source: U.S. Geological Survey, 2017

4. U.S. Geological Survey, Mineral Commodity Summaries, January 2020

Mapping the Bauxite/Aluminum Global Value Chain

Figure 1: The Bauxite/Aluminum Global Value Chain



Source: Authors' illustration based on the Emirates Aluminum Global Value Chain

The bauxite/aluminum global value chain spans a large number of sectors and products, which are subsumed under four broad segments

(i) the upstream segment, which comprises mining of bauxite and production of alumina, called also mining& refining stage

(ii) the middle segment, which covers smelting of primary aluminum and the production of secondary (recycled) aluminum

(iii) the downstream segment, covering the production of semi-fabricated aluminum products ('semis') from new and old scrap via scrap recovery and trading and their use in manufacturing processes further down the chain

iv) final product in these sectors: transportation, construction, packaging and foils, electrical engineering, and machinery and equipment

Box- Different Stages of the Aluminum Production Process

Bauxite mining

Aluminum production starts with the raw material bauxite. Bauxite, containing 15% to 25% aluminum, is currently the only ore that is used for commercial extraction of aluminum. Raw material security is a key parameter of the development of the aluminum industry in a country. European aluminum industry is highly dependent on imports of raw materials from other parts of the world. China also imports substantial bauxite. The greatest concentrations of bauxite are in Central and South America, in West Africa, in particular Guinea, and then in India, Vietnam, and Australia.

Alumina Refining and Smelting

Aluminum oxide (alumina) is extracted from bauxite in a refinery. In the smelting process, alumina is refined into primary aluminum. The aluminum atom in alumina is bonded to oxygen. These bonds have to be broken by electrolysis to produce aluminum metal. Aluminum production is highly energy-intensive, with electricity making up a large share of the energy consumed[5]. Primary aluminum production, which involves alumina refining and aluminum smelting, is approximately ten times more energy-intensive than secondary production (recycling from process strap and used aluminum products). Improving energy efficiency and environmental sustainability through technology and innovation are key challenges for the aluminum industry.

Casting

Primary aluminum is alloyed with other elements such as copper, manganese, and silicon for additional strength, corrosion resistance, and other properties. These are then cast into billets, remelt ingots, slabs, and rods, and other castings for further processing.

Semi fabricators

Aluminum can be extruded and shaped into a variety of tubes and profiles. Aluminum billets are heated to 500 degrees Celsius and pressed through shaping tools, to make profiles and various products. The properties of aluminum change when small quantities of other metals are added to produce aluminum alloys. These can give greater strength, brilliance, corrosion resistance, and ductility, making aluminum easier to form into an endless variety of products.

End users

Aluminum fabricated products are used throughout the world in different sectors. In developed countries, the demand for aluminum comes mostly from the rapidly growing transport industry, which is driven by an expanding auto market. Mature countries typically use more aluminum in light vehicle production. Due to this low weight, aluminum makes cars more energy efficient. Moreover, end-use of aluminum concerns the following activities: Building and Construction, Auto and Light Truck, Aerospace, Other Transport, Cans, Other Packaging-Foil, Machinery and Equipment, Cable, Other Electrical Products, Consumer Durables, Destructive Uses (Source: Bertram et. al., 2017).

Recycling

Aluminum is one of the most environmentally friendly metals in terms of how it is produced and applied. It can be easily recycled, whilst keeping its distinctive properties. Aluminum can be endlessly recycled without loss in quality (secondary aluminum production)[6].

5. EIA, Tracking report, May 2019
6. Hulamin, Inegrated Annual Report, 2017.

Global Supply and Demand in the Bauxite/ Aluminum GVC[7]

The total exports of aluminum ore & concentrate increased by 90% from 2010 to 2018 (Table 3). Guinea was the top exporter in 2018 with 46% of world exports, followed by Australia (23%). China's export share decreased from 10% in 2010 to 4% in 2018, due to increased domestic transformation in refineries. The total import value increased from US$3.3 billions in 2010 to US$6.3 billions in 2018 (Table 4). China is the top importer with 70% of world total imports in 2018, from 40% in 2010. The second importer was Ireland with around 5% share.

Table 3: Top Ten Exporters of Aluminum Ore & Concentrate, By Value 2010-2018

	Export Value (US$ million)					Export Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**3,310**	**4,150**	**4,596**	**4,054**	**6,344**	**100%**	**100%**	**100%**	**100%**	**100%**
Guinea	657	850	835	1,225	2,911	20%	20%	18%	30%	46%
Australia	409	626	1,282	987	1,428	12%	15%	28%	24%	23%
Brazil	366	391	420	475	435	11%	9%	9%	12%	7%
Indonesia	970	1,275	416	-	387	29%	31%	9%	-	6%
China	343	264	338	206	274	10%	6%	7%	5%	4%
Guyana	141	208	169	130	196	4%	5%	4%	3%	3%
Jamaica	77	166	144	109	139	2%	4%	3%	3%	2%
Sierra Leone	52	31	55	65	90	2%	1%	1%	2%	1%
Solomon Islds	-	-	-	-	79	-	-	-	-	1%
Ghana	29	15	72	79	60	1%	0%	2%	2%	1%
India	56	130	356	264	53	2%	3%	8%	7%	1%

Source: UN Comtrade. HS2002-2606, Aluminum Ore & Concentrate. All Exporters. Downloaded 6/4/2020.

Table 4: Top Ten Importers of Aluminum Ore & Concentrate, By Value 2010-2018

	Import Value (US$ million)					Import Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**3,310**	**4,150**	**4,596**	**4,054**	**6,344**	**100%**	**100%**	**100%**	**100%**	**100%**
China	1,310	1,886	2,052	2,497	4,435	40%	45%	45%	62%	70%
Ireland	186	214	228	219	263	6%	5%	5%	5%	4%
Ukraine	183	184	157	155	207	6%	4%	3%	4%	3%
U.S.	446	544	525	235	200	13%	13%	11%	6%	3%
Spain	184	203	183	173	187	6%	5%	4%	4%	3%
India	-	-	131	99	162	-	-	3%	2%	3%
Germany	156	197	182	109	142	5%	5%	4%	3%	2%
Canada	102	134	117	107	141	3%	3%	3%	3%	2%
France	77	110	95	74	104	2%	3%	2%	2%	2%
Romania	53	-	-	62	85	2%	-	-	2%	1%
Bahrain	-	77	354	-	-	-	2%	8%	-	-
Japan	95	-	-	-	-	3%	-	-	-	-

Source: UN Comtrade, HS 2002 - 2606, Aluminum Ore & Concentrate; All Importers. Downloaded 03/04/2020.

7. To understand global supply and demand conditions in the bauxite/aluminum GVC, four different HS2 groups are analyzed. 2606 Aluminum ore & concentrate is the raw material. Two intermediate goods are also considered: (i) 2818 Alumina (aluminum oxide) as a refining output and (ii) 7601-7602 unwrought aluminum and aluminum waste and scrap as production outputs. Finally, a range of fabrication goods as semi-final products with codes 7603-7609 are explored. 7603 Aluminum powders and flakes; 7604 Aluminum bars, rods and profiles; 7605 Aluminum wire; 7606 Aluminum plates, sheets and strip; 7607 Aluminum foil; 7608 Aluminum tubes and pipes & 7609 Aluminum tube or pipe fittings.

The world total alumina export value has increased by 48% from US$13.8 billions in 2010 to US$20.4 billions in 2018. This upwards trend hides a decrease of 17% between 2014 and 2016, mainly imputable to a decline in commodity prices. Australia dominates the export market with an average share of world export above 35%. It is followed by Brazil (around 15%) and China which has overtaken the U.S. and Germany among the top exporters (Table 5). China's Alumina exports surged in the third quarter of 2018, with producers willing to realize gains on a favorable arbitrage between domestic and international prices amid tighter global supplies. Jamaica's export value has more than doubled between 2016 and 2018, ranking the country as the fourth exporter in 2018.

Table 5: Top Ten Exporters of Alumina, By Value 2010-2018

	Export Value (US$ million)					Export Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**13,771**	**13,784**	**15,258**	**12,675**	**20,357**	**100%**	**100%**	**100%**	**100%**	**100%**
Australia	4,813	5,387	5,268	4,303	7,709	35%	39%	35%	34%	38%
Brazil	1,774	1,966	2,499	2,418	2,792	13%	14%	16%	19%	14%
China	585	656	825	650	1,595	4%	5%	5%	5%	8%
U.S.	846	931	1,046	633	486	6%	7%	7%	5%	2%
Germany	746	716	743	671	861	5%	5%	5%	5%	4%
India	1,367	375	562	419	728	10%	3%	4%	3%	4%
Jamaica	405	516	537	458	1,056	3%	4%	4%	4%	5%
Ireland	454	483	631	479	812	3%	4%	4%	4%	4%
Ukraine	440	596	472	387	572	3%	4%	3%	3%	3%
Kazakhstan	226	311	297	318	337	2%	2%	2%	3%	2%
France	308	312	299	266	302	2%	2%	2%	2%	1%
Viet Nam	-	-	155	162	547	-	-	1%	1%	3%
Netherlands	74	107	338	91	110	1%	1%	2%	1%	1%
Indonesia	-	-	-	128	459	-	-	-	1%	2%

Source: ITC, based on UN COMTRADE and ITC statistics -- Product: 2818 Artificial corundum, whether or not chemically defined; aluminum oxide; aluminum hydroxide (download from ITC Trade Map, 11 April 2020).

Table 6: Top Ten Importers of Alumina, By Value 2010-2018

	Import Value (US$ million)					Import Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**13,499**	**14,695**	**16,036**	**13,135**	**20,042**	**100%**	**100%**	**100%**	**100%**	**100%**
Russia	1,247	1,712	1,487	1,326	2,210	9%	12%	9%	10%	11%
Canada	1,371	1,305	1,253	1,204	2,079	10%	9%	8%	9%	10%
UAE	950	1,156	1,438	1,380	1,752	7%	8%	9%	11%	9%
India	-	-	-	434	1,442	-	-	-	3%	7%
U.S.	920	1,035	962	662	1,216	7%	7%	6%	5%	6%
Norway	693	732	716	662	1,078	5%	5%	4%	5%	5%
Bahrain	434	-	-	434	907	3%	-	-	3%	5%
Iceland	516	508	495	428	846	4%	3%	3%	3%	4%
Germany	502	455	530	500	759	4%	3%	3%	4%	4%
South Africa	547	441	-	-	703	4%	3%	-	-	4%
China	1,582	1,900	2,012	934	-	12%	13%	13%	7%	-
Malaysia	-	-	558	-	-	-	-	3%	-	-
Saudi Arabia	-	-	509	-	-	-	-	3%	-	-
Qatar	-	420	-	-	-	-	3%	-	-	-

Source: UN Comtrade, 2020. HS 2002 - 2818, Alumina (Aluminum Oxide); All Importers. Downloaded 03/04/2020.

Total imports of alumina increased by 50% in ten years from 2010 to 2018 (Table 6). Russia, Canada, and the United Arab Emirates (UAE) are the top importers of Alumina with around 10% share. The emergence of the UAE was due to Emirates Global Aluminum company that has two of the world's largest single-site primary aluminum smelters in the country.

The world's total exports of unwrought aluminum/ingots increased from US$54.5 billions in 2010 to US$66.0 billions in 2018 (Table 7). Canada is the top exporter with around 11% share of world total exports from 2010-2018. UAE became the second largest exporter in 2018, overtaking Russia's historical second position. The U.S. is the fourth with a declining share, from 8% in 2012 to 6% in 2018. Similarly, Australia's share had declined from 8% in 2010 to 6% in 2018.

Table 8 shows that the world's total imports of unwrought aluminum/ingots increased by around 30% in the last ten years. The U.S. is the top importer with a 15% share in 2018. The second importer is Germany with around 10% share. Japan's share has declined from 10% in 2010 to 8% in 2018. The Republic of Korea is the fourth importer with around 6% share, before Italy (5%).

Table 7: Top Ten Exporters of Unwrought Aluminum/Ingots, By Value 2010-2018

	Export Value (US$ million)					Export Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**54,478**	**57,141**	**58,542**	**51,655**	**66,020**	**100%**	**100%**	**100%**	**100%**	**100%**
Canada	6,535	6,222	6,585	5,703	7,343	12%	11%	11%	11%	11%
UAE	-	-	3,797	4,647	5,392	-	-	6%	9%	8%
Russia	5,859	6,335	5,252	4,667	5,129	11%	11%	9%	9%	8%
U.S.	4,072	4,646	4,064	2,769	4,001	7%	8%	7%	5%	6%
India	-	-	-	1,648	3,816	-	-	-	3%	6%
Australia	4,155	3,970	3,580	2,705	3,632	8%	7%	6%	5%	6%
Norway	3,646	3,442	3,272	2,490	3,191	7%	6%	6%	5%	5%
Netherlands	2,117	1,853	2,559	2,135	2,830	4%	3%	4%	4%	4%
Germany	2,498	2,566	2,730	2,316	2,751	5%	4%	5%	4%	4%
Malaysia	-	-	-	1,645	2,331	-	-	-	3%	4%
Saudi Arabia	-	-	1,593	-	-	-	-	3%	-	-
Iceland	1,832	1,751	1,510	-	-	3%	3%	3%	-	-
Qatar	-	-	2,611	-	-	-	-	4%	-	-
UK	1,939	1,611	-	-	-	4%	3%	-	-	-
China	1,537	-	-	-	-	3%	-	-	-	-

Source: UN Comtrade, 2020. HS 2002 – 7601-7602, Unwrought Aluminum/Ingots; All Exporters. Downloaded 03/04/2020.

Table 8: Top Ten Importers of Unwrought Aluminum/Ingots, By Value 2010-2018

	Import Value (US$ million)					Import Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**61,451**	**63,844**	**67,674**	**57,102**	**78,766**	**100%**	**100%**	**100%**	**100%**	**100%**
U.S.	7,165	7,645	8,206	8,962	11,466	12%	12%	12%	16%	15%
Germany	6,646	6,852	7,333	5,874	7,566	11%	11%	11%	10%	10%
Japan	6,289	6,106	6,241	4,372	6,438	10%	10%	9%	8%	8%
Rep. of Korea	3,963	4,274	4,641	3,756	4,446	6%	7%	7%	7%	6%
Italy	2,753	2,651	3,304	2,920	3,999	4%	4%	5%	5%	5%
India	-	1,975	2,256	2,121	3,247	-	3%	3%	4%	4%
Netherlands	2,145	2,510	3,270	2,222	3,156	3%	4%	5%	4%	4%
China	5,095	5,528	4,206	2,690	2,959	8%	9%	6%	5%	4%
Turkey	1,792	2,147	2,549	1,917	2,701	3%	3%	4%	3%	3%
Mexico	-	1,731	1,812	1,771	2,544	-	3%	3%	3%	3%
Belgium	1,805	-	-	-	-	3%	-	-	-	-
France	1,572	-	-	-	-	3%	-	-	-	-

Source: UN Comtrade, 2020. HS 2002 – 7601-7602, Unwrought Aluminum/Ingots; All Importers. Downloaded 03/04/2020.

The world total export of aluminum semi-products increased from US$54.9 billions in 2010 to US$76.9 billions in 2018 as displayed in Table 9. China is the top exporter of aluminum sheets, plates, wire, rod, bar with increasing its world share from 14% in 2010 to 20% in 2018. Germany is the second exporter with an almost steady share of around 14% from 2010 to 2018. The U.S. is the third exporter with around 9% share. Then Italy and France are listed with a 4% steady share from 2010 to 2018. In contrast, Japan's export share declined from 4% in 2010 to 2% in 2018.

The world's total imports of aluminum semi-products increased by around 40 % from 2010 to 2018 (Table 10). U.S. and Germany are the top importers with around 10% share of world total import. Mexico and France are the third and fourth importers with around 5% share. Then, United Kingdom, China, and Canada are listed with around 4 % shares.

The above analysis suggests a growing trend in trade concerning the different products of the aluminum GVC, consistent with the expected high demand for aluminum. Three countries in sub-Saharan Africa (Guinea, Sierra Leone, and Ghana) appears among the top exporters of the raw material only, illustrating their specialization in primary commodities with low value-added.

