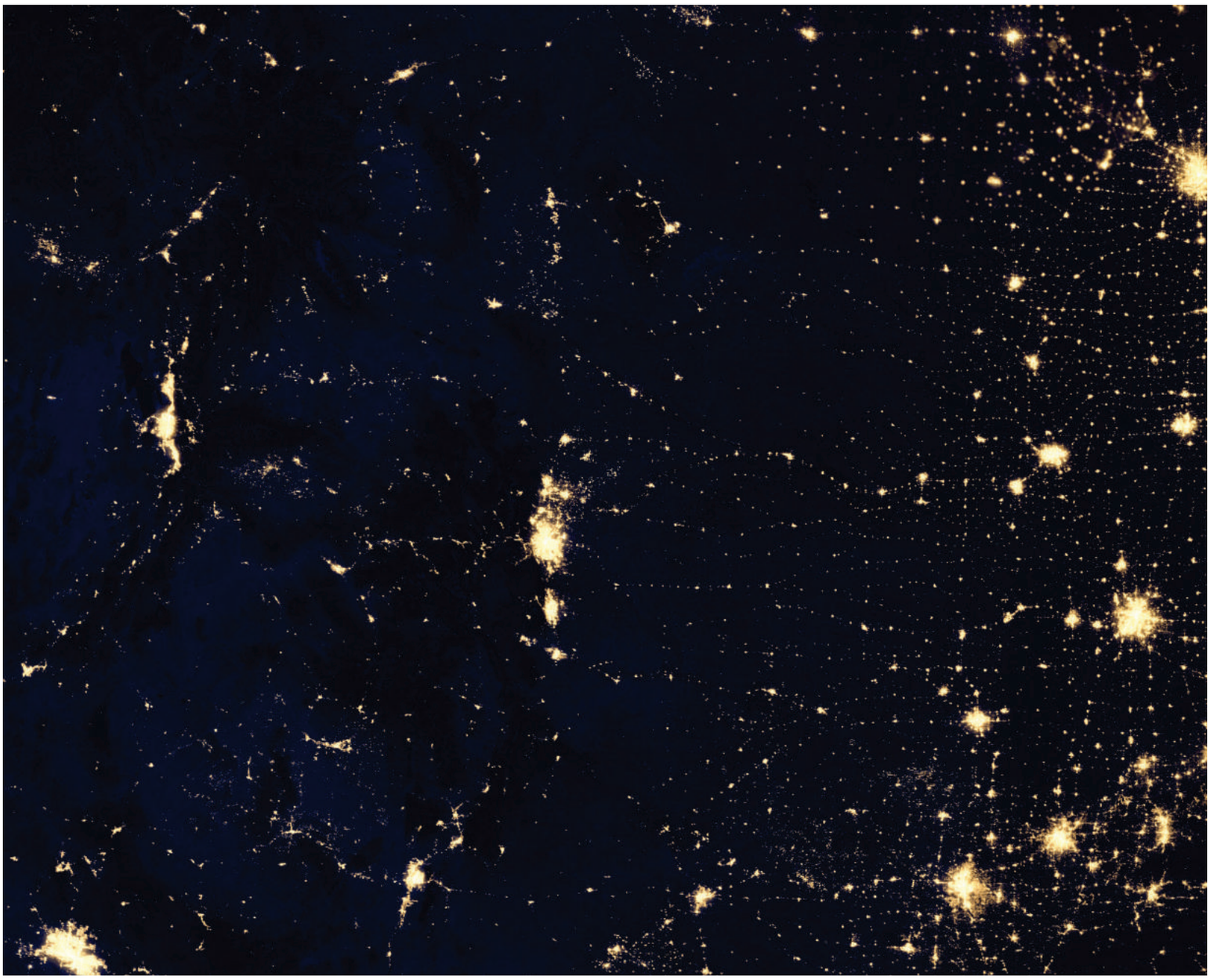
Making Markets Work for Development through Global Value Chains

Methodology and tools to identify and measure the highest-potential value chains



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Islamic Development Bank

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MAKING MARKETS WORK FOR DEVELOPMENT THROUGH GLOBAL VALUE CHAINS:
Methodology and tools to identify and measure the highest-potential value chains

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Methodology and tools to identify and measure the highest-potential value chains

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FOREWORD

Since taking over as President of the IsDB Group, I was convinced that the Bank needed to be more proactive and serve the member countries in a more coordinated, inclusive and forward-looking manner, given the challenges and rapid changes that are happening in the world today. The move requires the Bank to shift gears and continue moving at an accelerating pace while at the same time keeping on track with the development goals and supporting member countries more effectively.

In recent years, the world has seen rapid changes due to globalization and technological advancements that required the development community to shift the paradigm of engaging the markets or private sector to explore how limited public resources can be used to leverage additional private financing. Supporting this new shift requires a different approach to bringing markets to work for development in the highest-impact sectors that would enable IsDB to be at the frontier of development.

The concept of making markets work through global value chains requires fresh thinking about globalization and industrialization in a world that is changing rapidly, given what we witness today in terms of shifts in the global economy as well as the pace and breadth of technological advancements. Taking all these challenges into consideration, I am proud that the Bank has been able to develop its own framework of *Making Markets Work for Development through Global Value Chains*. This methodology book, developed 100% in-house by the Bank's staff, will enable the Bank to guide its interventions in the highest-impact areas and at the same time foster sustainable and inclusive development for our member countries.

The Bank's value chain approach is forward looking in identifying potential value chains that focus on the competitiveness of a country based on industries and products. This new approach is expected to change the Bank's priorities by being more proactive and taking into account the globally changing environment, in line with the aim of achieving the Sustainable Development Goals (SDGs). The value chain approach will form part of the basis of engagement with member countries through the Member Country Partnership Strategy (MCPS). My hope is for the new value chain approach to be a unifying framework that leads the Bank to be at the frontier of development.

H.E. DR. BANDAR M. H. HAJJAR
President, Islamic Development Bank (IsDB) Group


HILLSTEDT

PREFACE

The concept of 'making markets work for development' revolves around how development can be driven by the competitiveness of industries that are connected to the global market through global value chains. The focus on value chains would allow the Bank to prioritize its projects in areas with the highest impact and at the same time provide greater opportunity for countries to be interconnected in global value chains.

To align markets and development agendas, focus should be placed on areas that both are convincingly market competitive and provide inclusive development solutions. This concept, which can be referred to as inclusive competitiveness, allows markets or the private sector to actively engage in a development agenda, which would drive competitiveness in the market and cater to development by creating more inclusive development goals such as high-quality job creation and sustainable export competitiveness.

The value chain approach is anchored towards supporting SDG 9: build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation. Although there has been steady progress and improvements in manufacturing output and employment in the world today, the report of the UN Secretary General on progress toward the SDGs in 2017 called for renewed investments to double the industry's share of GDP by 2030. The Bank's move in championing value chains in member countries will support this agenda and allow markets to mobilize resources for development.

DR. AHMED KHODARY
Director, Department of Strategy and Transformation,
Islamic Development Bank (IsDB)

ACKNOWLEDGEMENTS

Making Markets Work for Development through Global Value Chains was authored by Mohammed Faiz Shaul Hamid, Khalid Ibnou Walid Kane and Ahmet Enes Demirhan under the guidance of Ahmed Khodary, Director of Strategy and Transformation, the Islamic Development Bank. The book is part of the President of the IsDB's five-year plan for making markets work for development. The book aims to provide a systematic tool for assessing a country's competitiveness and global value chains' trade potential.

The book also provides a framework for analyzing value chains in order to find the highest-potential value chains for a country that would guide the Bank to intervene in more focused projects with greater impact. This work draws on contributions from multiple sources including discussions and feedback from experts. The methods described in this book were also used as a pilot study for four different member countries of the Bank and the effort in completing the analysis on the ground is also highly appreciated.

We thank all the departments in the Bank especially the Economic Research and Institutional Learning (ERIL), Country Strategy & Cooperation (CSC), Country Relations and Services for their input, contributions, discussions and comments on shaping the narrative of this book and the methodologies presented herein.

ABBREVIATIONS

ISDB	Islamic Development Bank
MC	Member Country
OIC	Organization Of Islamic Development
SDG	Sustainable Development Goal
GVC	Global Value Chain
OECD	Organization For Economic Co-Operation And Development
MVA	Manufacturing Value Added
GDP	Gross Domestic Product
FDI	Foreign Direct Investment
MCPS	Member Country Partnership Strategy
RCA	Revealed Comparative Advantage
PCI	Product Champion Index
HS	Harmonized Commodity Description And Coding Systems
ICI	Industry Champion Index
UNDP	United Nations Development Programme Ecr Export Concentration Ratio

New Album
Release
もんじゃ
DHC Channel
DHC
Taisei neon
FOREV
DMM
Bitcoin
クスリ
大盛堂商事ビル
BOOKS TAISEIDO

1

MAKING MARKETS WORK FOR DEVELOPMENT

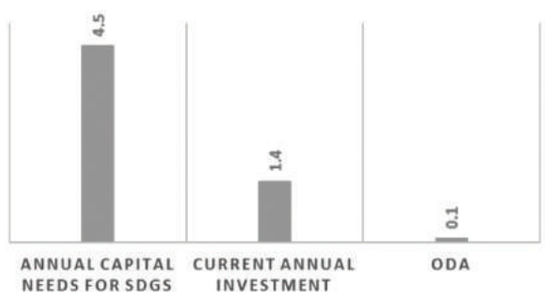
The development community acknowledged that in adopting the Sustainable Development Goals (SDGs) in 2015, there was a real need to shift the paradigm of engaging the markets or private sector in order to explore how limited public resources can be used to leverage additional private financing. Supporting this new shift requires a different approach to bringing markets to work for development in the highest-impact sectors to foster inclusive and sustainable development across member countries.

The achievement of the SDGs will require a broad-based economic transformation. The scale of this transformation makes it impossible to carry out with only public expenditures and official development assistance (ODA). An estimated investment of $4.5 trillion is needed every year between now and 2030 (Niculescu, 2017), an amount that dwarfs the current investment levels in SDG-critical sectors by orders of magnitude. Indeed, the financing gap is estimated at an astounding $3.1 trillion annually (Niculescu, 2017).

To put this into perspective, the world will need 18 times the current ODA ($172 billion in 2017) to fill the financing gap (World-Bank G. , 2016). This means that for every $1 of ODA, the development community needs to mobilize $18 from yet-untapped sources. The challenge is not insurmountable. Global capital markets stand at $218 trillion (WEF & OECD, 2015). A 1.4% fraction of this market can fill the financing gap.

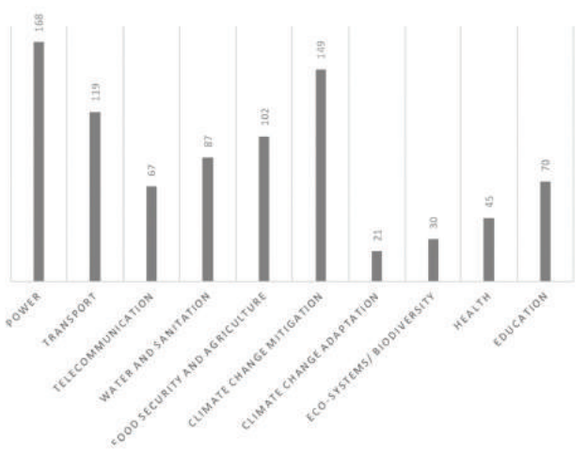
As developing countries, the member countries (MCs) of the Organization of Islamic Development (OIC) require a huge amount of

SDGS FINANCING GAP ($ TRILLION)

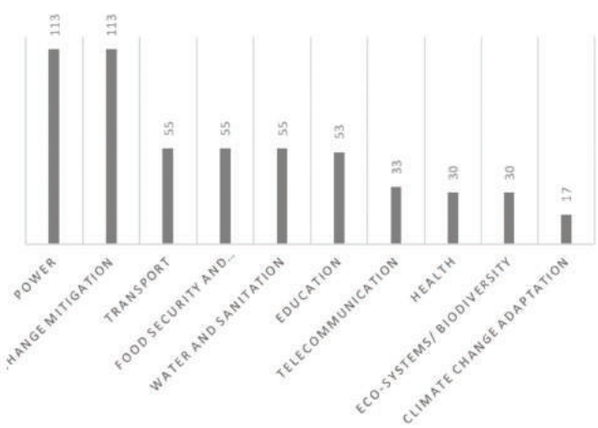


PRIVATE CAPITAL SOURCES ($ TRILLION)

ANNUAL INVESTMENT REQUIRED IN OIC COUNTRIES (2016 – 2030) ($ BILLION)



ANNUAL OIC SDG INVESTMENT GAP ($ BILLION)