Table 9: Top Ten Exporters of Aluminum Sheets, Plates, Wire, Rod, Bar, Powder, By Value 2010-2018

	Export Value (US$ million)					Export Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**54,866**	**62,278**	**67,465**	**61,932**	**76,895**	**100%**	**100%**	**100%**	**100%**	**100%**
China	7,543	9,798	11,948	11,429	15,260	14%	16%	18%	18%	20%
Germany	7,133	8,575	9,257	8,378	10,152	13%	14%	14%	14%	13%
U.S.	4,471	5,816	6,080	6,813	5,958	8%	9%	9%	11%	8%
Italy	2,501	2,583	2,723	2,375	3,032	5%	4%	4%	4%	4%
France	2,451	2,504	2,647	2,345	2,868	4%	4%	4%	4%	4%
Spain	-	-	-	1,768	2,428	-	-	-	3%	3%
Rep. of Korea	1,704	1,743	1,906	1,668	2,295	3%	3%	3%	3%	3%
Belgium	-	-	-	-	2,152	-	-	-	-	3%
Turkey	-	-	-	-	1,973	-	-	-	-	3%
Japan	2,396	1,929	1,824	1,638	1,753	4%	3%	3%	3%	2%
Austria	1,963	1,961	1,812	1,704	-	4%	3%	3%	3%	-
Belgium	1,810	1,761	1,900	1,680	-	3%	3%	3%	3%	-
Bahrain	-	1,722	2,075	-	-	-	3%	3%	-	-
Canada	1,677	-	-	-	-	3%	-	-	-	-

Source: UN Comtrade, 2020. HS 2002 – 7603-7609, Aluminum Sheets, Plates, Wire, Rod, Bar, Powder; All Exporters. Downloaded 03/04/2020.

Table 10: Top Ten Importers of Aluminum Sheets, Plates, Wire, Rod, Bar, Powder, By Value 2010-2018

	Import Value (US$ million)					Import Share (%)				
	2010	2012	2014	2016	2018	2010	2012	2014	2016	2018
World	**51,715**	**58,390**	**61,760**	**56,288**	**71,743**	**100%**	**100%**	**100%**	**100%**	**100%**
U.S.	4,596	4,779	5,193	5,396	7,632	9%	8%	8%	10%	11%
Germany	5,984	6,356	6,667	6,194	7,360	12%	11%	11%	11%	10%
Mexico	1,860	2,955	2,402	2,523	3,490	4%	5%	4%	4%	5%
France	3,033	3,322	3,370	2,893	3,484	6%	6%	5%	5%	5%
United Kingdom	2,510	2,574	3,228	2,733	3,209	5%	4%	5%	5%	4%
China	3,126	3,390	3,017	2,420	2,701	6%	6%	5%	4%	4%
Canada	1,849	2,153	2,244	2,095	2,529	4%	4%	4%	4%	4%
Viet Nam	-	-	-	1,746	2,386	-	-	-	3%	3%
Poland	1,281	1,471	1,673	1,447	2,117	2%	3%	3%	3%	3%
Italy	2,109	1,929	1,890	1,590	2,111	4%	3%	3%	3%	3%
Saudi Arabia	-	1,593	1,570	-	-	-	3%	3%	-	-
Belgium	1,186	-	-	-	-	2%	-	-	-	-

Source: UN Comtrade, 2020. HS 2002 – 7603-7609, Aluminum Sheets, Plates, Wire, Rod, Bar, Powder; All Importers. Downloaded 03/04/2020.

Lead Firms and Governance Structures in the Bauxite/Aluminum GVC

There is a global and highly competitive market in bauxite mining. Globally, the top ten companies in bauxite mining are listed in Table 11[8]. Bauxite and alumina production is a vertically integrated market. This is illustrated by the fact that the top ten companies in bauxite mining and alumina production are usually the same (Table 12).

Based on data availability, the Australian/British company of Rio Tinto has the largest annual production of bauxite mining with 55 million metric tons. The company has bauxite mining in Australia and Guinea. The second is the American company, Alcoa, with 47 million metric ton bauxite mining and they have seven bauxite mines in Australia, Brazil, and Guinea. These two companies are the top-tiers and their total production is more than one-third of world total production. The Russian company Rusal comes as the third-largest player in the bauxite mining market with 13.8 million metric tons annual production in different geographies of Guyana, Guinea, and Russia. Then the Norwegian company Norsk Hydro that has bauxite mining in Brazil and the Canadian company Noranda that operates in

Table 11: Top Ten Companies in Bauxite Mining

Company	HQ Location	Annual Production (million metric ton)	Geographies
Rio Tinto	UK/Australia	55	Australia, Guinea
Alcoa	US	47	Brazil, Australia, Guinea
Rusal	Russia	13.8	Guyana, Guinea, Russia
Norsk Hydro	Norway	6	Brazil
Noranda	Canada	5.8	Jamaica
South 32	Australia	3.8	Australia
Antam	Indonesia	1.1	Indonesia
Hindalco	India		India
Hangzhou Jinjiang	China		China, Guinea
Chalco	China		China

Source: Annual Reports of Companies

Table 12: Top Ten Companies in Alumina Production

Company	HQ Location	Capacity (million metric ton)	VC	Geography
Chalco	China	13.8	Mining, alumina production, smelting, casting, semi-fab	China
Alcoa	US	12.7	Mining, alumina production, smelting, casting	Australia, Brazil, Spain
Rusal	Russia	7.8	Mining, alumina production, smelting, casting, semi-fab	Russia, Ireland, Italy, Jamaica, Ukraine
Rio Tinto	UK/Australia	7.7	Mining, alumina production, smelting, casting, semi-fab	Australia, Brazil, Canada
Chiping Xinfa	China	7	Alumina production, smelting, casting, semi-fab	China
Norsk Hydro	Norway	6.4	Mining, alumina production, smelting, casting	Brazil
South 32	Australia	5	Mining, alumina production, smelting	Australia, Brazil
Hangzhou Jinjiang Group	China	3	Mining, alumina production, smelting	China
Hindalco	India	2.9	Mining, alumina production, smelting, casting, semi-fab	India
Nalco	India	2.1	Alumina production, smelting, casting	India

Source: Annual Reports of Companies

8. Data on annual production and revenue is still lacking to complete the table

Jamaica are listed as the fourth and fifth in the market with around 6 million annual production of bauxite. The Australian company, South 32, has 3.8 million metric ton production in Australia and the Indonesian company Antam has 1.1 million metric ton bauxite mining in Indonesia. Finally, the Chinese companies Chalcao (Aluminum Corporation of China Limited) and Hangzhou Jinjiang Group have mines in China and Guinea, and the Indian company Hindalco has bauxite mining in India.

The Chinese Chalco is the leader company in alumina production with a 13.8-million-ton production capacity. The American company Alcoa is the second with a 12.7-million-ton alumina production capacity with refineries in Australia, Brazil, and Spain. These two companies are the top-tier in alumina production. The Russian company Rusal has alumina refineries in different countries, Russia, Ireland, Italy, Jamaica, and Ukraine. Similarly, The Australian/British company Rio Tinto has around 8-million-ton alumina production capacity with refineries in Australia, Brazil, and Canada. The remaining second top-tier companies with around 7-million-ton alumina production capacity are the Chinese Chiping Xinfa and the Norwegian Norsk Hydro with refineries in China and Brazil, respectively. Then the Australian company South 32 comes with a 5-million-ton alumina production capacity. Entities at the bottom of the list include the Chinese Hangzhou Jinjiang Group and the Indian companies Hindalco and Nalco with less than 3-million-ton alumina production capacity.

Reliability of bauxite supply and the price and quality of bauxite are the key factors in the competitiveness of the alumina market. Moreover, locating alumina refineries close to bauxite mines is a critical cost-cutting advantage for competitiveness in the industry. For example, Chalco, Alcoa, and Tinto usually have alumina refineries very close to bauxite mining areas. However, Rusal alumina refineries are more dispersed, especially in Europe, making the company a leader in the European aluminum market. Although most of these companies use their bauxite for domestic transformation in their alumina production refineries, there has been a growing trend for third-party markets for bauxite, as global demand increased, fueled by China. For instance, the Russian company Rusal sells around 30% of its production in third-party markets to global companies[9].

9. https://aluminuminsider.com/alumina-costs-are-hurting-aluminum-smelters/

Upgrading in the Bauxite/Aluminum GVC

China provides a great example in upgrading Bauxite/ Aluminum GVC. China has emerged as the world's leader in the aluminum industry and it now produces more than 50 % of the total world primary aluminum. This is mainly achieved by the significant increase in the number of aluminum smelters in the country. Moreover, the development of new bauxite mines, alumina refineries, and semis factories also helped the country becoming the world leader in the aluminum industry.

In the upstream of the Bauxite/Aluminum GVC, the government of China has hampered the exports of raw bauxite through incomplete rebates of value-added tax (VAT). In contrast, Chinese bauxite imports have surged. Similar to bauxite, exporting alumina is also penalized through Chinese export-policy tools that favor domestic usage of alumina for production of primary aluminum in Chinese aluminum smelters. In the middle stream, China has accomplished great success by producing around 60% of total world primary aluminum. This outcome reflects the Chinese government's strategy to heavily subsidize aluminum production. Moreover, 119 out of 133 aluminum smelters built globally between 1985-2005 were in China, providing job opportunities for many people in the aluminum production[10]. Exports of primary aluminum are also discouraged by the Chinese export-policy tools, with a view of channeling it to Chinese semis-factories that make them competitive in the global markets.

In the downstream, China is also the global leader in the production of aluminum semis with a production of around 25,000 metric tons out of 55,000 metric tons of world production[11]. Moreover, the production cost of Chinese firms is much cheaper since they have cheaper access to primary aluminum that accounts for 75-86% of the total production of semis[12]. Unlike bauxite, alumina, and primary aluminum, the exports of semis are encouraged by the government of China through Chinese export-policy tools. Thus, the Chinese unit values of exports of semis are lower compared to those of both the European Union and the U.S. as a result of cheaper production and exports cost of the semis. Consequently, the Chinese share in world exports of semis increased drastically from less than 5% in 2005 to more than 20% in 2016.

In the unprecedented emergence of Chinese dominance in the aluminum industry, the government of China played a key role through trade policy and regulation. Moreover, the government-subsidized Chinese firms in each step of the production through financial and non-financial support. As non-financial support, Chinese firms, especially aluminum smelters, have been granted energy subsidies that help them to lower their production cost since electricity accounts for around 40% of smelting costs. Furthermore, Chinese companies in the aluminum sectors have accessed financial support through cheap funding by concessional loans, capital injection by the Chinese provincial and municipal governments, and tax concessions and incentives.

In Australia, there has been a structural change in the bauxite/ aluminum industry. Historically, there has been an integrated bauxite-alumina-aluminum industry in the country. However, with the emergence of low-cost Chinese aluminum smelters, operators in Australia started to close. For example, Kurri Kurri smelter in the Hunter Valley of New South Wales and Point Henry aluminum smelter at Geelong, Victoria were closed[13].

Accordingly, the Australian export of aluminum/ingots decreased, while the alumina refineries increased their capacities, boosting exports. Similarly, the growth in global demand for direct export of bauxite increased Australian exports of the raw material.

On the other hand, Indonesia failed to significantly increase alumina production by banning bauxite exports. In 2014, the government imposed a ban on the export of unprocessed nickel and bauxite ores, with a view to compelling miners and processors to build smelters in Indonesia, thereby increasing the country's share of the value-added to its mineral resources. Instead of promoting the construction of new smelters, the Indonesian export ban had the effect of shifting bauxite extraction activities to neighboring Malaysia.

4.1.2. Guinea and the Bauxite/Aluminum Global Value Chain

Current Participation of Guinea in the GVC

Guinea's economy is highly dependent on mining activities, which account for nearly 90% of goods exports and 20% of tax revenue (IMF, 2020). Bauxite is the most active mining sector in Guinea, accounting for 34 % of Guinea's exports. Most of the country's bauxite is exported by two firms: Société Minière de Boké-Winning Africa (SMB-WAP, or simply "SMB") and Compagnie des Bauxites de Guinee (CBG). The relative importance of the sector has increased recently after a steady decline between the early 1990s and the late 2000s, mainly due to a decline in export prices. Since 2010, a gradual normalization of the political situation following the presidential elections, combined with a surge in global demand, has revitalized the industry. The signing of major investment agreements since 2013 triggered the arrival of more companies, strengthening the momentum for the bauxite industry. This growth confirmed the position of Guinea as a major player in the international market and a destination for a substantial investment.

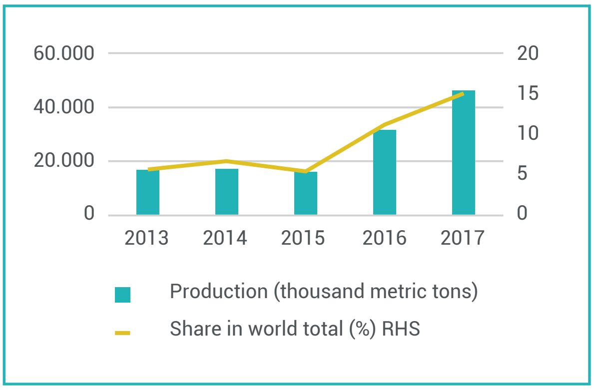
10. https://qz.com/20209/it-is-tin-hat-time-for-aluminum-company-shareholders-china-has-a-glut-of-the-stuff-and-cannot-stop-producing-it/
11. OECD, 2019
12. USITC, 2017
13. Geoscience Australia, 2019

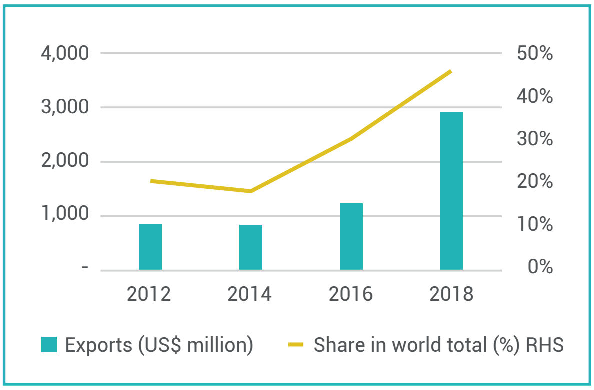
As shown in Figure 2, the total production reached 46.2 million tons in 2017 (15% of world production), up from 16.9 million tons in 2013 (6% of world production)[14]. Regarding the value of bauxite exports, a sharp increase was noted between 2014 and 2018, from US$835 million (18% of world total) to US$2.9 billions (46% of world total)[15].

Guinea has the lowest alumina to bauxite production ratio of all the major bauxite and alumina producing countries (IMF, 2008). Figure 3 below compares the country's share of bauxite and alumina exports in world exports. While the ratio for bauxite is relatively high and has increased over time, Guinea's share in alumina exports remains weak. Furthermore, it decreased from 1.2 % in 2010 to 0.4 % in 2018, as the value of Guinea's alumina exports more than halved between the two periods, suggesting a decline in the country's refining capacity.

Despite more than a half-century of bauxite mining, only one alumina refinery has been established in Guinea and its operation has been sporadic and largely inconsequential. No smelters have yet been constructed. The vast majority of bauxite is exported in its raw form, representing a major missed opportunity for the country. Since 2015 Guinea's government

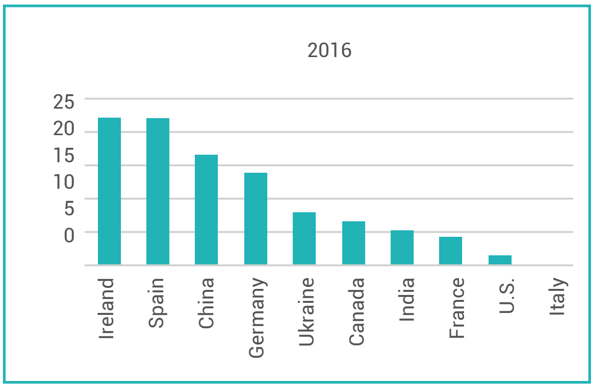
Figure 2: Recent Trends in Guinea's Bauxite Production and Exports





Source: U.S. Geological Survey, 2017 and UN Comtrade, 2020. HS 2002 - 2606, Aluminum Ore & Concentrate; All Exporters. Downloaded 03/04/2020.

Figure 3: Top Ten Destinations of Guinea's Bauxite Exports[16]



Source: ITC, Trade Map. Download on 17 April 2020.

has consistently signaled strong interest in expanding bauxite mining, as well as in-country alumina refining and aluminum smelting. Specifically, all new mining concessions have included rights for alumina refineries, most notably a US$2.8 billions investment from the Chinese company TBEA, which plans to bring its alumina refinery online by June 2021 and to start smelter construction by 2025. Guinea's stated goal is to grow bauxite refining from 0.6 million tons to over 1 million tons by 2024, thereby boosting GDP and generating considerable demand for local employment, though it is not clear that local workers will benefit from these new concessions (Widder et al., 2019).