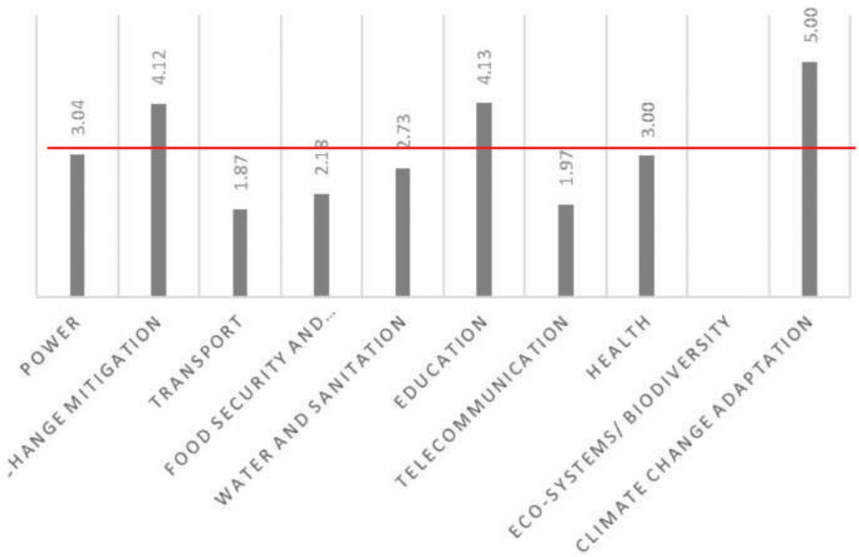


Source: Concept Note on Mobilizing Resources through Regional Islamic Supranational Entities (RISE) – IsDB's BED Document September 2018

"To put this into perspective, the world will need 18 times the current ODA ($172 billion in 2017) to fill the financing gap"

"Globalization has brought about rapid progress in technology, capital mobility and the creation of common global standards, as well as trade liberalization"

RATIO OF NEEDED INVESTMENT TO CURRENT INVESTMENT



Source: Concept Note on Mobilizing Resources through Regional Islamic Supranational Entities (RISE) – IsDB's BED Document September 2018

investment to power their economic development. Every year, MCs need to channel between $700 billion and $1 trillion into crucial SDG sectors. Infrastructure, by far the most capital-consuming sector, will attract roughly three out of every four dollars (72%) of total SDG financing needs in OIC MCs (McKinsey, 2016).

The terminology of markets in economics explains that economic activity between buyers and sellers creates markets, which can differ by products, factors, size, type, location, regulation, governance and processes. The supply of and demand for products or services create the market. In the context of a global economy, markets are facilitated by trade and investment, which enables efficient distribution of resources in a society. Productivity, efficiency and competitiveness provide crucial incentives for allocation of resources towards the most productive uses. This will result not only in improved economic performance and productivity, but also in better infrastructure and stronger institutions.

With the emergence of global production networks, multinational enterprises are exploiting the competitive advantages of different regions in their production processes, and small and medium-sized enterprises are also connected in some stages of the global production network. Connecting to the global production network thus promotes exploitation of economies of scale and specialization, while at the same time promoting technology and knowledge spillover, which also contributes to development.

As a result, to align markets and development agendas, focus should be placed on areas that both are convincingly market competitive and provide inclusive development solutions. This concept, which can be referred to as inclusive competitiveness, would allow markets or the private sector to actively engage in development agendas, which would drive competitiveness in the market and caters to development by creating more inclusive development goals such as high-quality job creation and sustainable export competitiveness.

In the past, the precondition of the competitiveness of a market for the private sector required huge investments and transformation, largely focused on the structural transformation of the public spheres of the economy. However, in the highly globalized world that we live in today, such preconditions can be accelerated, reduced, shared or even avoided, as globalization has brought about rapid progress in technology, capital mobility and the creation of common global standards, as well as trade liberalization.

As a result, countries do not necessarily need to address all market imperfections through structural transformation but rather can focus on areas with the highest comparative advantage. The most effective way to successfully achieve this in many countries has been to plug into the global value chain (GVC). An economy that is integrated with GVCs will be able to create jobs and achieve broad-based development of the population as well as the development of activities involved in the production of global-level supply, distribution and post-sales efforts. Similarly, from the market perspective, plugging into the GVC increases income in a more productive and sustainable manner while increasing exports and income for that particular economy.

According to estimates by the World Bank, there is a need for 600 million new jobs by 2028, and the private sector creates nine out of

ten jobs in the developing world. Therefore, based on this trend, the inclusive competitiveness of an economy that increases its exports by integrating into the GVC would need to create jobs in the private sector, and this provides a greater impact on poverty alleviation than other forms of direct financial aid.

The channelling of markets to work for development also requires a better understanding of how capital markets could help resource mobilization for development purposes at the domestic level. Capital flows consist of two principle types, foreign direct investment (FDI) and foreign portfolio investment (FPI). Before the 1980s, the main flow of capital to developing markets was through FDI and official aid, supplemented by bank lending (DI, 2012). Today, the nature of foreign portfolio flows comprises not only traditional bank lending, equities and bonds, but also derivatives, structured products, venture capital and private equity (Aizenman, Pinto, & Radziwill, 2014). In the last two decades, Latin American and Asian markets have been the major beneficiaries of capital flows, partly because of high growth, but also because their political development has been more stable in comparison with most Islamic Development Bank (IsDB) member countries.

Traditionally, the benefits of attracting capital markets can be divided into four areas: efficient resource allocation; price discovery; risk management; and corporate governance. Many developing countries are in fact not lacking in resources or savings. However, due to inefficient or incomplete banking and capital markets, savings leak out through capital flight, while foreign capital cannot or does not want to flow in.

Investors will certainly benchmark or compare investing in different markets based on the return, risk and liquidity of investing in a more-developed market. If the rate of return, risk and liquidity is insufficient, investors will not invest in developing markets because of two issues that arise from this situation. First, developing countries or markets are competing with each other for the same funds. The consequence of this competition has resulted in trend-based economic decisions centred on market competition rather than economic development based on actual comparative advantage. Competition between similar markets to attract such investments has also resulted in less-targeted growth in certain industries and poses more risks to these countries, as their resources and wealth are distributed in sectors or industries driven by investment needs.

Second, in order to retain or attract such funds, developing countries must demonstrate commitment not only to upholding international standards, including good corporate governance standards, but also to developing strong partnerships with others for financing. The GVC allows countries to connect to the global network of domestic financial systems, across which national savings flow in search of the highest return relative to the risks in the most competitive industry, and this strengthens the domestic financial system to international standards.