14. According to national authorities, the country has the capacity to reach an annual production level of 40 to 60 million tons from 2018, with the ultimate goal of producing 100 million tons per year.
15. Due to the difference in data sources, it is difficult to compare the production and exports in volume. Nonetheless, it seems that up to 2015, over 90% of Guinea's bauxite production was exported as raw material.
16. Data for Guinea Bauxite exports by country of destination is available up to 2016 only.

Employment and Human Capital

Guinea's population is relatively young, with more than 60% below 24 years. The country is characterized by a high poverty headcount ratio, estimated around 58% in 2017, while the adult literacy rate was 32% (World Bank, 2019). Apart from poor education levels, the population faces issues of high unemployment and underemployment and low human resource availability. The mining sector in Guinea is constrained by the lack of an appropriately qualified local workforce. Due to this constraint, mining companies are compelled to hire a significant part of its qualified workforce from neighboring countries (KPMG, 2014). The available statistics about employment in the mining sector are very weak, with no data reported for several companies (Ministry of Mining, Statistical Bulletin, December 2018). Based on the available official data, employment in the mining sector increased sharply between 2015 and 2017, a jump of 520%, reflecting mainly the entry of new companies. The historical Bauxite company Compagnie des Bauxites de Guinée accounted for 37% of the employment in the mining sector in 2017, down from 79% in 2015.

Table 13: Employment in the Mining Sector, Guinea

	2015		2016		2017	
	National	Expatriate Workers	National	Expatriate Workers	National	Expatriate Workers
Total Mining Companies	2937	100	15094	401	16261	2582
Compagnie Des Bauxites De Guinee	2373	39	4711	36	6720	362
Societe Miniere De Boke	175	53	550	91	1045	119
Compagnie Des Bauxites De Kindia	n/a	n/a	1194	27	1194	27
Societe D'alumine De Frigia	n/a	n/a	934	5	921	3

Source: Ministry of Mining and Geology, December 2018

Key Firms

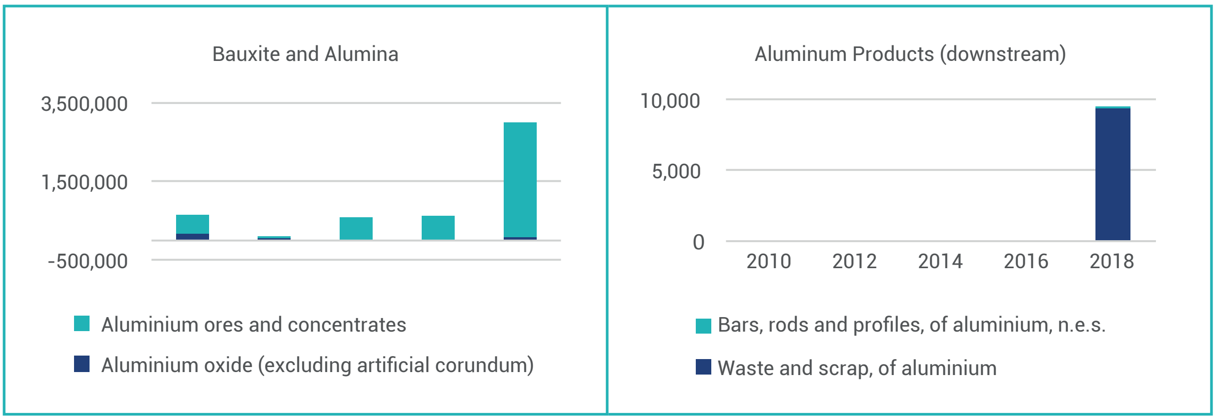
Mining is largely centered in northwestern Guinea in the Boké Region's SEZ. The majority of concessions are held in whole or in part by foreign mining organizations that have incorporated Guinean operating companies in conjunction with the Republic of Guinea's government. The bauxite-aluminum industry's current boom is borne largely of FDI from China, the UAE, Russia and, to a lesser extent, Iran, France, the US, the UK, Australia, India, and the Netherlands in joint ventures with federal ownership (see annex 1). Moreover, a consortium of mining companies funded a new trade organization, Guinea's Chamber of Mines, to communicate and represent private mining sector interests.

Through 2015, Compagnie des Bauxites de Guinée (CBG, a.k.a. Guinea Bauxite Company) accounted for more than 75% of extracted bauxite. Guinea's government holds a 49% interest in CBG, with the balance held by an international consortium. The remaining 20– 25% of Guinea's bauxite industry before 2016 was controlled by Russia's RUSAL, operating three wholly-owned subsidiaries. Large-scale growth began in 2015 (primarily) by expanding existing concessions and granting new concessions, with new mining operations coming on line in 2016. Guinea's government controls 10–15% of most of the new concessions.

Evidence of Upgrading

The available trade data confirms a very low level of transformation in Guinea's Bauxite-Aluminum industry, with the country's exports overwhelming dominated by the raw material. As of 2018, Guinea's exports of Aluminum ores and concentrates were estimated at US$2,9 billions, compared to 77.6 million US$ for the value of Aluminum Oxide (Alumina). The exports of waste and scrap of aluminum jumped to 9.4 million US$ in 2018 from 62 thousand US$ in 2016. These figures indicate a high potential for value addition through transformation. However, they also suggest the existence of severe constraints to transformation. Such constraints include poor infrastructure and a generally weak investment climate. The percentage of paved roads of the total road network is among the lowest in West-Africa. The railway system is considered outdated and is largely incapable of supporting Guinea's mining and industrial product exports (KPMG, 2014). According to the 2015-16 Global Competitiveness Report, firms identified the inadequate supply of infrastructure as the third most problematic factor for doing business in Guinea. Access to electricity is very low in both rural (3 %) and urban areas (11 %), and power outages are common. The Conakry port, which suffers from physical issues and management flaws, has become the most expensive one among West-African ports for all types of vessels (World Bank, 2018).

Figure 4: Guinea's Exports in Main Bauxite-Aluminum Products (US$ thousand)



Source: ITC, Trade Map. Downloaded on 25 April 2020.

The lack of human capital and organizational capacity are also serious concerns. Skills challenges impact every sector of the economy. Challenges in the educational system include very low coverage, poor quality of education, and vocational training. This has led to skill shortages. Guinea has conspicuously low levels of skills development and lags significantly behind most developing countries. In the mining sector, operators have difficulty in recruiting skilled Guinean staff trained both in professional and technical/vocational schools. Moreover, firms find it difficult to obtain reliable engineering and subcontracting services locally.

The accountability, transparency, and effective management of the sector has also been a major issue, increasing the frustration of the population in mining areas. Guinea has recently updated its Investment Code and renewed efforts to attract international investors. However, the reality is that businesses often wait months or years to receive final approvals from one ministry or another (depending on the sector). Guinea's capacity to enforce its more investor-friendly laws is compromised by a weak legal system and weak institutional capacity. Difficulties also remain in defining and enacting mechanisms to distribute the mining sector's benefits and to enact good governance, community enhancement, and environmental mitigation (Widder et al., 2019).

Guinea's abundant rainfall, sunny weather, and natural geography create advantageous conditions for hydroelectric and renewable energy production. Until recently, the most significant energy investment in Guinea was the 240MW Kaleta project, which began operating its first hydro turbine in May 2015. Built and financed (US$526 million) by China, Kaleta more than doubled Guinea's electricity supply and for the first time furnished Conakry with relatively dependable power. A second major dam, the 450MW Souapiti project, is already under construction with Chinese backing and scheduled for completion in 2020[17].

Chinese firms operating in Guinea are the most likely candidates for delivering an integrated project. With China placing more importance on securing mineral supplies for the next few decades rather than short-term profitability, these firms have a distinct advantage. Moreover, the growing concern about air pollution in China is encouraging Beijing to consider building more refineries abroad. And transforming the bauxite into alumina in Guinea before it is shipped to China would drastically reduce shipping costs[18].

17. The International Trade Administration (ITA), U.S. Department of Commerce.
18. www.minning-journal.com

4.1. 3. Challenges and Recommendations

Table 14: Challenges

Challenges	Description and relevance
Weak institutional capacity to mitigate the environmental and social impacts of bauxite mining	Bauxite mining has considerable social and environmental impacts, which affect the livelihoods of local communities and threaten the long-term sustainability of the activity. In advanced and Emerging Markets Economies, leading firms are facing strong constraints and incentives to upgrade the social and environmental standards in the industry. In Guinea, institutional and technical capacity to set up the norms and standards and to implement the regulation is an important challenge for both the central government and for local communities.
Power supply shortage	Aluminum production is highly energy-intensive, especially primary aluminum production, which involves alumina refining. In this regard, the power supply shortage is one of the major obstacles to domestic transformation of the raw material.
Low human capital	With a low adult literacy rate, weak human capital is a cross-cutting issue for Guinea's economy. Especially, the lack of an appropriately qualified workforce ranks among the most binding constraints to further development of the mining sector through industrial transformation.
Poor logistics performance	Infrastructure is inadequate to transport materials from mines to the export facilities. In 2018, Guinea's overall score for the Logistics Performance Index (LPI) was 2.20 and the country was ranked 145 out of 160 countries. The Conakry port, which suffers from physical issues and management flaws, has become the most expensive one among West-African ports for all types of vessels. This affects Guinea's competitiveness in the global markets for bauxite and alumina.
A weak investment climate	Guinea has recently updated its Investment Code and renewed efforts to attract international investors. However, the reality is that businesses often wait months or years to receive final approvals from one ministry or another (depending on the sector).

Table 15: Policy Recommendations

Institutionalization	To ensure the long-term sustainability of the extractive activity, the government needs to foster green process upgrading through supporting engagement models based on public-private-local communities' partnerships to enforce international standards promoted by the global industry. Development institutions could also play a key role in supporting such platforms. IsDB's reverse linkage program can be instrumental in sharing the experience of member countries like Malaysia. The bank can also support the empowerment of local communities by promoting developers' networks in the country.
Infrastructure and services Energy Supply	The country has been confronted with the challenges of economic growth stemming from power infrastructure constraints. To increase investment in power supply infrastructure, the government of Guinea should reform the private sector involvement scheme by simplifying licensing procedures for investment, improving public-private partnership regulations, and enhancing foreign direct investment schemes. The IsDB's reverse linkages program can also be leveraged to provide technical assistance in supporting policy and regulatory reforms.
Infrastructure and services Transportation and Logistics	The government of Guinea should also prioritize the investments in transportation and logistics in partnership with the concerned mining companies. Facilities developed by private companies have so far failed in improving the country's logistics performance and do not guarantee the access needed to diversify actors in the sector. By promoting investments in transportation and logistics, the country can also achieve the objective of supply chain linkages upgrading, enabling increased participation of local actors in the value chain. IsDB alternative development finance scheme with emphasis on support to project preparation can be an efficient tool for catalyzing the needed resources to close the financing gaps.
Productive Capacity Human capital	The mining sector in Guinea is constrained by the lack of an appropriately qualified local workforce. Thus, the government of Guinea should focus on for reforms in the training and education system, where it is evident that there is a mismatch between the education curriculums and the market needs. Given the large scope of mining activities in Guinea and in the sub-region, especially among IsDB member countries, a regional approach could be envisaged with regional centers to develop basic competencies, while a more specialized curriculum could be supported in partnership with the mining companies.
Business environment	Guinea needs to continue improving its business environment to be more successful in attracting FDI and improving competitiveness. Given the huge challenges and capacity constraints, the approach could be gradual with a focus on boosting the Special Economic Zone's capacity and attractiveness to create industrial clusters, especially in the bauxite aluminum sector.

4.1.4. The Potential Impact of the COVID-19 Outbreak

Similar to other metal prices, the aluminum price started declining in the first quarter of 2020 because of the COVID-19 related developments and lost more than 20% of its value. Collapsing demand, especially in Europe and the US, due to the global supply and demand disruptions resulting from the COVID-19 pandemic could deteriorate the downstream segment of aluminum, especially the construction and automotive sectors. On the other hand, bauxite mining has not been affected much since there is no closure of mines due to the COVID-19 pandemic in the major producing countries of Australia, Brazil, and Guinea. Furthermore, the bauxite mining activities, alumina refining, and primary aluminum production in China have resumed[19] after canceling lockdowns in China. Therefore, there is an overcapacity of primary aluminum production which increased aluminum inventories globally. In the short-term, the bauxite/aluminum industry will be negatively impacted by the global recession and related decline in demand, this could create delays in investments and a decline in revenue, affecting the government's capacity to pursue its reform agenda, especially in the mining sector. However, there is also a positive impact on the industry by falling energy prices since the industry's energy costs are sizeable. Thus, it can be said that the impact of the pandemic is mixed. In the medium to long-term, it is expected that there will be positive development since global demand is expected to resume, fueling investment and exports. Moreover, smart technologies and automation of the processes will lower the cost that will increase the supply in the bauxite/aluminum industry. Also, green technologies will play a more important role in the long term that will provide sustainable growth of the industry and better living standards for the local communities.

19. https://www.mining-technology.com/comment/COVID-19-impact-aluminium-industry/

Annexes

Table 16: Guinea's Key Bauxite Mining Companies

	Company name	Controlling interest	Guinea interest (%)	Location	Concession type
CBG	Compagnie des Bauxites de Guinée	U.S., Australia, UK (51% Halco: Alcoa, Rio Tinto-Alcan, Dadco)	49	Boké Rgn	Bauxite, alumina
AMC	Société Alliance Mining Commodities Guinée	Australia (90% AMC)	10	Gaoaul Prf, Boké Rgn	Bauxite
	Pella Ventures Limited	UK (85% Pella Ventures)	15	Boffa Prf, Boké Rgn	Bauxite
IMD	International Mining Development	Ireland		Fria Prf, Boké Rgn	Bauxite, alumina
SBG	Société des Bauxites de Guinée	The Netherlands (76.1% Metalcorp)	23.9	Kindia Rgn	Bauxite, alumina
AMR	Alliance Minière Responsible	France		Boké Rgn	Bauxite
Fria	RUSAL (using three separate operating companies)	Russia (48.1% of RUSAL is owned by En + Group	0	Fria Prf, Boké Rgn	Bauxite, alumina
CDM	China Henan International Mining Development Group	China (41% Chico, 51% Y'ngc'g C'l Elec, 8% Henan)	0	Boffa Prf, Boké Rgn	Bauxite, aluminum
CPI	China Power Investment Corporation	China	0	Boffa Prf, Boké Rgn	Bauxite, alumina
CHALCO	Aluminum Corporation of China Ltd.	China	0	Boffa Prf, Boké Rgn	Bauxite
SMBWAP	Société Minière de Boké—Wining Port Afrique	China, Singapore, France (Shandong Weiqiao Al Pwr, Winning Ship'g, UMS)	10	Boké Rgn	Bauxite
	Jaguar Overseas	India (50% Dynamic Mining)	50	Boké Rgn	Bauxite
SBDT	Societe des Bauxites de Dabola-Tougue	Iran (51% SBDT)	49	Dabola and Tougué Prfs	Bauxite, alumina
EGA	Emirates Global Aluminum	UAE	0	Boké Rgn	Bauxite, alumina, aluminum

Source: Widder, Pacioni and Bocoum, 2019 "Sustainably Growing Guinea's Bauxite-Aluminum Industry"; Regional Development in Africa.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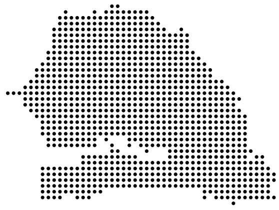
4.2 ESTABLISHING A VIBRANT PETROCHEMICAL INDUSTRY IN SENEGAL



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Summary

The Islamic Development Bank's (IsDB) new business model with Global Value Chain (GVC) based Member Country Partnership Strategy (MCPS) aims to identify the bottlenecks, opportunities, and challenges in Member Countries' (MCs) integration and upgrading within certain GVCs. The GVC Selection Analysis based on IsDB's GVC methodology and consultations with stakeholders have shown that the petrochemical industry is one of the industries whereby Senegal has natural, dynamic, spillover, and surplus potential to increase its international competitiveness, engage in more value-added activities, and create employment opportunities. Accordingly, this Preliminary GVC Analysis of the petrochemical industry provides a brief GVC-based analysis in identifying the opportunities and challenges in upgrading within the GVCs.

This report builds a bridge between global and domestic level value chain analysis for the Senegalese petrochemical industry. In doing so, the global level analysis identifies the lead firms in the detergent and fertilizer GVC, production processes, emerging trends, and technologies whereas the domestic level analysis finds the Senegal-based leading fertilizer and detergent companies. Moreover, several upgrading trajectories in the GVC are explained and suggestions are made. This report makes three key contributions to the Senegalese petrochemical industry's upgrading in the fertilizer and detergent GVCs:

- To develop its energy and transport infrastructure to bring their costs down to a competitive level on par with other petrochemical producing countries, as the production of petrochemicals especially fertilizers is very energy-intensive. Any competitiveness yield on the capacity of the country to produce enough reliable electricity at a reasonable cost.
- To look at the African market as a whole to increase end industries demand, mainly fertilizer and detergent end-industries to stimulate demand for petrochemical formulation in the country.
- To utilize the future Réseau Gazier du Sénégal to attract ammonia production in the country through natural gas to ammonia formulation. This could be in the form of a joint venture between an Ammonia lead firm and two Senegalese champions: Société Africaine de Raffinage (SAR) and Industries chimiques du Sénégal (ICS).

4.2.1. Introduction

According to the IsDB classification, Senegal is a 'Domestic Formulator' of petrochemicals.[1] Unlike other countries in the region, Senegal's economy is rather diversified and not heavily dependent only on one natural resource. The national development plan is the Emerging Senegal Plan (ESP). The ESP[2] aims to be more of an economic development plan and reach market emergence by 2035. The ESP now constitutes the reference for economic, social policy, and infrastructure needs in the medium and long term. It has a built-in Priority Action Plan (PAP) that identified the most impactful infrastructure projects that would create economic value add, employment, and increase productivity especially in the second sector of the economy. With a GDP of US$23.578 billions, a GDP growth of 5.3%, and low inflation rates of c.1.% in 2019, Senegal's real GDP is expected to grow by a meager 3% in 2020 with the global slowdown brought about by the COVID-19 Pandemic, it is projected that the economy would rebound with growth of c.6 and 7% for the upcoming years.[3] [4] The economic sector breakdown looks as follows: agriculture accounts for c.16.9%, industry for c.24.3%, and services for c.58.8% of Senegal's

The economic sector breakdown looks as follows: agriculture accounts for **c.16.9%,** industry for **c.24.3%**, and services for **c.58.8%** of Senegal's GDP.

1. IsDB Petrochemical report, 2020
2. https://www.sec.gouv.sn/sites/default/files/Plan%20Senegal%20Emergent_0.pdf
3. CIA World Factbook, 2020
4. International Monetary Fund, 2019

GDP.[5] Though only c.17% of the country's GDP is attributed to agricultural products, over 75% of the employment is in agri-foods.[6] Consequently, the majority of the labor force lacks capacity and competencies which is crucial for the development of transformative industries. Regarding the industry share, a large part can be attributed to mining and construction. The main export industries comprise phosphate mining, the production of fertilizers and agricultural products along with commercial fishing.[7]

Regarding the petrochemical industry, there exist small natural gas production with the Gadiaga Field (60 km northeast of Dakar), but quantities extracted remain minor with only c.70,000 m cubic meters of gas per day.[8] In other words, the oil and natural gas industry today remains modest vis-à-vis Senegal's GDP share due to limited feedstock on which grounds processing of petrochemical products could be alleviated. Currently, Senegal is a net importer of the key petrochemical products, plastics and rubber with an import value of c.US$300 million and exports of c.US$50 million.[9]

With recent discoveries of major oil and gas fields, these quantities are likely to increase within the next years. An estimated 1 billion barrels of crude oil (FAN-1 well and SNE-1 well on the Sangomar Block) and 1.1 trillion cubic meters of natural gas (Geumbeul wells 1 & 2 on Tortue and Teranga and Teranga-1 on the Grand Tortue Block) were discovered within the past 5 years.[10] Most of the natural gas has been located in Senegal and Mauritania's waters with both governments having signed a memorandum of understanding laying the basis for obtaining an amicable solution.[11] Though these discoveries are large in comparison to current known reserves in Senegal, they are relatively modest compared to that of African giants, such as Libya (48 billion barrels of crude oil and 1.5 trillion cubic meters of natural gas), Nigeria (37 billion barrels of crude oil and 5.3 trillion cubic meters of natural gas) or Algeria (12 billion barrels of crude oil and 4.5 trillion cubic meters of natural gas). Hydrocarbons are expected to make up c.5% of Senegal's GDP between 2024 and 2040.[12] Consequently, Senegal has the opportunity to build an upstream petrochemical sector. The country has identified not only gas-to-power as an important industry driver to fuel the country's economic growth but also the production of petrochemicals. Thus, Senegal is promoting various investment opportunities in the country.[13] Moreover, opportunities in domestic petrochemicals formulation seem to be actionable in the short-term.

In this report, the petrochemical industry is broken into the following categories:

- Surfactants, a key segment within specialty/fine chemicals, abbreviated from the term **sur**face-**act**ive ag**ents.** Surfactants are used as emulsifiers, wetting agents, dispersants, and stabilizers for different chemical and industrial applications. The report will mainly focus on petrochemical-based detergents.
- Fertilizers, which are any material of natural or synthetic origin that is applied to a soil or a plant to supply essential nutrients to promote the growth of plants. The report will focus mainly on nitrogen-based fertilizers, the most used type of fertilizer and is formulated from petrochemicals.

Some of the key findings of the reports are:

- The petrochemical industry is a capital and asset-intensive one, that requires economies of scale to justify the huge investments needed, especially upstream activities of base chemicals' formulation.
- The same oil and gas lead firms or their subsidiaries are usually responsible for the first few activities (upstream) of the petrochemical GVC, with upstream integration into base chemical production and plastics manufacturing.
- Senegal is not a historical petrochemical player. However, with an already existing refining capacity and chemical formulation destined for fertilizer production by two regional champions, Senegal can ambition to upgrade their position by helping their local lead firms formulate base chemicals and ammonia, especially considering the future natural gas production in the country.
- Senegal can look at the African market to increase end industries' demand, mainly fertilizer and detergent end-industries to stimulate demand for petrochemical formulation in the country. This is aligned with the new African Continental Free Trade Area (AfCFTA).
- There are existing binding constraints, mainly energy and transport infrastructure that need to be relaxed for Senegal to upgrade its position. Therefore, energy and transport infrastructure need to be developed to bring their costs down to a competitive level on par with other petrochemical producing countries, as the production of petrochemicals especially fertilizers is very energy-intensive. Any competitiveness yield on the capacity of the country to produce enough reliable electricity at a reasonable cost.

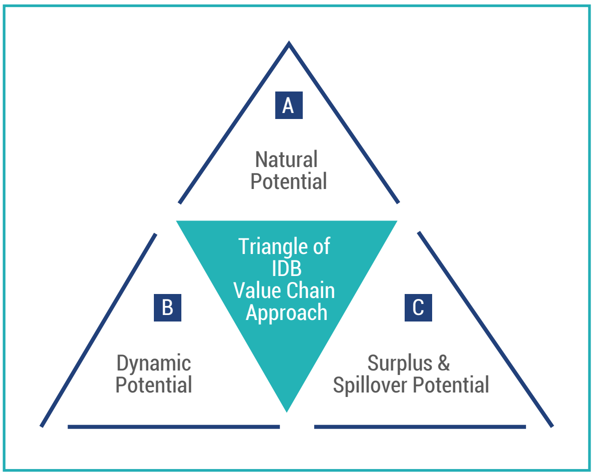
5. Global Business Reports, 20192.
6. Netherlands Enterprise Agency, 2017
7. CIA World Factbook, 2020
8. Whaley, 2015
9. OEC, 2019
10. International Monetary Fund, 2019
11. Netherlands Enterprise Agency, 2017
12. International Monetary Fund, 2019
13. International Policy Digest, 2019

4.2.2. Quantitative Analysis of the Petrochemical Industry in Senegal (IsDB Methodology)

The Islamic Development Bank Global Value Chains Methodology

To align markets with development programs, it is important to focus on areas that are both promising and competitive and that offer inclusive development solutions. This concept, which can be described as inclusive competitiveness, would allow markets or the private sector to participate actively in a development program that can boost market competitiveness and foster development by creating more inclusive development goals such as the creation of high-quality jobs and the promotion of sustainable export competitiveness.

Figure 1: Global Value Chains' Selection Toolkit



Source: Hamid, M Faiz Shaul, Kane, K, Demirhan, AE, Khodary, A. 2019. Making Markets Work for Development through Global Value Chains: Methodology and tools to identify and measure the highest-potential value chains.

To identify and subsequently develop the sectors with the most potential that Senegal needs to focus on achieving its high value-add increase and job creation targets, an analytical model of "Making Markets Work for Development through Global Value Chains"[14] was utilized. This instrument is a GVC methodology and a filtering tool to identify sector and product champions of a country. It is based on three criteria (Figure 1). The first criterion is the "natural potential" of a country, which takes into account the existing comparative advantage of a country at the industry level. The second criterion concerns the "dynamic potential", included in a prospective approach that identifies and quantifies the competitive advantage of products or goods according to future market conditions. The third criterion measures the potential in terms of the effects on

value add and hence job potential. This "surplus and spillover potential" indicates upstream and downstream linkages, the induced effects that may result from interconnections between industries and optimizes the value-added in a specific industry. Through this approach, countries can focus on the GVC of products for which it has a revealed comparative advantage.

After this identification and in-depth analysis, GVCs will be analyzed to identify bottlenecks, capacity gaps, and product potential across the value chain from the initial phase of production up to export and distribution. The interventions derived from this process will seek to address the gaps and bottlenecks in the GVCs of Senegal's leading products/ industries.

The promotion of global value chains in Senegal would allow markets to mobilize resources for development. For markets to work in GVCs, globalization, and industrialization need to be rethought in a rapidly changing world, due to the changing global economy and the pace and magnitude of technological advances.

14. M. F. S. Hamid, K. I. W. Kane, A. E. Demirhan and A. Khodary, Making Markets Work for Development through Global Value Chains, Islamic Development Bank, 2019.

The Senegalese Petrochemical Industry in the Lenses of the IsDB Quantitative Tool

The revealed comparative advantage (RCA) index, is used to determine the products at HS2 level in which Senegal has a comparative advantage. A product or an industry with an RCA>1 indicates that a country has revealed comparative advantage in this product or industry. As shown in Figure 2, Senegal has a very high revealed comparative advantage for the Manufacture of petroleum (HS27) and basic chemicals (HS28-29 and HS31-36) for the whole period from 2003 to 2018. However, it could also be observed that the RCA for the Manufacture of basic chemicals and other products has rapidly declined over the past 16 years although both industries have remained above the 1 threshold. This demonstrates the importance of these industries for the Senegalese economy.

In Figure 3, the export growth, over the past five years, of the 20 highest products exported by Senegal in the Manufacture of Petroleum; basic chemicals and related products industries are compared with the average growth of world demand for all products and the average growth of Senegalese's export over the same period. This allowed us to gauge the pace at which the exports of Senegalese chemicals' products have grown compared to all Senegalese and all world goods exports. As it could be seen, a little over half of the products exported are located in the lower quadrants (declining sectors), and mostly on the left lower quadrant (red quadrant – losers in declining

Figure 2: RCA Calculation for Manufacturing Industries with Natural Potential for the Past 16 Years.

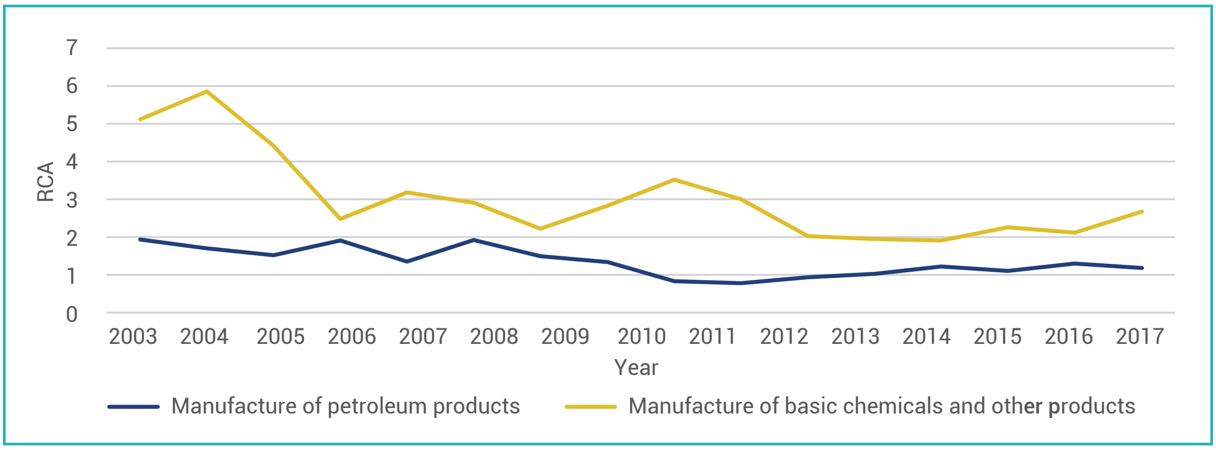
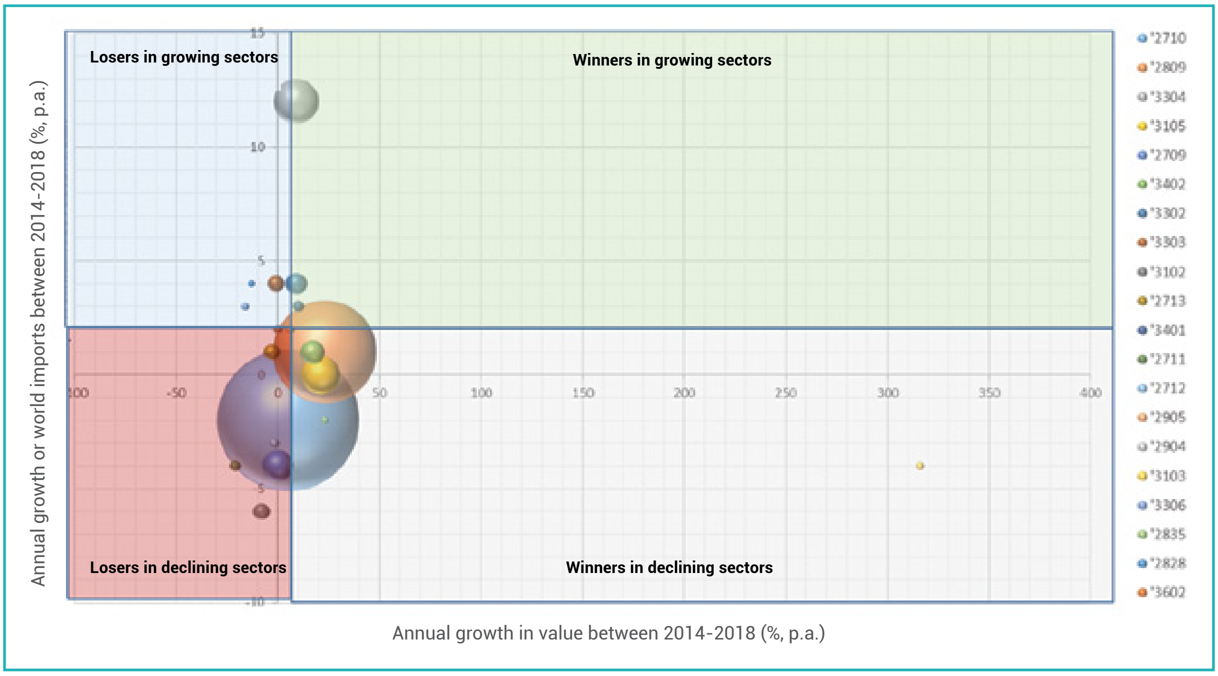


Figure 3: Relative Capabilities of Production at HS4 Levels



Source: Authors using UN Comtrade data

sectors) that is their demand is lower than the world average demand for goods, and that their export values are growing slower than the average Senegalese goods' export. In other terms, they have low dynamic potential according to the Product Champion Index (PCI) as shown in Table 1, especially the PCI that emphasizes access to markets. The PCI combines demand, supply, trade, and resilience indicators into a single index that indicates the HS4 products with the highest potential for trade.