“Investors will certainly benchmark or compare investing in different markets based on the return, risk and liquidity of investing in a more-developed market”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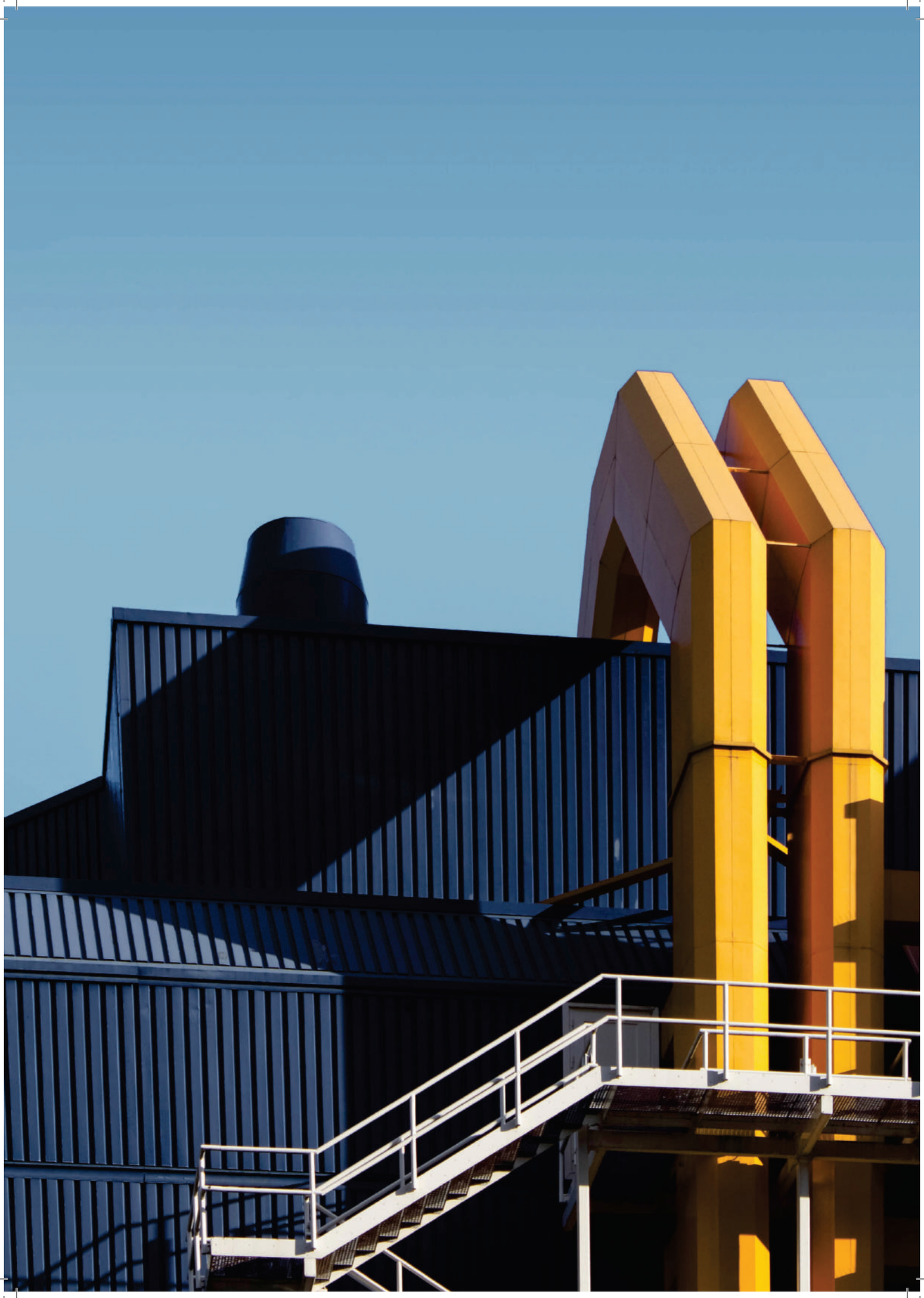


2

RETHINKING GLOBALIZATION AND INDUSTRIAL POLICY

Globalization—or to a certain extent, global economic integration—is an ongoing process that tends toward diminishing barriers and borders between countries and transforming the world into one global unit. While economic globalization is not a new process, its pace has accelerated as a result of various factors, which include the recent rapid progress in technology, capital mobility and the creation of common global standards, in addition to trade liberalization.

The process essentially would contribute to the economic development of developed and developing countries alike. However, it is now increasingly recognized that economic globalization has not benefited all countries. The income gap between the richest and the poorest countries has widened significantly over the years, and the number of people living in absolute poverty in developing and least-developed countries still remains markedly high despite unprecedented prosperity in the developed world. The more vulnerable a country is, especially those least-developed countries that rely heavily on exports of certain primary commodities, the more it has been negatively affected by globalization.

At the background of winners and losers of globalization, the world is continuing to see the rapid advancements in technology, transportation and communication that are constantly changing the pattern of global trade. This is taking place alongside the fragmentation of production processes across different parts of the world, which may not be equally distributed due to incoherent policies between countries and the private sector or firms. The disconnect between the state and private-sector policies, especially in highly globalized production and trade environments, is the main cause of failure in economic globalization.

The changing environment caused by global production and trade will have an immediate impact on developing and least-developed countries, as the disconnect between the state and private sectors is usually driven by the external markets that will change the opportunities for production and trade at the domestic level. The changes in these external markets require the state to continuously understand the changing patterns of firms and view the global production process from the angle of global value chains.

Participating in GVCs requires policymakers to understand global firms and assess linkages within GVCs, as well as to build the productive capacities that would allow countries to move up the value chain. Successful participation in a GVC results primarily in higher value added of domestic production and the ability to move up the value chain. These are two important factors in economic development that help generate productive and sustainable activities which will contribute to increasing income and employment. The broader aspects of such activities can also bring about benefits such as foreign direct investment, contributions towards economic diversification and greater resilience, knowledge transfer and creation of jobs that strengthen skills, and backward linkages that lead to more broad-based economic growth.

Effective industrial policy will be critical to increasing the competitiveness of an economy to participate in GVCs. Industrial policy in the evolving GVCs requires fresh thinking. Rodrik defines industrial policy as a 'strategic collaboration between the private sector and the government with the aim of uncovering where the most significant obstacles to restructuring lie and what type of interventions are most likely to remove them' (Rodrik, Industrial Policy for the Twenty-First Century, 2004).

Traditionally, the industrialization process of a country begins with defining policy instruments to address the imperfections in the economy and to provide incentives and measures that promote activities deemed to have the highest potential growth. The implementation of such 'inward-looking' industrial policy would result in countries specializing in some products for either domestic consumption or the export market based on the industrial policies selected. Today, most industrialized countries use this traditional process of industrialization to connect to the global value chain, even though this progression is entirely driven by inward-looking policies that slow down the process of plugging into the global value chain. The traditional inward-looking industrialization process is illustrated in Figure 1.

Figure 1: Traditional 'inward-looking' industrialization process

Source: Source: Authors' own illustration

"The disconnect between the state and private-sector policies, especially in highly globalized production and trade environments, is the main cause of failure in economic globalization"

"A fresh approach is required to understand, from the standpoint of a country's comparative advantage, how a country is able to connect to the GVC"

Given the nature of the evolving GVCs and the opportunities for even countries without natural resources to be plugged into them, industrial policy-making should be based on how a country will be able to connect to the value chain. A fresh approach is required to understand, from the standpoint of a country's comparative advantage, how a country is able to connect to the GVC. Today, GVCs shape global trade flows, and the current global trade patterns are a network of GVCs (UNCTAD, 2013).