The PCI for the main HS4 product within 'Manufacture of Petroleum; basic chemicals and related products industries' is computed and summarized in Table 1. There are three products, preparations for oral or dental hygiene, hypochlorites; commercial calcium hypochlorite; chlorites; hypobromites and perfumes and toilet waters (HS3306, HS2828 and HS3303 respectively) on the top left quadrant (losers in growing sectors), which means that despite the fact their export value is not growing rapidly in Senegal, their world demand has been steadily growing over the past five years, indicating these products are relevant in the GVC and can move to the green quadrant if exports grow. Soap (HS3401), mixtures of odoriferous substances and mixtures, incl. Alcoholic solutions (HS3302) and beauty or make-up preparations and preparations for the care of the skin (HS3304) are in the top right quadrant, meaning it is growing faster than average compared with world

Table 1: Product Champion Indices of top 20 exported products within petroleum and chemicals

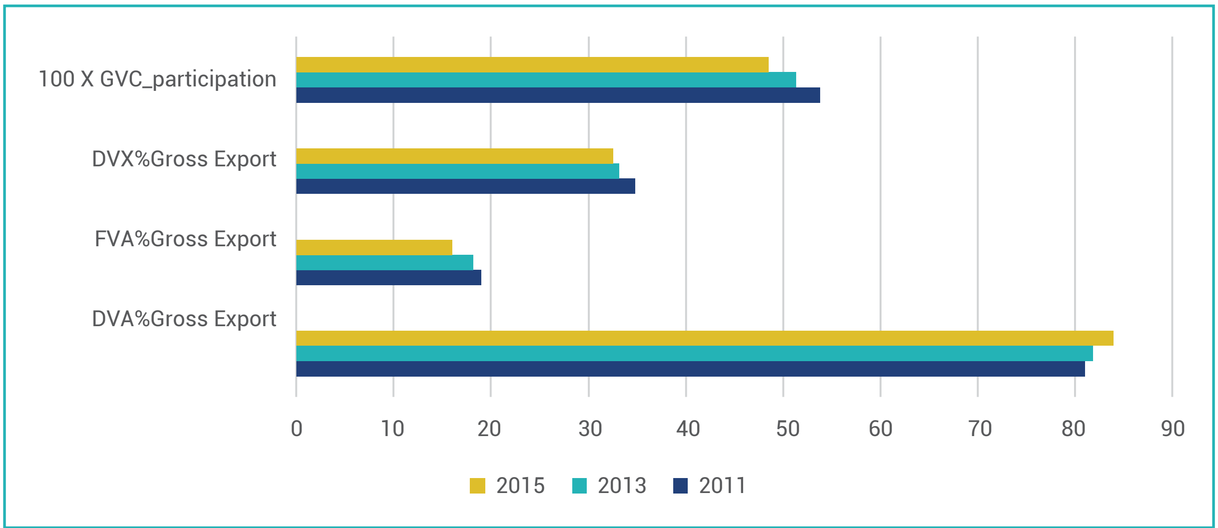
Product	PCI STATIC	PCI DYNAMIC	PCI MARKET ACCESS
Petroleum oils and oils obtained from bituminous minerals (excluding ... crude); preparations containing	0.875	0.506	0.073
Diphosphorus pentaoxide; phosphoric acid; polyphosphoric acids, whether or not chemically defined	0.038	0.002	-0.431
Beauty or make-up preparations and preparations for the care of the skin, ... incl. sunscreen or	0.198	0.287	0.117
Mineral or chemical fertilizers containing two or three of the fertilizing ... ,elements nitrogen	-0.048	-0.048	-0.235
Petroleum oils and oils obtained from bituminous minerals, crude	0.495	0.237	0.026
Organic surface-active agents (excluding soap); surface-active .. ,preparations, washing preparations	0.008	0.018	-0.075
Mixtures of odoriferous substances and mixtures, incl. alcoholic ... solutions, based on one or	0.071	0.095	-0.008
Perfumes and toilet waters (excluding aftershave lotions, personal (deodorants and hair lotions	0.047	0.077	-0.017
Mineral or chemical nitrogenous fertilizers (excluding those in pellet or ... similar forms, or	-0.110	-0.165	-0.202
Petroleum coke, petroleum bitumen and other residues of petroleum oil ... or of oil obtained from	0.027	0.018	-0.105
Soap; organic surface-active products and preparations for use as soap, ... ,in the form of bars	0.035	0.057	-0.046
Petroleum gas and other gaseous hydrocarbons	-0.029	-0.103	-0.266
Petroleum jelly, paraffin wax, microcrystalline petroleum wax, slack wax, ... ozokerite, lignite	-0.068	-0.094	-0.144
Acyclic alcohols and their halogenated, sulphonated, nitrated, or nitrosated derivatives	0.018	0.034	-0.035
Sulphonated, nitrated or nitrosated derivatives of hydrocarbons, whether or not halogenated	0.013	0.025	-0.094
Mineral or chemical phosphatic fertilizers (excluding those in tablets or ... similar forms, or	0.026	0.089	-0.172
Preparations for oral or dental hygiene, incl. denture fixative pastes and ... powders; yarn used	0.019	0.038	-0.059
Phosphinates "hypophosphites", phosphonates "phosphites" and phosphates; polyphosphates, whether	-0.048	-0.059	-0.166
Hypochlorites; commercial calcium hypochlorite; chlorites; hypobromites	0.038	0.066	-0.026
(Prepared explosives (excluding propellent powders	-0.014	0.002	-0.133

Source: Authors using UN Comtrade data

demand and average Senegalese products. Among the top 20 export products, two kinds of products jump with the high potential based on PCI: Beauty/Cleaning & Household products and chemical-based agricultural products such as fertilizers and inorganic chemicals (Carbon and Silicon dioxide). There are the fastest-growing products, which are further confirmed by higher PCI (Static, Dynamic, and Market Access). As a result, the expansion and upgrading opportunity lies further in developing these two value chains. Therefore, this study will focus more on petrochemical-based detergents GVC and petrochemical fertilizer GVC.

Utilizing the Eora Input-Output database for Senegal, the value-add of the overall Senegal export was broken down into all the industries, then further broken into the domestic value-add, foreign value-add, and indirect value-add contributions of each industry. The results of which for Petroleum, Chemical, and Non-Metallic Mineral Products are summarized in Figure 4. The Petroleum, Chemical, and Non-Metallic Mineral industry have a total gross output of US$2.07 billions, approximately 5% of which is exported in 2015. The gross export amounts to US$103.6 million. Almost US$28 million of this export revenue is collected from the final good exports. The value of intermediate good exports is around US$75.6 million. In terms of value-add, US$87 million value-added were generated. In other terms, the share of domestic and foreign value-add is around 84% and 16% respectively. The indirect value-add, i.e., domestic value-added included in the third country's exports is around US$33.7 million or 32.5% of total exports. In other words, 32.5% of the export of Petroleum, Chemical, and Non-Metallic Mineral industry is included in the exports of other countries. In terms of GVC position Petroleum, Chemical, and Non-Metallic Mineral industry is well connected to GVC, but more with the downstream portion of the GVC. Besides, the domestic value-add has increased over the years as Senegal increased its sets of activities in the value chain, while the portion of foreign and indirect value add has decreased over the same period. This has culminated in declining GVC participation.

Figure 4: Value-Added Decomposition of Senegal's Petroleum, Chemical, and Non-Metallic Mineral Products Export



Source: Authors using Eora database

4.2.3. The Global Petrochemical Industry

The Global Petrochemicals Industry

The petrochemical sector accounts for approximately US$1 trillion and, thus, more than 50% of the global chemical industry.[15] The chemical industry overall contributes around US$5.7 trillion to global GDP, accounting for 7.1%, sustained through a combination of direct, indirect, and induced economic channels. It is estimated that the chemical industry is responsible for the existence of 120 million jobs globally, whether direct, indirect, or induced.[16]

The petrochemical industry produces chemical intermediates and end products using oil and natural gas as the major raw materials. The industry has evolved out of downstream processing by adding value to by-products of the petroleum industry. The petrochemical industry produces a wide range of products that are indispensable in the everyday lives of people around the globe. Examples of these products include plastics, rubbers, and specialty chemicals such as solvents, fertilizers, pharmaceuticals, additives, explosives, and adhesives. Materials produced by the petrochemical industry are of high importance in almost all areas of today's society, as the aforementioned products are used, for instance, in automotive applications,

15. Cefic, 2019
16. Oxford Economics, 2019

packaging, electronics, construction, consumer goods such as textiles and detergents, and even advanced technologies such as medical equipment and aerospace applications. Examples include a wide range of products such as car dashboards and bumpers, food packaging, phone and notebook screens, and covers, insulation foams, textile fibers such as nylon, and soap and cleaning agents. Today, petrochemical feedstock accounts for approximately 14% of global oil and 8% of global gas demand.[17]

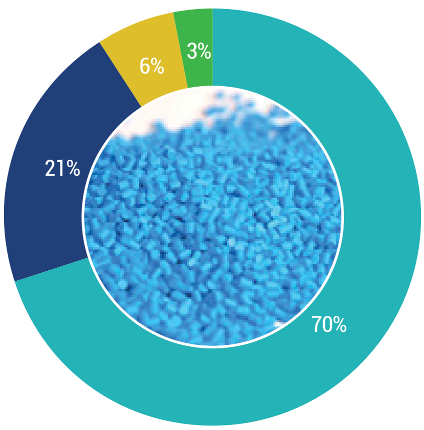
The petrochemical industry has evolved from technological innovation in developed industrial regions, resulting in the fact that, until the 1970s, the production of petrochemicals was almost exclusively concentrated in the U.S., Western Europe, and Japan. However, in recent decades, petrochemical production has increased substantially in regions with access to competitively priced raw materials such as the Middle East. These new large-scale production capacities equipped with the latest technologies and access to inexpensive raw materials have changed the competitive landscape of the industry. As older production plants, using more expensive raw materials, consequently faced competitive disadvantages, site closures particularly in established and mature European markets have been the result.[18] Several examples of this transition away from production in regions with expensive raw material exist. While Gulf Oil exited European petrochemical production completely by closing its Milford Haven and Europort facilities, players like BASF and Shell reduced their European petrochemical production capacities.[19]

The petrochemical industry can be characterized as capital and asset-intensive, involving significant technological innovation and serving a global product market. The industry is becoming increasingly competitive as a result of the ongoing commoditization of petrochemical products. Different types of corporate players operate in the industry. Specialty chemical companies, that purchase raw materials to produce a wide range of fine chemicals, exist alongside major oil and gas companies that produce large quantities of petrochemicals based on their raw material sources with upstream integration into base chemical production and plastics manufacturing. Especially the latter has been at the cutting edge of many technological industry developments. Additionally, more and more national oil companies have entered the petrochemical production arena in emerging markets.

The petrochemical industry has gradually become a key pillar of the global economy, as it is an engine for growth for numerous secondary sectors that depend on the supplies and innovation from the petrochemical industry. Among the key petrochemical products are plastics, rubbers, and surfactants, which are the largest groups of chemical sector products that have become an indispensable part of the everyday lives of the global population. Plastics are the fastest-growing group of bulk materials in the world. Moreover, the high asset intensity of the petrochemical industry requires high investments in production machinery and equipment creating value in other industry sectors.

The c.US$1,000 billions market of primary processed petrochemicals has historically grown by c.4% p.a. since 2005. Until 2030, the industry is expected to see a slowdown of growth to c.2-3% p.a. The key segments within the produced chemical market are commodity and engineered plastics, fine/specialty chemicals, fertilizers, and rubbers. The market for commodity and engineered plastics is estimated at c.US$690 billions in 2018[20] and thus comprising c.70% of the total produced petrochemical market. Fine/specialty chemicals are

Figure 5 – Market Split of Produced Chemicals, 2018



Plastics
> Polymeric material with the capability of being molded or shaped, usually by the application of heat and pressure

Fine/specialty chemicals
> Materials utilized as an additive to enhance the characteristicsof other finished chemical products such as plastics

Fertilizers
> Fertilizers are compounds containing high concentration of nutrients to improve growth/productiveness of plants such as ammonia and urea

Rubbers
> Elastic substances resembling natural rubber, produced by polymerization of butadiene, isoprene and other unsaturated hydrocarbons

17. International Energy Agency, 2018
18. R.J. Clews, 2016
19. Galambos, Hikino & Zamagni, 2007
20. IBIS World, 2019

expected to constitute a market of c.US$210 billions, while fertilizers (c.US$60 billions)[21] and rubbers (c.US$30 billions)[22] are expected to represent a smaller part of the total produced chemical market. As most petrochemical players cover not only single steps in the value chain but the entire value chain, most beforementioned players active in base chemicals also play an important role in the produced chemicals segment.

Mapping the Petrochemicals Global Value Chain

As summarized in Figure 6, several value chain steps have to be passed to get a petrochemical product to its final use, starting with a simple raw material and ending with a more complex chemical composition in its desired shape or formulation.

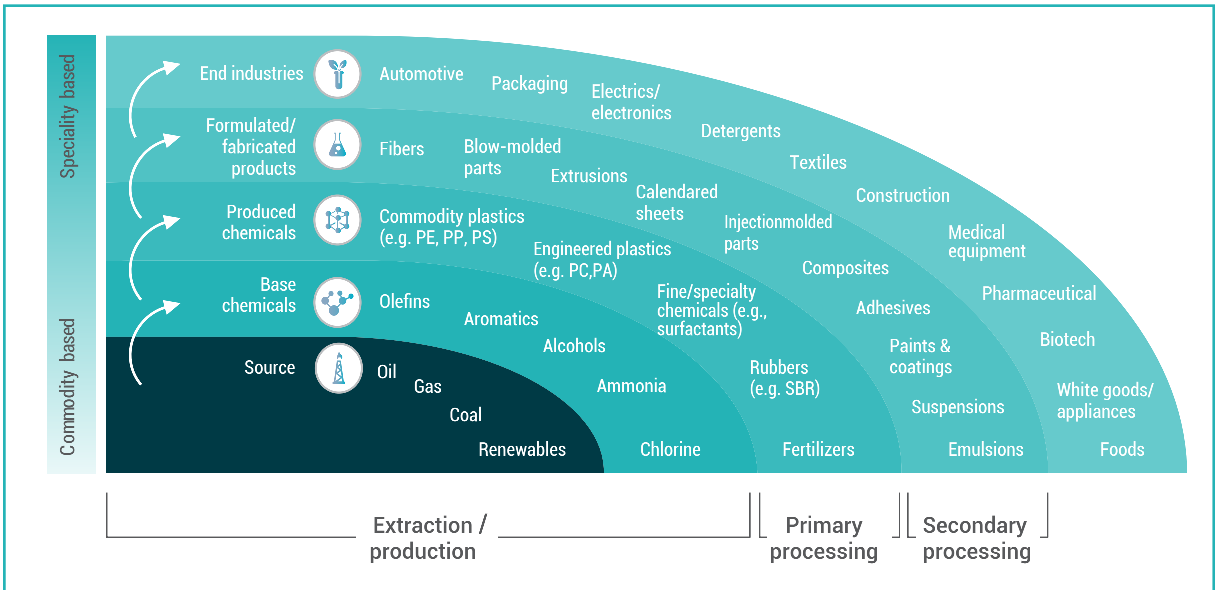
In a first step, feedstock (source) is processed into a base chemical. Sources include oil, gas, coal, and renewables, depending on regional resource availabilities. The base chemicals themselves, which are intermediate products such as alcohols and aromatics, mainly serve as an interim material that requires further processing.

Base chemicals are further processed in a second step, which often adds significant value since the base chemical is transferred into a final chemical product. These produced chemicals may be commodity/engineered plastics, fine/specialty chemicals, rubbers, or fertilizers. These chemicals have now obtained their final chemical composition.

In a third step, the produced chemicals are processed into formulated/fabricated products. This means that the chemicals are put into the shape and formulation that is eventually required for the final application. These products can vary greatly, ranging from fibers to molded parts to suspensions.

Eventually, the formulated/fabricated petrochemical products are sold to and utilized in numerous end industries such as the automotive, packaging, electrics/electronics, detergents, textiles, construction, medical equipment, pharmaceutical and biotech, white goods/appliances, and food industries.

Figure 6 – Petrochemical value chain



Detergent Value Chain Formulation Process

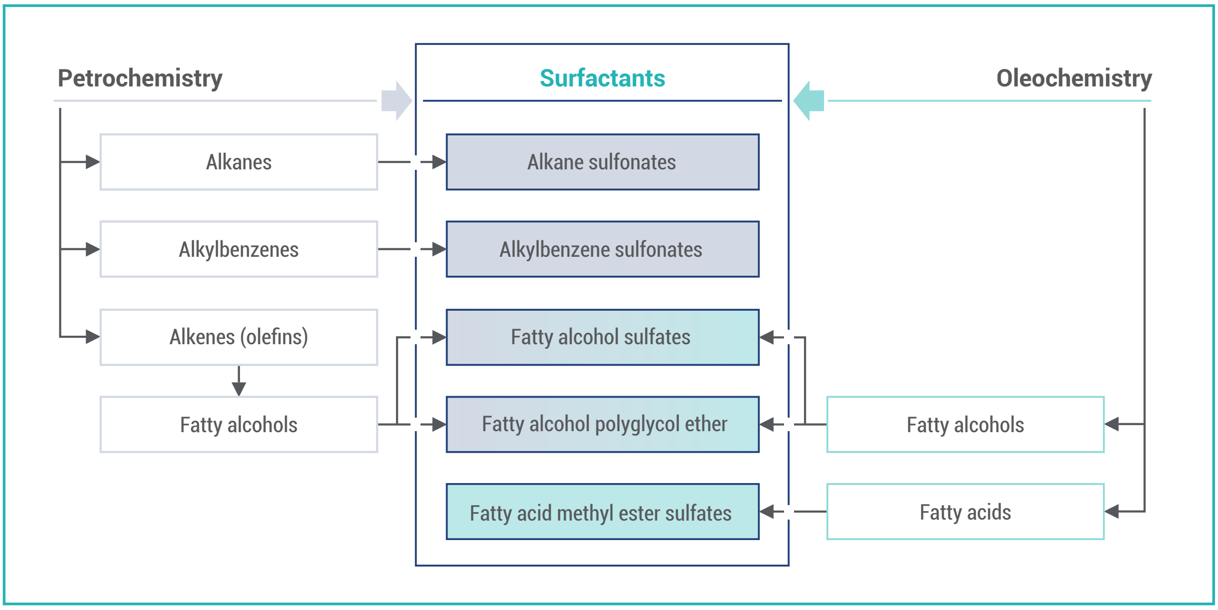
Surfactants, abbreviated from the term **sur**face-**act**ive ag**ents,** are chemical compounds that are amphiphilic, meaning they contain both hydrophobic (i.e. water-fearing) and hydrophilic (i.e. water-loving) groups and thus are soluble in both organic solvents and water. The hydrophilic group can be electrically charged. Surfactants reduce the surface tension of a liquid by adsorbing at the liquid-gas interface, allowing easier spreading, and lower the interfacial tension between two liquids (e.g. between oil and water) by adsorbing at the liquid-liquid interface. Surfactants are used as emulsifiers, wetting agents, dispersants, and stabilizers for different chemical and industrial applications. Surfactants are a key segment within specialty/fine chemicals.

Surfactants can be categorized into synthetic and bio-based surfactants based on their substrates. While synthetic surfactants comprise petrochemical components, bio-based surfactants (e.g. fatty acid methyl ester sulfates) are solely extracted from biomass such as cereals, vegetables, and oilseeds and are therefore based on renewable raw materials.

21. Industry Arc, 2019
22. Polaris Market Research, 2019

Within the synthetic surfactants class, two subcategories are existent. The first subcategory is pure synthetic surfactants, that are entirely based on petrochemical components (e.g. alkane sulfonates, alkylbenzene sulfonates). The second subcategory is partially synthetic surfactants, which comprise a mixture of petrochemical as well as bio-based components (e.g. fatty alcohol sulfates, fatty alcohol polyglycol ether). With a market share of around 93% of the global surfactants market, synthetic surfactants are the dominant surfactant class, while bio-based surfactants comprise only 7% of the market.[23] However, partially synthetic surfactants constitute the majority of the synthetic surfactants market, while pure synthetic surfactants are less common.[24]

Figure 7 – Overview of Chemical Ingredients for Surfactant



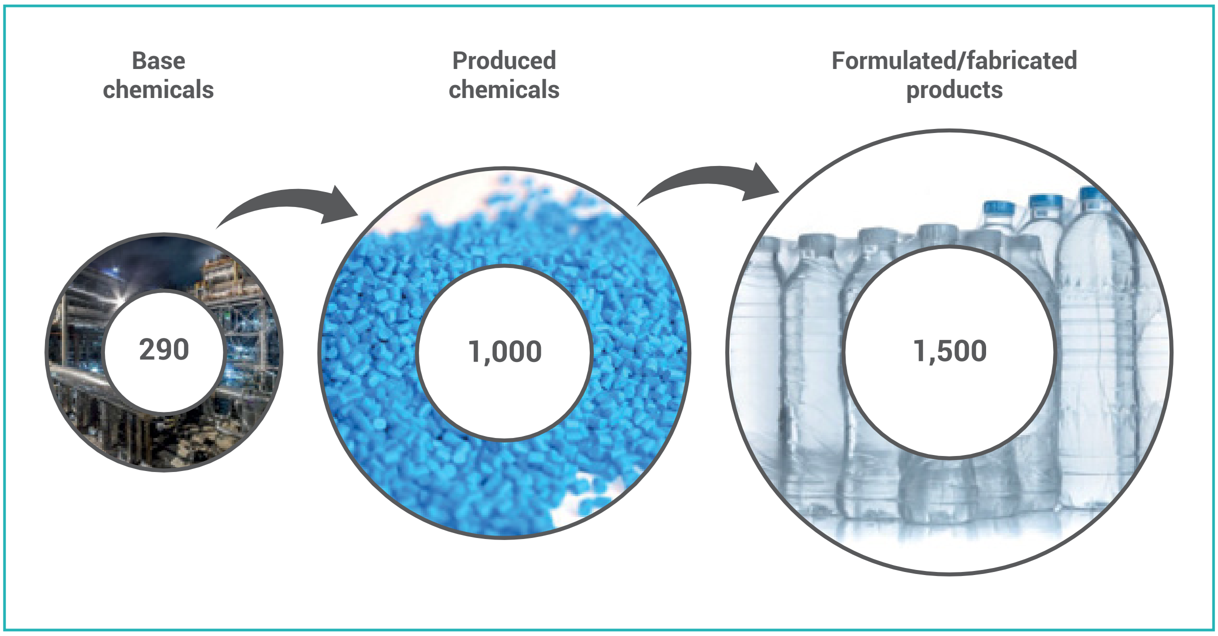
Four types of surfactants exist, which are distinguished by the electrical charge of the hydrophilic end of the surfactant molecule: (a) Anionic surfactants, (b) cationic surfactants, (c) non-ionic surfactants, and (d) amphoteric surfactants.

(a) Anionic surfactants possess a negative charge on their water-loving end. Through their superior cleaning properties, anionic surfactants are widely used in dishwashing liquids, laundry care, and shampoos and are particularly good at keeping dirt, once dislodged, away from fabrics. Anionic surfactants used are alkylbenzene sulfonates, alkyl sulfates, alkyl ether sulfates, and (fatty acid) soaps. (b) Cationic surfactants have positively charged water-loving ends and are more expensive than anionic surfactants. Thus, they are used only in cases without cheaper substitutes. These are the utilization as bactericides and as fabric softeners due to their corrosion inhibiting characteristics. (c) Non-ionic surfactants do not bear an electrical charge on their hydrophilic end, which helps to make them superior oily soil emulsifiers. They also do not interact with calcium and magnesium ions in hard water and therefore provide superior resistance to water hardness deactivation. Non-ionic surfactants are used in household cleaners, laundry products, and dishwashing liquids but also oil drilling fluids. Examples of non-ionic surfactants are ethoxylates, special ethoxylated fatty esters, and oils, fatty acid esters of polyhydroxy compounds, and alkyl polyglycosides. (d) Amphoteric surfactants possess both a positive and negative charge on their hydrophilic end, creating an electrical net charge of zero. Amphoteric surfactants show little utility on their own but are beneficial in enhancing the cleaning effect of both anionic and non-ionic surfactants. They can serve as coupling agents, which hold the surfactants, solvents, and inorganic salt components of a formula together. Moreover, they are very mild and pH-balanced which makes them attractive for use in shampoos and cosmetics. Examples of amphoteric synthetic surfactants are betaines and sulfobetaines.

The surfactant production is highly heterogeneous depending on the final product and utilized feedstock. The reason for this is the large number of different surfactants existing. In general, the production of surfactants entails the synthesis of the different constituents and auxiliary substances (e.g. catalysts, water) in a predefined, sequential manner usually under the application of heat.

23. Technavio, 2017
24. Novelli, 2016

Figure 8 – The Market Size of the Petrochemical Value Chain Steps, 2018 [US$ billions]



Synthetic Fertilizer Value Chain Formulation Process

Plants need nutrients to grow which they absorb from the soil via the plant's root system. Unless the nutrients are replenished, the soil's productive capacity, that is the exploitation yield, declines with every harvest. A fertilizer is any material of natural or synthetic origin that is applied to a soil or a plant to supply essential nutrients to promote the growth of plants. Therefore, the use of high-quality fertilizers is crucial to any industrial grade agricultural activity.

Fertilizers can be straight single nutrient (N-nitrogen, K-potassium, or P-phosphate based), multi nutrients (NP, NK, PK), or micronutrients (molybdenum, zinc, boron, and copper). Nitrogen is used to provide leaf growth, phosphate for the development of roots, flowers, seeds, and fruits, and potassium for strong stem growth, better movement of water in plants, and promotion of flowering and fruiting. Depending on their origin fertilizers can also be categorized as natural or organic fertilizers, from plant and animal origin, and synthetic or inorganic fertilizers which are manufactured from chemical processes. This latter group is the most used type of fertilizer in the world. Within the synthetic fertilizers class, a straight single nutrient is mostly used. Nitrogen-based products make up by far the largest fertilizer group, followed by fertilizers based on phosphorus and potassium. For this report, we will be focusing mostly on nitrogen-based fertilizers for two main reasons. First, nitrogen-based fertilizers are the most relevant to the petrochemical industry. Second, they are the most widely used and economically available form of fertilizers.

Lead Firms and Governance Structures in the Petrochemical GVC

The size of the petrochemical market depends on the step of the value chain. In 2018, the global market for base chemicals, which are further processed along the outlined value chain, was estimated at approximately US$290 billions. After completion of the subsequent value chain step, the global market for produced chemicals was estimated at approximately US$1,000 billions.[25] Once the petrochemical products were transformed into their final form, the market size was estimated at approximately US$1,500 billions for formulated/fabricated products.

25. Marketwatch, 2018

Detergents

The global synthetic surfactants market amounted to c.16 million tons translating to US$36 billions in 2018.[26] The market is expected to grow by 4.4% p.a. in terms of value.[27] [28] This exceeds the historic global market growth from 2008 to 2018 of 3.4% p.a.[29] Some of the market drivers are the increasing demand for surfactants in personal care and detergent applications and increasing demand from developing countries (e.g. India, China, Brazil, Mexico, Philippines, and Indonesia) due to population growth paired with constantly increasing household incomes. This results in the expected growth of c.6% in the APAC region, while the EMEA and Americas are expected to grow at a slower pace of 4-5% and 3-4% respectively.[30] The countries that export the most soap is listed in Table 2.

Table 2: The 10 Countries that Export the Most Soap Products

Exporters	Exported value in 2019
Germany	1219930
United States of America	939464
China	657782
Indonesia	611017
Japan	585571
Malaysia	564229
Poland	554610
France	492659
United Kingdom	476810
Italy	472468

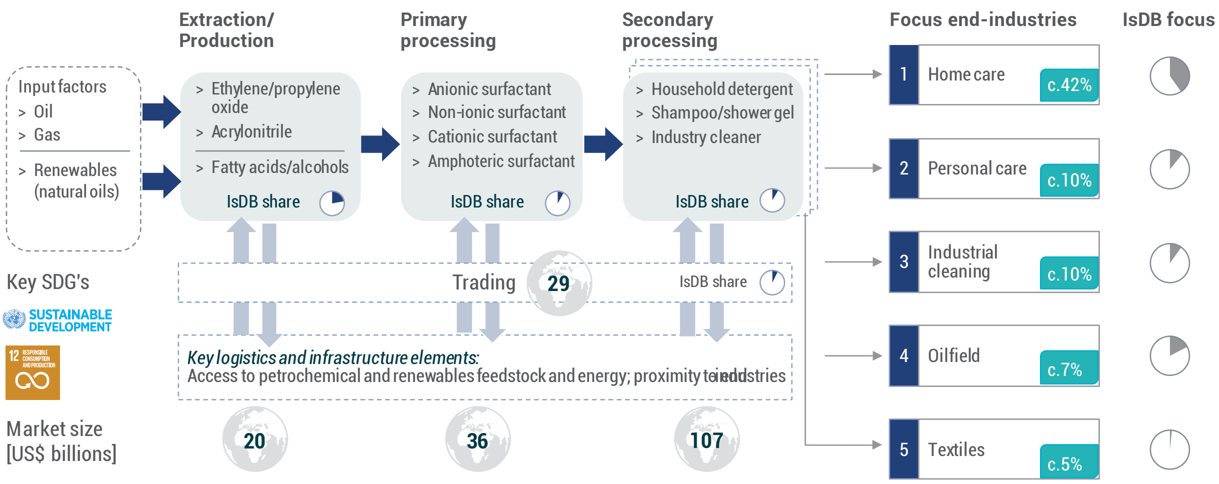
Source: UN Comtrade Data

The global synthetic surfactants market can be split into four different surfactant types. Anionic surfactants are the most relevant surfactant type and amount to c.52% of the global synthetic surfactants market. The second biggest type are non-ionic surfactants with c.23% of the global market. Cationic surfactants (c.15%) and amphoteric surfactants (c.10%) represent a smaller share of the global surfactant market. It is expected that anionic surfactants will grow around 5%, while non-ionic surfactants are expected to grow at 4-5% and cationic surfactants at 3-4%. The biggest growth is expected from amphoteric surfactants at a CAGR of more than 6%.[31] The rationale for the elevated growth rates of amphoteric surfactants is the low toxicity and eco-friendly nature of this type of surfactant, which has become an increasingly important product characteristics.

The global value chain of surfactants is divided into three steps. In the first step, the extraction/production step, chemical intermediates are produced as the base material for the further production of the surfactants. The input factors for these intermediates are petrochemical sources such as oil and gas as well as renewable sources like natural oils and animal fats. The petrochemical input factors are cracked and processed into ethylene and polyethylene at first. Ethylene is then processed into ethylene oxide and α-olefins, while propylene is processed into propylene oxide, acrylonitrile, and acrylic acid. The market for these intermediate products used for subsequent production of surfactants is estimated at around US$20 billions in 2018. Among the key producers for the petrochemical intermediates are Sasol, Royal Dutch Shell, Sumitomo Chemical, SABIC, BASF, and INEOS. The key producers for the oleochemical intermediates are Emery Oleochemicals, Oleon, Wilmar International, KLK Oleo, and IOI Oleo. The landscape of key manufacturers in the surfactant space is quite diverse, depending on the respective surfactant type and intermediates.

The second step of the value chain, the primary processing, is the production of surfactants based on the petrochemical and oleochemical intermediates. This synthesis creates surfactants

Figure 9 – Global Value Chain of the Surfactants Industry



26. IHS Markit, 2019
27. Technavio, 2017
28. Allied Market Research, 2018
29. Acton, 2013
30. Technavio, 2017
31. Technavio, 2017

Table 3: The 10 Countries that Export the Most HS2814 Ammonia

Exporters	Value exported in 2019 (US$ thousand)	Share in world exports (%)	Concentration of importing countries
Saudi Arabia	1981901	28.9	0.32
Russian Federation	1114899	16.3	0.1
Trinidad and Tobago	1005636	14.7	0.18
Indonesia	443949	6.5	0.17
Canada	382881	5.6	1
Algeria	349943	5.1	0.15
Qatar	163611	2.4	1
Netherlands	155447	2.3	0.35
Ukraine	151878	2.2	0.45
Malaysia	133625	2	0.26

Source: U.S. Comtrade Data

valued at US$36 billions globally in 2018. It becomes evident, that the vertical integration of the global value chain of surfactants is only weakly developed, as key surfactant producers like Stepan, Clariant, Akzo Nobel, Evonik, and Huntsman purchase the petrochemical and oleochemical intermediates required for the surfactant production. This import of intermediates paired with the global export of finalized surfactants results in significant international trade, which is valued at US$29 billions. The top exporting countries are Germany (US$4 billions), the United States (US$4 billions), Belgium (US$2 billions), France (US$2 billions), and the Netherlands (US$2 billions). Fairly analog, the top importing countries are Germany (US$2 billions), France (US$2 billions), the United States (US$2 billions), the United Kingdom (US$2 billions), and Canada (US$2 billions).[32]

The third step of the value chain, the secondary processing, comprises the production of the final product utilized in the end industry. These products vary widely and range from household detergents to shampoo and shower gels to industry cleaners and oil drilling fluids. This production step comprises the formulation of the end product in a liquid or granular form by synthesizing surfactants with other components such as builders (e.g. citrates, silicates, zeolites), bleaching agents (e.g. hydrogen peroxide), enzymes (e.g. proteases, lipases, α-amylases, cellulases) and other materials (e.g. water, colorants, perfumes, optical brighteners). The value of the synthesized final products including surfactants and other components are expected to amount to US$107 billions in 2018, not including further marketing and retail efforts. Key players for this value chain step are renowned consumer goods players such as Procter & Gamble, Unilever, Reckitt Benckiser, Kao Corporation, Colgate-Palmolive, and Unilever as well as specialty cleaning agent producers such as Ecolab and Schlumberger.