Nearly all production processes are increasingly organized around GVCs, and most countries are trading in activities rather than goods as inputs to larger GVCs. Since more than half of manufacturing inputs consist of intermediate goods and more than 70% of service imports are intermediate services (OECD, 2018), it is logical for the industrial policy of a country to be a result of 'outward-looking', GVC-centred industrial policy.

By taking GVCs into account, the industrial policy of a country will be more inclusive, and the product specialization that is selected through the industrialization process will provide greater sustainable growth. This outward-looking industrialization is illustrated in Figure 2.

Conventional industrial policies in general also fail to understand the importance of specialization in the areas of revealed comparative advantage, while advocating that countries diversify into new industries which in many cases may result in low value added and create low-income jobs. Typically, countries incentivize private investments in the promoted sectors of the economy and attract foreign direct investments with the hope of technology and knowledge transfer. However, given the expansion of multinationals within the global value chain, often the multinational's expansion into a new country is driven by efficiency and profit-seeking goals, resulting in minimal benefit to the host country.

The constant offshoring of industries that are mature in the developed world to developing countries effectively creates lower-income jobs with lower value added and has created a phenomenon described as the negative 'premature deindustrialization' (Rodrik, Premature Deindustrialization, 2015). As a result, developing countries are able to diversify their economies, but at the cost of lower value added and low-income jobs, which then places them in the middle-income trap for a very long period of time. This phenomenon does not support inclusive and sustainable growth.

With the pace of globalization, industrial policies that are disconnected from global value chains may cause the adverse effects of premature deindustrialization. This is a worrying trend, as many countries are deindustrializing far too early in their development journeys. In Africa, for example, the share of manufacturing value added (MVA) in gross domestic product (GDP) decreased from 12.8% in 1990 to 9.9% in 2010 (World-Bank & OECD, 2017). This is in stark contrast to developing Asia. This retrenchment in manufacturing is evidenced not only by the decreasing share of MVA in GDP but also by the share of employment in these sectors.

Besides industrial policies, the conventional trade policies also does not directly support the structure of GVCs. As GVCs are organized in a process sequence, rather than industry-wide sequence, the misalignment between trade policies and the promotion of certain GVCs is quite challenging and result in ineffective trade policies. This was evidenced especially in the developing economies of Southeast Asia under the ASEAN Free Trade Area (AFTA). Despite having an aim to be the regional hub for the textile and clothing industry and promoting tariff and non-tariff barrier elimination at industry level, the inability to coherently manage the complexity of GVC resulted in trade- diverting effects that may disrupt ASEAN's vision of becoming a regional hub for the textile and clothing industry (Hamid & Aslam, 2017). Similarly, the agriculture industry within ASEAN showed that trade policies at industry level increased competitiveness among countries in the region without a complementing effect (Hamid & Aslam, 2017). These results validates that national industrial policies with regional trade agreements that are not organized within the form of GVCs tend to be ineffective and hamper the regional integration efforts.

Figure 2: The 'outward-looking' industrialization process

Source: Authors' own illustration

3

WHY THE GLOBAL VALUE CHAIN?

"From the perspective of the market or private sector, integration into GVCs strengthens the growth of exports, which is very important to fostering sustainable economic progress"

Many countries that are heavily plugged into the global value chain recognize the importance of generating productive linkages with other sectors of the economy domestically, regionally and internationally as a key driver of successful economic development. By plugging into the GVC, the productive linkage drives not only technological progress but also potential productivity improvements. The fragmentation of production in different parts of the world also allows countries to participate in the GVC at different stages based on their differing levels of technology adaptation, industrialization, labour force skills and overall economic and market situations. Therefore, the GVC offers countries the ability to adopt a learning experience for their economies and as well as the ability to play a leading role in technology adaptation.

In the past decade, the GVC in the manufacturing sector has also been recognized as the strongest driver of employment, especially in developing countries (ILO, 2014). At the outset of IsDB member countries, the majority of the labour force are trapped in vulnerable jobs (SESRIC T. S., 2017), and most of the jobs created from plugging into GVCs provide opportunities for more social security and more stable income flows.

Global value chains also foster greater backward and forward linkages to the rest of the economy, leading to knowledge and technology spillover to other sectors. At the same time, GVCs also reduce countries' risks from market shocks, as trade in intermediate goods is less affected by the market prices of final goods.

The economic development of most advanced countries has been linked to productivity growth in manufacturing activities. The movement of labour from the informal sector to the formal sector increases productivity and is the main source of rising incomes. A huge body of literature supports the notion that the process of transformation with a declining share of agriculture and a rising share of manufacturing in total output and employment is essential to reducing poverty and increasing welfare (McMillan, Page, Booth, & Velde, 2017). At the same time, most studies have also argued that developing countries would follow the same developmental process as advanced economies through reallocation of labour from informal to formal industry sectors.

The least-developed and developing countries may find integrating into the GVC to be the solution to some of their major economic resilience questions. First, integration into the GVC would address the inadequate level of industrial diversification in developing countries. Most IsDB member countries are oil producing countries with little industrial diversification except in certain industries that are related to the petroleum industry. Integration into GVCs will open up more opportunities in different industries for countries to explore further. Secondly, integration into the GVC would reduce the high level of vulnerability to external trade and financial shocks caused by the high concentration of economic activities in low productive sectors. Since GVCs are organized in the production processes of more productive sectors driven by competitiveness, countries will be able to increase their resistance to these shocks. Furthermore, integration into the GVC would also address issues such as limitations on export-led growth due to weakening global demand and premature deindustrialization. In short, integration into the GVC allows countries to remain in those relevant industries that are market driven and at the same time participate in an entire global production network that is interdependent.

From the perspective of the market or private sector, integration into GVCs strengthens the growth of exports, which is very important to fostering sustainable economic progress. Many empirical studies have demonstrated that firms that are connected to the global economy through exports or FDI are more productive than firms that serve a domestic market only. The productivity gains from GVCs will increase the competitiveness of firms, and at the same time it is also associated with increasing wages, upgrading of skills and transfer of technology. Both export-intensive and FDI- related firms and sectors typically have a substantial wage premium and have achieved higher average labour productivity than those serving the domestic market.

Success in reducing poverty on a worldwide scale has been concentrated in a few countries (e.g., those of East Asia) and, in many cases, in urban populations within those countries. Rural poverty persists in sub-Saharan Africa and significant portions of South and Southeast Asia, as well as Central and South America. Given that more than half of the developing world's population lives in rural areas (Word-Bank, 2007), rural poverty emerges as a fundamental determinant of underdevelopment.