Fertilizers

The global fertilizer exports in 2018 totaled 228 million tons, up 20% over the prior five years. It has a yearly export value of around US$60 billions. The main market driver to produce fertilizers is their use to increase yield in agropastoral applications. Around 67% of which are Nitrogen-based fertilizers or fertilizers containing two or three elements among Nitrogen, Potassium, and Phosphate (HS3102 and HS3105). Global fertilizer demand increased 1% in the five years to 2019 to total over 700 million tons. However, the aforementioned N or NPK combination-based fertilizers have grown by around 7% over the same period. In other terms, the share of these types of fertilizers has increased rapidly over the past five years. Total global fertilizer production and supply topped 805 million tons in 2018, meaning supply was greater than demand. Overall supply increased by 12% in the five years since 2013. The global ammonia market amounts to 181 million tons, of which just 10% (19 million tons) is traded on the world market.

The top exporting countries are Germany (US$4 billions), the United States (US$4 billions), Belgium (US$2 billions), France (US$2 billions), and the Netherlands (US$2 billions). Fairly analog, the top importing countries are Germany (US$2 billions), France (US$2 billions), the United States (US$2 billions), the United Kingdom (US$2 billions), and Canada (US$2 billions).

32. OEC, 2019

Table 4 lists the 10 countries that export the most N or NPK combination-based fertilizers (HS3102 and HS3105). While there are IsDB member countries, such as Saudi Arabia, Egypt, and Qatar that are big exporters of Nitrogen-based fertilizers, the more complex NPK combination-based fertilizers market is dominated by the most industrialized regions: North America, Western Europe, Russia, and China. Table 5 summarizes the countries that utilize the most Nitrogen-based fertilizers. These are mainly comprised of the same above-mentioned industrialized countries, and only Turkey is among them as an IsDB Member Country. In addition, among the biggest importers of synthetic fertilizers, there are no IsDB Member Countries.

Table 4: The 10 Countries that Export the Most Chemical Fertilizers (HS3102, HS3105)

Exporters	Exported value in 2019 (US$ thousand)
China	6,417,892
Russian Federation	6,061,368
United States of America	3,097,175
Belgium	1,884,189
Netherlands	1,856,029
Qatar	1,462,050
Egypt	1,184,475
Saudi Arabia	1,130,196
Germany	1,019,415
Oman	872,499

Source: UN Comtrade data.

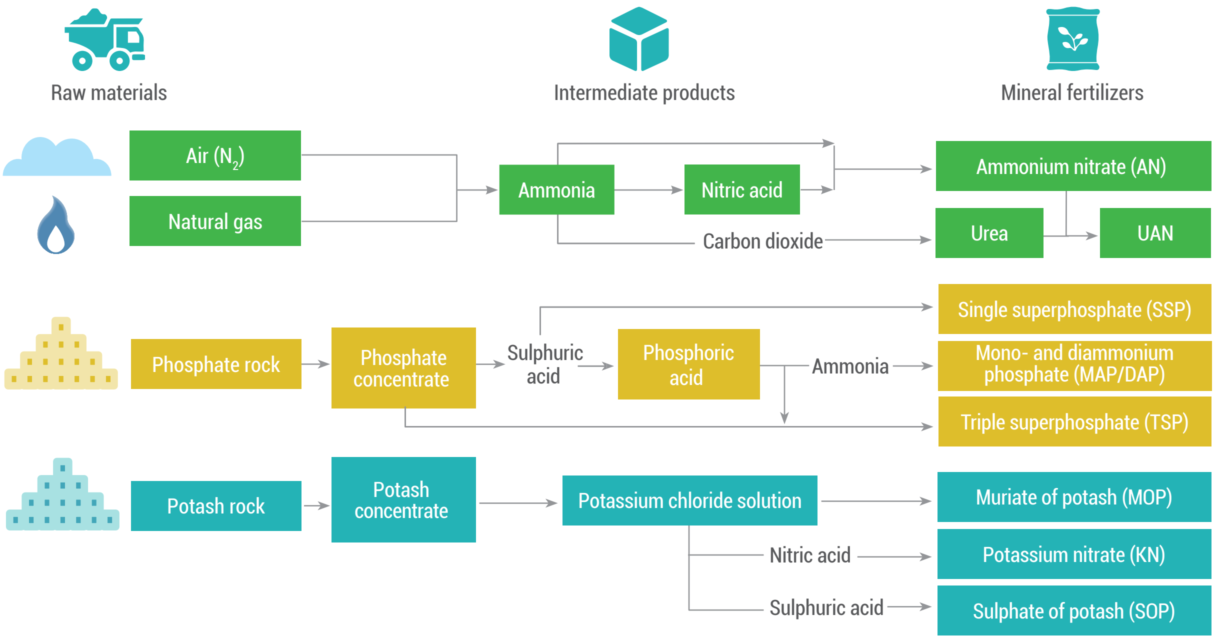
Table 5: Chemical Fertilizer N used in Selected Countries

Country	Share of total N consumption (%)	Absolute amount (1 000 tons/year)
U.S.	51	4697
China	16	2998
France*	52	1317
Germany*	62	1247
Canada	55	897
UK*	70	887
Brazil	40	678
Spain	42	491
Mexico	20	263
Turkey	17	262
Argentina	29	126

* Countries with a considerable amount of N fertilized grassland.
Source: Based on FAO (2002; 2003).

The global value chain of petrochemical formulated fertilizers can be divided into three steps. The steps of which are summarized in Figure 10. In the first step, the extraction/production step, chemical intermediates are produced as the base material for the production of fertilizers. The input factors for these intermediates are petrochemical sources such as gas, liquefied petroleum gases (propane, butane), and naphtha. The petrochemical input factors are processed by removing their sulfur content to produce gaseous hydrogen sulfide, which is further processed into hydrogen by a process called steam reforming.

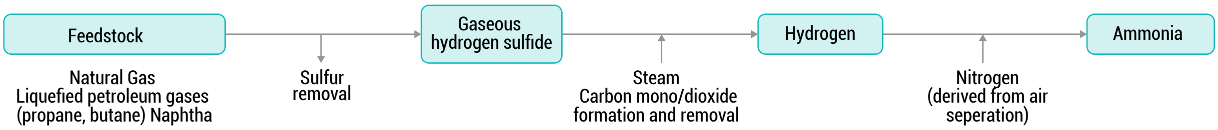
Figure 10: Production Process of the Main Fertilizers



Source: Fertilizers Europe

The second step of the value chain, the primary processing, is the production of Ammonia based on the petrochemical intermediates. The ammonia is produced by a process called Haber-Bosch, in which nitrogen derived from the low-temperature separation of air is mixed with the petrochemical intermediate (hydrogen) to produce ammonia. These first two steps are sometimes called the ammonia synthesis loop. Almost 90 % of ammonia goes into fertilizer production. The biggest input factor for ammonia formulation is natural gas. For ammonia formulation based on natural gas, nearly 60% of the natural gas is used as raw material, with the remainder utilized to produce the energy required for the synthesis process[33]. For this purpose, a large part of the ammonia is converted into solid fertilizer salts or, after catalytic oxidation, into nitric acid (HNO3) and its salts (nitrates). Among the key producers of petrochemical intermediates, are also key producers of ammonia. These are Haldor Topsoe of Denmark, Thyssenkrupp Industrial Solutions GmbH of Germany, OSTCHEM of Ukraine, Ammonia Casale of Switzerland, and Kellogg Brown & Root of the United States.

Figure 11: Summary of Ammonia Production Value Chain



Source: Authors own interpretation of chemical formulation of Ammonia

The third step of the value chain, the secondary processing, comprises the production of the final product utilized in the end industry. Based on the two main end products, ammonium nitrate, and urea, different fertilizer types are manufactured by mixing with ingredients such as phosphorus and potassium to form NPKs, dolomite to form calcium ammonium nitrate or CAN, or by mixing urea and ammonium nitrate solution to make UAN. The world's largest fertilizer producer and distributor are Yara international. Agrium, CF Industries Holdings, Potash Corporation of Saskatchewan, and The Mosaic Company are also key fertilizer producers and distributors.

Upgrading in the Petrochemicals GVC

In its industry report titled "Realising Opportunities for the 21st Century Through Inclusive Global Value Chains for the Petrochemicals Industries", IsDB has classified countries based on their petrochemicals profile. A country can be a Trailblazer, a Rising Star, a Demand Leader, Dormant Potential, or a Domestic formulator depending on the type of activities the country is responsible for in the petrochemicals GVC[34]. Depending on which type of profile a country has, different step by step upgrading strategy is available.

Figure 12 – Summary of Recommendations Per Cluster

		LAYING THE FOUNDATION	FOSTERING COMPETITIVE ADVANTAGES	BECOMING A GLOBAL LEADER
SECTOR CAPABILITIES	Industrialization level	Industrialize step by step > Move away from a pronounced agricultural sector > Start with smaller domestic formulation sites before moving onto building and modernizing primary processing technologies	Modernize and build scale > Modernize outdated and unsustainable production sites to improve utilization rates and energy efficiency > Integrate backward from end industries	Build state-of-the-art (research) facilities > Introduce and foster sustainable technologies to build high-value products > Leverage cutting-edge technology for automation and digitalization
	Innovation	Learn from others and adopt technology > Focus on domestic formulation and primary processing with lower technological barriers by attracting global companies and their ex pertise	Achieve leadership in selected technologies > Upgrade technological equipment at older production sites > Adopt new processing/recycling technologies > Provide government funds for research and development to foster domestic innovation labs	Foster an open approach to innovation > Increase resources for new processes and sustainable/renewable technologies > Set up technology parks and innovation hubs with neardeal research environments (that integrate research and industrial production sites)
	Workforce qualifications	Accumulate technical knowledge and skills > Strengthen primary and secondary education > Foster vocational training in collaboration with industry players to build up the basic technical knowledge needed for plant management and processing	Focus on specialized higher education > Strengthen secondary and tertiary education, e.g. by increasing funding for academic institutions > Found specialized institutes for vocational training in collaboration with industry and international training institutes	Educate highly qualified employees > Focus on tertiary education, with specialized petrochemistry departments to deliver highly qualified professionals who can drive research and development in both academia and industry
	Access to infrastructure	Improve the road infrastructure > Facilitate transportation between petrochemical production sites and end-industry sites (mainly construction hubs)	Improve pipeline networks and ports/airports > Strategically enlarge and improve pipeline networks to connect production sites to mainly national end industries > Raise port and airport quality to an internationally competitive levels to foster ex port readiness	Concentrate on logistics hubs > Enlarge logistics and transshipment hubs to connect local and international markets in a fast, cost-effective manner > Prepare infrastructure for international trade
FRAMEWORK CONDITIONS	GDP contribution & job creation potential	Leverage the vast labor force and boost the petrochemicals industry > Leverage a large and affordable labor force for labor-intensive production steps by investing selectively and effectively in training and education > Focus on strengthening the industrial sector due to substantial employment potential		Diversify the petrochemical product portfolio > Diversify the petrochemical production portfolio to incorporate and focus on specialty chemicals and secondary processing > Lower employment barriers, e.g. by easing labor package regulations
	Governance & regulation	Safeguard stability and cut red tape > Introduce structural reforms and implement economic policies that foster private investment > Ensure political stability and create a predictable regulatory environment > Ease the burden of bureaucracy for the industrial sector	Incentivize direct investment > Incentivize direct investment and thus diversify the petrochemicals sector by introducing effective investment incentives, such as Special Economic Zones (SEZs) > Incorporate regulatory best practices and industry norms	Advance the regulatory framework > Maintain an already favorable investment climate through appropriate policies (tax incentives, strengthening of SEZs etc.) > Streamline administrative processes
SECTOR COM-PETITIVENESS	Domestic demand	Build domestic end industries > Support local end industries for petrochemicals (focusing on the local formulation of petrochemical products for supply to the construction sector) > Reduce reliance on imports of commodity plastics (as the population increases)	Enlarge local end industries > Continuously diversify the economy, focusing on end industries for petrochemical products > Foster cluster development > Reduce dependence on imports (cut imports of high-end products)	Focus on specialized local end industries > Focus on supplying higher-value specialty chemicals to specialized and technologically advanced industries such as the automotive and electronics sectors > Integrate petrochemical and end-industry production sites
ACCESS TO FINANCE	Equity	Make it easier to do business > Streamline bureaucracy for (foreign) private investments > Support small and medium-sized companies to sustainably and actionably enlarge the industrial base	Ensure effective support for investors > Remove investment uncertainties > Foster intellectual property > Make regulatory policies more transparent	Provide a near-ideal investment environment > Diversify the investment portfolio > Attract specialty chemical companies > Allow for a larger share of private ownership

Domestic formulators — Dormant potentials — Demand leaders — Rising stars — Trailblazer

33. https://www.fertilizerseurope.com/fertilizers-in-europe/how-fertilizers-are-made/
34. KIW Kane, MFS Hamid, A Khodary and B Hajjar, 2020. Realising Opportunities for the 21st Century Through Inclusive Global Value Chains for the Petrochemicals Industries

4.2.4. Senegal and the Petrochemicals Global Value Chain

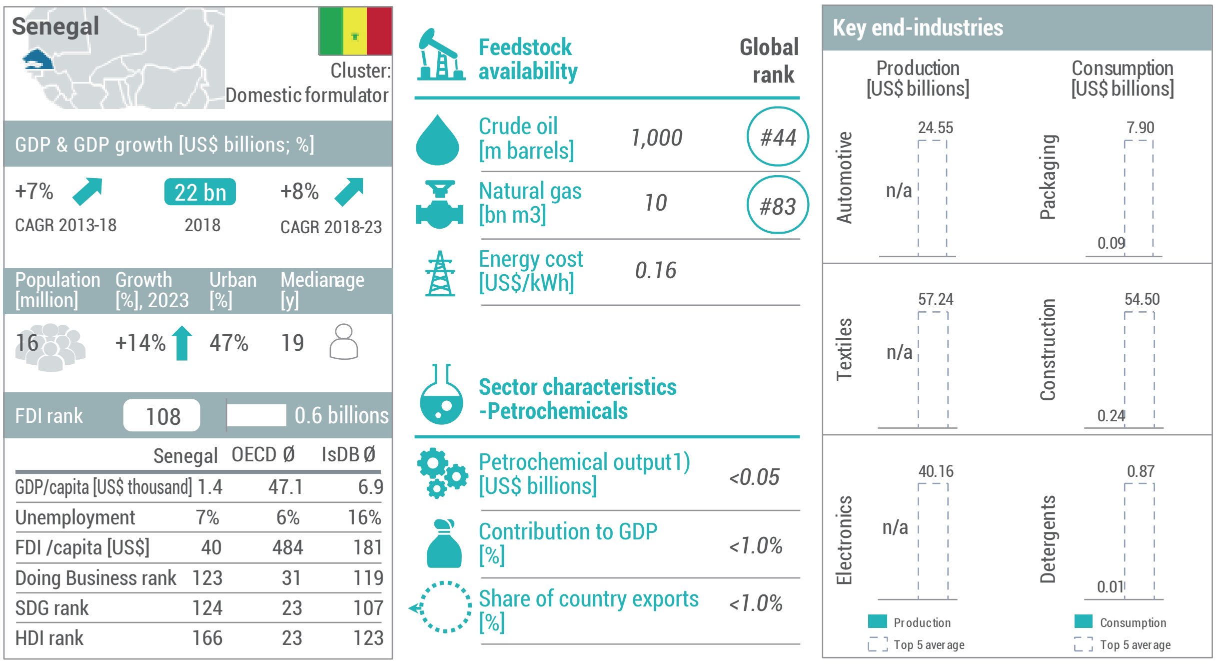
Positioned as a **"Domestic formulator"**, that is the local petrochemical industry is mainly concentrated on the final step (formulation of products for end-user industries) of the value chain, Senegal could prepare for a larger petrochemical industry by taking on local secondary processing activities to serve domestic demand. Examples include the local formulation of construction chemicals (e.g., PVC, PU, PS) and the production of plastic films (e.g., PET) for the packaging industry. With the backing of new reserves of oil and gas, primary petrochemical processing could in the long-term open the door to value creation beyond pure extraction. Senegal, thus, has a short-term and less capital-intensive opportunity to stimulate aspects of secondary processing by fostering domestic demand.