At the country level for members of the Bank, participation in the GVC or international trade for manufactured products is quite

MANUFACTURING VS. SERVICES

The services sector has come to dominate the economic structure of many economies in the latter half of the 20th century and even more so in the 21st century, both in terms of output and employment. There is a growing belief that we have now entered a 'post-industrial age' and therefore services should be the engine of economic development. This is especially apparent in the advanced economies, but also in many developing countries, the growth of services (especially tourism and telecommunications), rather than manufacturing, has become a core strategy to diversify away from dependence of primary commodities.

There are good reasons why services should play a more important role in the formulation of a country's development strategy today. Telecommunications, finance and business services are now organized in a way that resembles the manufacturing sector, as scale economies and technological advance are more easily incorporated into these services to increase efficiency. In some digitalized services, marginal costs of providing an additional unit of service have come close to zero, making scale economies even more prevalent than in the manufacturing sector. Moreover, the revolutions in ICT and transport technology have made more services tradable, making it easier to expand output.

However, there are also good reasons to be skeptical of the discourse of 'post-industrial age'.

First, the decline in the importance of manufacturing is partly an illusion. Much of the apparent fall in the manufacturing sector's share of GDP in advanced economies is due to the decline in the prices of manufactured goods, relative to the prices of services. This is thanks to faster productivity growth in their production. When this relative price effect is taken into account and the shares of different sectors are recalculated in constant prices, the share of manufacturing has not fallen very much in most rich countries.

Second, the growth of the services sector is also a bit of an illusion. A lot of services that are now supplied by independent companies at home or abroad used to be provided in-house in manufacturing firms.

Third, many services that have grown rapidly in the last few decades are heavily dependent on manufacturing firms as customers. These include banking, communications, insurance, and even more importantly producer services, such as transport, design, retail, engineering, and management consulting. These services cannot prosper without a strong manufacturing sector.

Fourth, low tradability characterizes most services because they require consumers and producers to be in the same location, like cleaning, grooming, public utilities, or education. This means that countries that rely on their services sector for economic growth will eventually struggle with trade balance constraints.

Source: (UNECA, 2016)

"The MVA share per GDP for all member countries has gradually declined from 13.7% to 9.91% between 2001 and 2016"

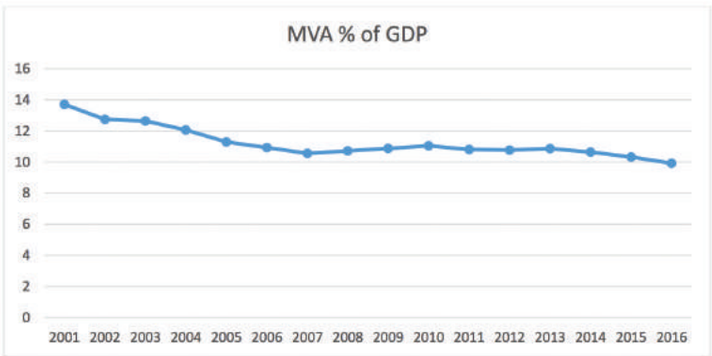
limited. Evidently, as revealed in Figure 3 below, the manufacturing value added (MVA) share per GDP for all member countries has gradually declined from 13.7% to 9.91% between 2001 and 2016, and at the same time the share of manufacturing in total employment and value added is still low (SESRIC, 2017).

The Bank MCs also face huge trade deficits in manufacturing products and manufacturing activities, with the exception of a few member countries such as Turkey, Malaysia and Indonesia. This shows that most MCs have insufficient capacity in manufacturing and rely heavily on imports for manufactured products, weakening their competitiveness in the global economy.

The most alarming impact for MCs is the widening trade deficit for manufactured products. As demonstrated in Figure 4, the top 10 HS2-level products with huge trade deficits have been growing larger since 2001 to 2017. Product of HS84- Machinery, mechanical appliances grew from $22 billion to $142 billion during this period. At the same time, other essential manufacturing products also reveal a widening trade deficit.

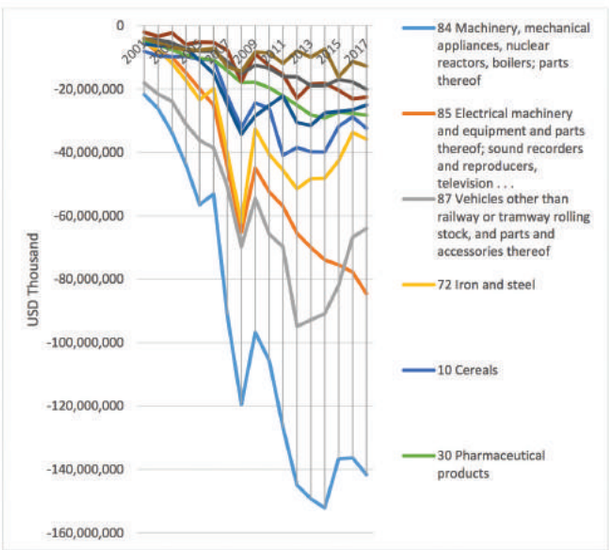
The huge trade deficit in these products supports the idea of a growing over- reliance on external imports for manufactured products and the inability of the IsDB MCs to catch up in the GVC. Persistent and growing trade deficits also have negative consequences for

Figure 3: Manufacturing value added (MVA) of IsDB member countries



Source: Staff calculation based on World Bank database

Figure 4: Top 10 HS2-level trade deficit products for IsDB member countries (2001–2017)



Source: Authors' own calculation based on UN Comtrade data

"At the level of manufacturing industries, IsDB member countries recorded only 3 out of 25 manufacturing industries with a trade surplus"

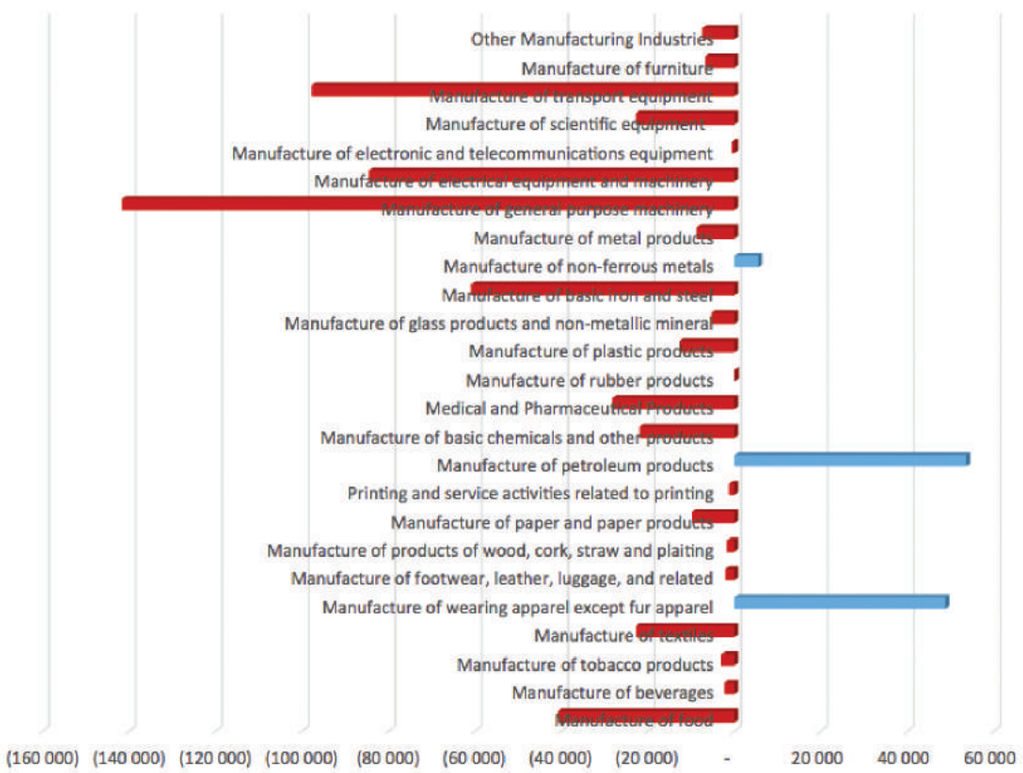
economic growth and stability. Empirical studies have found positive correlations between unemployment and trade deficits, which is a general challenge faced by most member countries (Felbermayr, Prat, & Schmerer, 2010).

At the level of manufacturing industries, IsDB member countries recorded only 3 out of 25 manufacturing industries with a trade surplus; the other 22 industries had a trade deficit. The manufacture of petroleum products (without crude oil), wearing apparel and non-ferrous metals were the only industries with trade surpluses. The over- reliance on manufactured imports reflects the fact that member countries are not able to integrate into the global production network in an effective manner.

At the Bank member-country level, as discussed above, there is only quite limited participation in the GVC or international trade for manufactured products. Among the 25 manufacturing industries, there are only 4 where the Bank's MCs have a revealed comparative advantage: manufacture of food, manufacture of petroleum products, manufacture of rubber products and manufacture of non-ferrous metals. There are two general themes reflected in these manufacturing industries. First, these industries involve no transformation (in the case of raw materials) or a low level of transformation, particularly in the last three industries listed. Second, the manufacture of food in the Bank MCs usually involves rudimentary processes with a low level of complexity, making it vulnerable to technological disturbances.

The key issue in the value chain is how producers—whether firms, regions or countries—participate in the global economy rather than whether they should do so. If they get it wrong, they are likely to enter a 'race to the bottom'; that is, a path of immiserizing growth in which they are locked into ever-greater competition and falling incomes. A comprehensive value chain analysis provides a key entry point into this evaluation as well as into the policy implications that arise, including addressing the nature and determinants of competitiveness. Such an analysis also makes a particular contribution in raising the sights from the individual firm to the group of interconnected firms by focusing on all links in the chain (not only on production) and on all activities in each link (for example, the physical transformation of

Figure 5: Top 10 HS2-level trade deficit products for IsDB member countries (2001–2017)
Trade Balance for Manufacturing Industries, 2017, USD Million

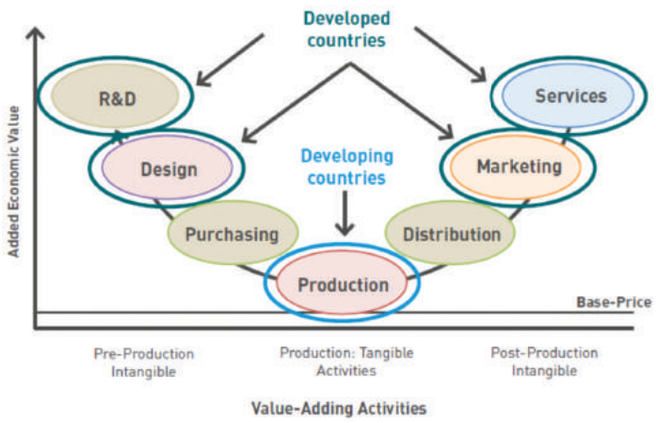


Source: Authors' own calculation based on UN Comtrade data

"Among the 25 manufacturing industries, there are only 4 where the Bank's MCs have a revealed comparative advantage: manufacture of food, manufacture of petroleum products, manufacture of rubber products and manufacture of non-ferrous metals"

"The Smile Curve makes a clear distinction of activities which are mainly concentrated in developed and developing countries and the difference it makes in value added terms"

Figure 6: Smile Curve of High-Value Activities in Global Value Chains



Source: Gereffi & Fernandez-Stark, 2016

materials in the production link). This comprehensive analysis thus helps to identify which activities are subject to increasing returns and which are subject to declining returns.

The ability to make these distinctions between the nature of returns throughout the various links in the chain can essentially guide policy-makers in formulating appropriate policies and making necessary choices. These may include interventions that may protect certain links in the value chain or facilitate the expansion of the links in order to generate greater returns or exports. For most of the GVC analysis, the smile curve of high-value added activities in GVCs is described in Figure 6.

The Smile Curve makes a clear distinction of activities which are mainly concentrated in developed and developing countries and the difference it makes in value added terms. At the outset, all IsDB MCs are still at the bottom of the curve and a majority number of countries have not even reached the level of production. Most countries that are successful in the GVCs especially those in Asia such as South Korea, Taiwan and Japan have coordinated their policies moving out of production either into design and R&D while the US and some European countries tend to move out into marketing and services while increasing the R&D and design capacities.

Given the huge unemployment and youth demographics in IsDB MCs, plugging into the GVC at the bottom level creates unskilled and semi-skilled jobs and systematically allows upgrading along the value chain as skills, enabling environment and industrial linkages grow in a systematic and coordinated way using industrial policy instruments that are wide ranging not only aligned with the industries but also expands in education, infrastructure and structural changes in the economy.