Initial Mapping and Current Participation of Senegal in the Petrochemical GVC

On top of the mentioned discoveries of oil and natural gas reserves, Senegal's phosphor reserves have not been fully exploited yet and offer enough potential for exploitation for another 10-20 years.[35] Export of feedstock of oil and gas have been negligible so far.[36]

With a heavy concentration on the agricultural sector, domestic demand for petrochemical products remains rather low except for the need for fertilizers that are mainly imported for domestic use. Moreover, key petrochemical imports include polyethylene, polypropylene, rubber tires as well as plastic lids, accounting for more than 40% of total rubber and plastics imports in sum.[37] When looking at the petrochemical sector, the industry contributes to less than one percent of GDP.[38] With the present exploitation opportunities, the GDP share of hydrocarbons is projected to increase to c.4.6% in 2022 and c.6.4% in 2023.[39] Key petrochemical exports in Senegal are secondary processed petrochemical products. Plastic lids, plastic housewares, and other plastic sheetings in sum amount to more than 50% of Senegal's total petrochemical exports valued at c.US$50 million.[40]

Figure 13: Profile of the Petrochemical Industry in Senegal



1) Defined as refined petroleum products

35. International Fertilizer Development Center, 2010
36. Prause, 2016
37. OEC, 2019
38. IHS Markit, 2020
39. International Monetary Fund, 2019
40. OEC, 2019

Detergents

Table 6: Trade Indicators for Senegalese Detergent Export

		Value exported in 2019 (US$ thousand)	Trade balance 2019 (US$ thousand)	Annual growth in value between 2015-2019 (%, p.a.)	Annual growth in value between 2018-2019 (%, p.a.)	Annual growth of world imports between 2015-2019 (%, p.a.)	Share in world exports (%)	Ranking in world exports	Average distance of importing countries (km)	Concentration of importing countries
'TOTAL	All products	4174502	-3968611	13	15	5	0	115	4428	0.1
'3402	Organic surface-active agents (excluding soap); surface-active preparations, washing preparations,	17139	7298	18	16	5	0.1	65	1033	0.27
'3401	Soap; organic surface-active products and preparations for use as soap, in the form of bars,	4965	-14171	35	63	6	0	75	1608	0.23

Source: Comtrade data

Looking at current end industries in the country, the detergent value chain is one of the stronger portions of the petrochemicals value chain in Senegal. The production and export of soap have substantially increased over the past years in terms of product group and product diversity. Initially, the export was mainly concentrated on Soap and organic surface-active products in the final molded form ready for the final user. However, over the past two years, the export of intermediate formulation of Soap and organic surface-active products has been established a regional (ECOWAS) export market. The export of Soap in the form of flakes, granules, powder, paste or in aqueous solution (HS340120) and Organic surface-active products and preparations for washing the skin, in the form of liquid. (HS340130) has increased by 12,250% and 897% respectively year to year. Only in these two products that Senegal has a trade surplus. However, overall Senegal has a huge trade deficit for the trade of soap products (HS3401) and a strong trade surplus for the other detergent subgroup (HS3402) with Surface-active preparations, washing preparations, auxiliary washing preparations, and cleaning preparations put up for retail sale (HS340220) and not for retail sale (HS340290) being the main exported products. The export of these two products has steadily increased over the past 5 years. The main export markets for Senegalese detergents are the border countries (Gambia, Mali, Mauritania, and Guinea-Bissau), while the import market is more varied with Côte d'Ivoire, Morocco, and France being the main import market of detergents.

There are many local firms involved in the formulation of petrochemical-based detergents in Senegal, most of which are subsidiaries of lead firms that formulate the final product for either the Senegalese market only or for Senegal and the neighboring countries. The main local actors are H&D Industries Sa which owns a multitude of local brands, each of which formulates a subproduct group of the detergent value chain with Madar Senegal which formulates most household cleaning products being the most known. Other important actors of the detergent value chains in Senegal include SAF Industries (historical actor), 3S- Societe Senegalaise de Savonnerie, Atol Industrie, Air Liquide, Colgate Palmolive Senegal Nsoa, Senegal Chlore & Chimie Derives Sa, Set Wecc Industries Sarl, Societe De Recherche Et De Developpement Chimie Senegal - Srdcs, Compagnie Commerciale Et Industrielle Du Senegal - Ccis Sa and Nouvelles Savonneries De L'Ouest Africain Sa - NSOA.

Fertilizers

Looking at current end industries in the country, the formulation of synthetic fertilizers offers a great opportunity to stimulate the founding of a vibrant petrochemical sector. In addition, it will also act as an import substitution for fertilizers used in the agriculture sector. In terms of production, fertilizers made in Senegal are mostly phosphorous based and also agricultural lime (soil additive rich in calcium carbonate) made from chalk. The reason being, Senegal has big reserves of phosphate and limestones, the two feedstocks for these chemicals. The majority of imports of fertilizer is in the form of Urea, Potassium Chloride, and Ammonium nitrate on one side (71% of fertilizer import) and chemical fertilizers containing the two fertilizing elements of Nitrogen and Potassium (NK) on the other side (18% of fertilizer import). The latter type is used as fertilizer for the agriculture sector or re-exported in neighboring countries to serve the same purpose. The former imported product is used as an intermediate for the formulation of mostly Nitrogen-based fertilizers (NPK) for mostly the export market. Senegal exports most of its Nitrogen-based fertilizers to Mali (c.98%), and the rest is exported to Gambia, United Kingdom, Guinea, Georgia, Saudi Arabia, and Côte d'Ivoire.[41]

Industries Chimiques du Senegal (ICS) is the main player of the fertilizer value chain in Senegal. ICS is responsible for the overwhelming majority of intermediate formulation and import and most of the local formulation of finished synthetic fertilizer and its final export. ICS is the largest producer of phosphate fertilizer products in Sub-Saharan Africa. The company began mining of phosphate rock in 1960 and production of phosphoric acid in 1984. ICS is the largest industrial complex in Senegal and consists of three sites. The mine site is located 100 km from the capital of Dakar and has extensive reserves of high-quality phosphate ore. The phosphoric acid plants are located in Darou and have a production capacity of 600,000 tons per year. The downstream fertilizer plant is located in Mbao, which is close to Dakar. The fertilizer plant can produce 250,000 tons per year of Diammonium Phosphate (DAP) and NPK products. ICS has an integrated logistics, including access to the railway system, its fleet of locomotives and wagons, and a dedicated berth at Dakar port. ICS exports the majority of its phosphoric acid (97% of all phosphoric acid export at US$333 million in 2019) to India, while it sells its fertilizer products in West Africa and international markets, mostly in Mali, Gambia, and the United Kingdom. ICS employs over 1,600 people. Indorama (one of Asia's leading chemical holding company based in Singapore) acquired ICS in 2014.

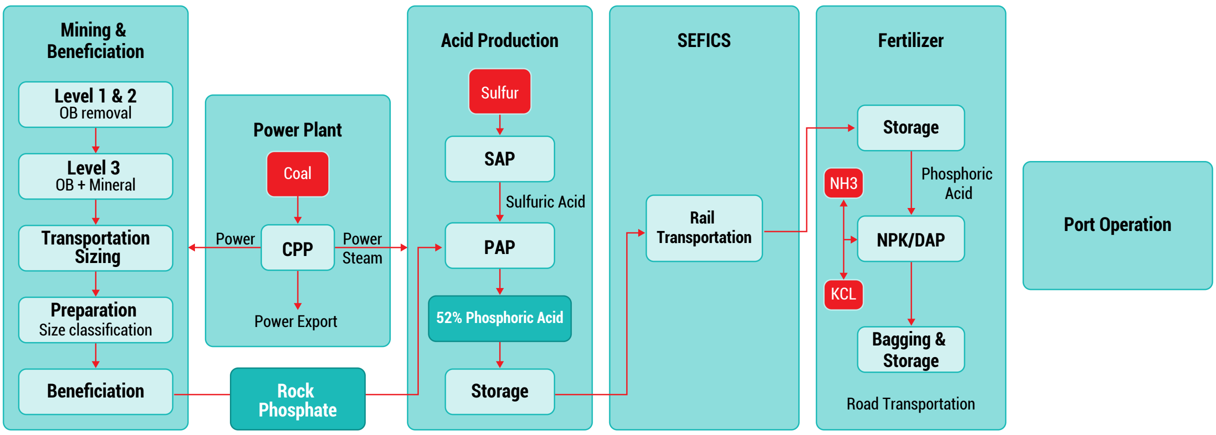
The secondary players of the fertilizer value chain are the Societe Senegalaise Des Phosphates De Thies, Louis Drefus Commodities, Felmagro and SEDAB Sarl (Sahélienne d'entreprise de distribution en agrobusiness).

Investment Regimes (Industry-Specific Programs/Economic Development Strategies)

Senegal does not have an investment regime especially geared towards developing the petrochemical value chain in the country. It rather has two overarching policies that guide foreign direct investments (FDI) into the country and public investments, especially for big infrastructure projects. The former is centered around the 'Code des Investissements'[43] (CDI), while the latter is through a long-term development program called the 'Plan Senegal Emergent' (PSE) or Emerging Senegal Plan (ESP).

The CDI through 'the code general des impots'[44] aims to attract investment into the country by offering to potential investors, who invest at least US$200,000[45] to start or extend a job/value-added creating activity, usual guarantees, and customs, fiscal and social incentives. The guarantees are in the form of property protection, unrestricted foreign currency availability and transactions, unlimited transfer of capital and profits, unlimited access to raw materials and intermediate goods, equal treatment with other local companies when it comes to access to markets and projects whether private or public and all usual company rights, freedoms and obligations. The incentives of the CDI are in the form of employer contributions (5 to 8 years depending on the number of jobs created), up to 5 years of tax breaks, no custom payment on import of inputs.

Figure 14: Fertilizer Formulation Value Chain at ICS



Source: Indorama

41. UN Comtrade
42. UN Comtrade
43. http://www.douanes.sn/sites/default/files/fichiers/code_des_investissements.pdf
44. http://www.impotsetdomaines.gouv.sn/sites/default/files/documentations/cgi2013.pdf
45. Based on exchange rate of US$1 = XOF 500

Unlike previous Senegalese national development plans (NDPs), which were centered around poverty reduction, the ESP[46] aims to be more of an economic development plan and reach market emergence by 2035. The ESP now constitutes the reference for economic, social policy, and infrastructure needs in the medium and long term. It has a built-in Priority Action Plan (PAP) that identified the most impactful infrastructure projects that would create economic value add, employment, and increase productivity especially in the second sector of the economy. Among the most pressing binding constraints identified by the PAP are the need to create energy in quantity and quality that would boost industrial output and transport.

Even though no specific investment regime or incentive structure is in place to promote the development of the petrochemical value chain, the presence of the CDI and the ESP already covers the enabling environment needed to stimulate the industry in the country.

In terms of industry-specific programs, RGS S.A. (Réseau Gazier du Sénégal) is a future gas pipeline project to transport the gas from production sites to areas of utilization (power plants, industries, domestic gas, etc.). RGS was set up between the Senegalese sovereign wealth fund (Fonsis), the national oil company (Petrosen), and the national electric company (Senelec) with a strategic objective to develop manufacturing industries in the country by lowering the cost of electricity. RGS offers an opportunity to develop a natural gas to ammonia plant in the country as shown in Figure 11.

4.2.5. Challenges and Opportunities

Senegalese footprint in the Petrochemicals GVC is very limited for three reasons. First, unlike most of its country peers, Senegal is not an oil and gas producer. As this report explains, the first activities of the petrochemicals GVC, mainly the production/extraction and the primary processing steps, are weakly integrated. In other terms, oil majors are also responsible for primary processing. Therefore, having access to abundant and efficient feedstocks is crucial to participating in these activities, and justifying the high investment costs required to establish primary processing capacity. Since further processing of crude oil into petrochemical products (cracking and refining activities) requires large investments without the presence of feedstocks and local end industries such as the automotive or the electronics industry, building up capacities for increased formulation processes should be considered, especially since many of the locally consumed petrochemical products, such as plastic packaging, fertilizers, and detergents

46. https://www.sec.gouv.sn/sites/default/files/Plan%20Senegal%20Emergent_0.pdf

are currently being imported. Today, there are many local companies in secondary processing, usually, subsidiaries of lead firms. Besides, the recent discoveries[47] of oil and natural gas reserves and the presence of an established refinery, Société Africaine de Raffinage (SAR), bring opportunities for Senegal's petrochemical industry to expand further upstream in the medium to long-term.

Second, the petrochemical business model is capital intensive, especially the first value chain steps which are usually performed by the same lead firms and require big investments that can only be justified with strong and abundant end-market demand. Senegal is a developing country with a small population of ~16 million inhabitants and does not have the required end industry demand to fulfill the required economies of scale to make upstream petrochemical activities viable. A path identified to create the required industry demand is to gear the industry more towards the regional (ECOWAS) and African markets. Due to the advantageous position of being the continent's most western country with sea access, more and more companies use Senegal's capital Dakar as their African hub for providing products and services to the rest of francophone Africa. The African Continental Free Trade Area (AfCFTA) offers a bigger opportunity to leverage the demand at the continent level with a population of 1.2 billion people. Africa as a continent has a detergent (HS 3402, 3822, 2915, 3302, 3507) trade deficit of ~US$3.5 billions. 49 out of 54 African countries have fertilizer and ammonia trade deficit. Only north African countries of Egypt, Morocco, Algeria, Libya, and Tunisia have a trade surplus for fertilizers; and Egypt, Kenya, Algeria, Libya, and Mauritania have a trade surplus for Ammonia. Inter-African ammonia trade has been very small over the past 10 years with a value of less than US$10 million in 2019[48]. These trade deficits have increased over the years and provide an opportunity to market the Senegalese detergents and fertilizers within the African continent.

Third, there is a massive infrastructure gap in the development of petrochemicals. This is especially the case for the energy sector. With US$0.17 per kWh energy prices are among the highest in Africa despite government subsidies leading to fixed pricing since 2017.[49] [50] Prices are expected to remain high in the short term. For instance, the average and median energy prices for the 10 biggest ammonia exporter is US$0.08 per kWh[51], which is 127% higher than business electricity prices in Senegal. The Senegalese government has undertaken considerable steps to diversify its energy mix with renewables (especially solar and wind energy) to decrease dependencies and supply. Reliable and cheap energy access will be a key prerequisite for fostering a future petrochemical industry in Senegal.

4.2.6. Recommendations to the Government of Senegal

This preliminary study shows that a stage by stage analysis of value addition from raw materials to sales can help identify specific interventions for Senegal's upgrading in the Petrochemical GVC.

This initial analysis identifies that in Petrochemicals, Senegal can add more value to the production process by focusing on first addressing the bottlenecks that would preclude the efficient development of oil and gas transformation into petrochemicals, which are mainly infrastructure base. Therefore, our first recommendation is for Senegal to develop its energy and transport infrastructure to bring their costs down to a competitive level on par with other petrochemical producing countries, as the production of petrochemicals especially fertilizers is very energy-intensive. Any competitiveness yield on the capacity of the country to produce enough reliable electricity at a reasonable cost. This will not only help the production of petrochemicals but will also help to build the portfolio of petrochemical production in the country. Therefore, our second recommendation is to look at the African market as a whole to increase end industries demand, mainly fertilizer and detergent end-industries to stimulate demand for petrochemical formulation in the country. Therefore, the infrastructure upgrading from the ESP should aim to utilize locally formulated petrochemicals so that both recommendations can go hand in hand with the development of the local petrochemical industry. A winning combination of stable politics and economic reforms could enhance Senegal's appeal to (foreign) investors, by removing former gaps in infrastructure and energy. Our third recommendation is to utilize the future RGS to attract ammonia production in the country. This could be in the form of a joint venture between an Ammonia lead firm and two Senegalese champions: SAR and ICS.

These recommendations can be substantiated with a detailed on the ground GVC analysis by meeting industry stakeholders from the public and private sectors.

47. Reuters, 2019
48. Data in this paragraph calculated using UN Comtrade data
49. Global Petrol Prices, 2020
50. International Monetary Fund, 2019
51. Calculated using data from https://www.globalpetrolprices.com/electricity_prices/

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