4

ISDB'S GLOBAL VALUE CHAIN APPROACH: PROVIDING FOCUS FOR COUNTRIES PLUGGING INTO THE GLOBAL VALUE CHAIN

CHAPTER 4

"The new thinking on GVCs allows low- and medium-income countries to participate in the global production network that fosters greater development prospects"

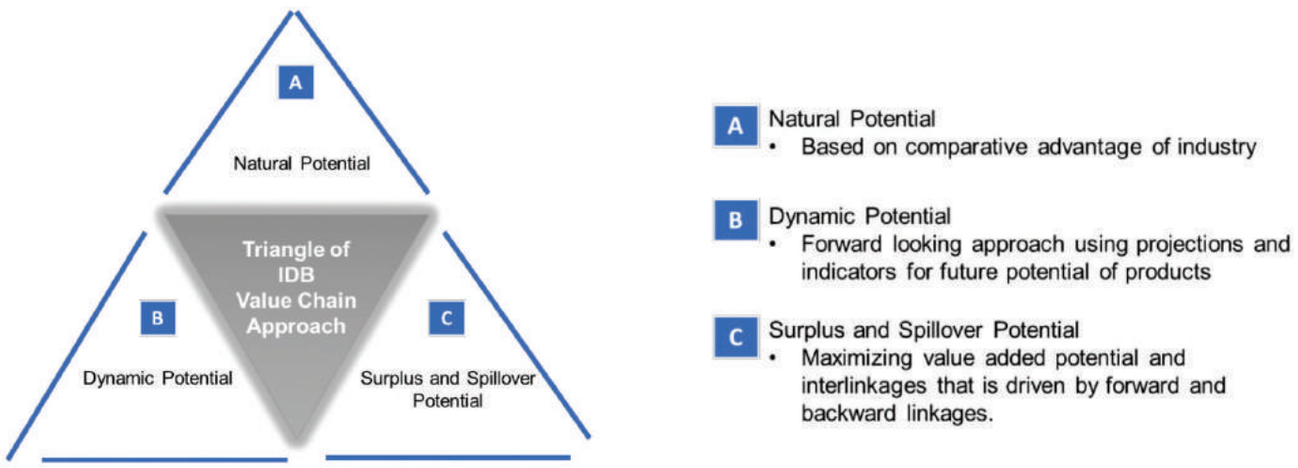
The Bank's value chain approach is forward looking in identifying potential value chains through an in-house methodology that focuses on the competitiveness of a country in terms of its industries and products. This new approach is expected to shift the Bank's priorities to a more proactive stance, taking into account the changing global environment in line with the aim of achieving SDG 9.

The value chain approach will form part of the basis of engagement with member countries through the Member Country Partnership Strategy (MCPS). Given the focus on value chains, interventions and projects in countries will be prioritized with the aim of achieving greater sustainable and inclusive growth while at the same time promoting industrialization.

Identifying a value chain for a particular country requires a deeper understanding of production processes and international product fragmentation. The new thinking on GVCs allows low- and medium-income countries to participate in the global production network that fosters greater development prospects. Most of the Bank's member countries should no longer master the whole production line and process of a good but rather specialize in one stage of the global production process, which provides opportunity for specialization, production and higher value added.

The Bank's new quantitative tool for selecting and identifying the value chain is based on three paradigms that focus on the potential of intermediate goods rather than of final goods. The first paradigm is the 'natural potential' of a country. This paradigm considers the existing comparative advantage of a country at industry level. It takes into account a particular economy with a given economic structure and ecosystem that can produce efficiently relative to other countries in the world. The second paradigm is the 'dynamic potential', which takes a forward-looking approach to identifying and quantifying products or intermediate goods that are potential product champions by using a few indicators such as market growth, global demand projections, market distance and potential export concentration. The third paradigm is the 'surplus and spillover potential', which evaluates the static value added of a particular industry and the interlinkages within different industries in a particular economy. The aim of the surplus and spillover potential is to identify the forward and backward linkages and the potential spillover effects from interlinkages of industries and to maximize the value added in a specific industry. The three paradigms of the Bank's approach that guide the quantitative tool for value chain identification are described as the 'triangle of IsDB's value chain approach', described in Figure 7 below.

Figure 7: The triangle of IsDB's value chain approach



Source: Authors' own illustration

"Each selected value chain is assessed through its natural potential, dynamic potential and surplus and spillover potential"

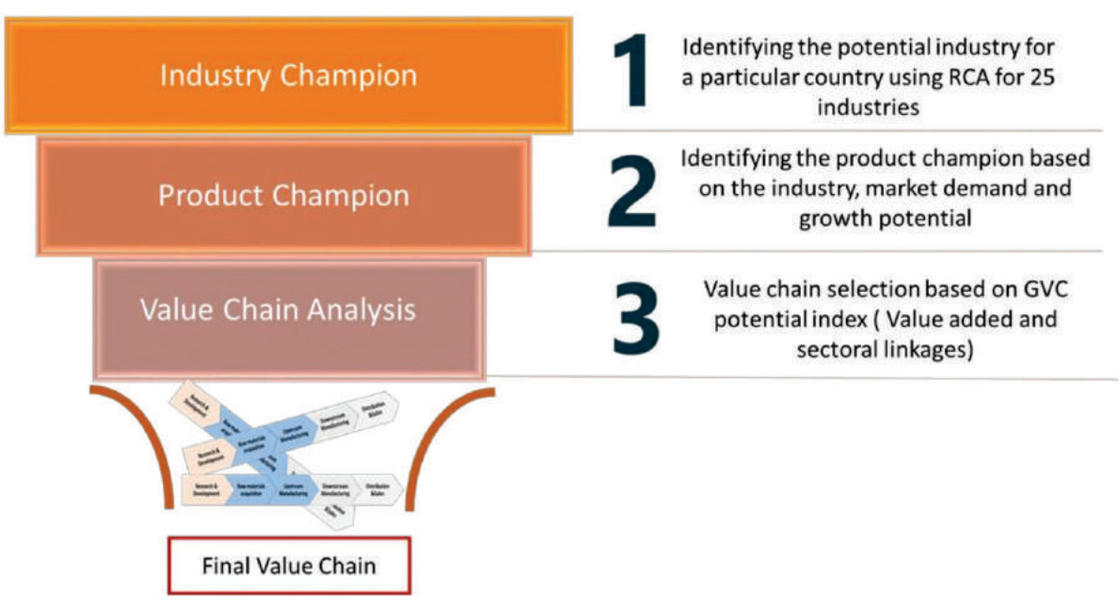
Based on the three paradigms in the triangle, the Bank's quantitative tool for identifying value chains is developed with the aim of suggesting the products with the greatest potential in particular industries where a country would be able to plug into the global value chain. Although most IsDB member countries may already have identified the first paradigm, the natural potential of the industries, the approach in this quantitative tool goes two steps further with the dynamic potential and the surplus and spillover potential to provide greater depth in identifying the potential products that can be plugged into the global value chain. These steps are illustrated in a 'value chain filtertool', illustrated in Figure 8 below. The value chain filtertool is a systematic tool for quantifying each step of the three paradigms in the triangle of value chain approach.

The first step in the value chain filtertool is to identify the industry champions. The analysis at country level in this first step filters the potential industries with revealed comparative advantage in the world that relates to the first paradigm, the natural potential of a country. The second step takes a more granular approach by identifying the product level champion based on the dynamic potential, which is forward looking and is selected through a product champion index (PCI) incorporating indicators that project the future potential of products from the industries in the first step. The third step is the value chain analysis, which then evaluates the third paradigm, surplus and spillover potential, by introducing a GVC potential index. The end result of the filtertool is a ranking of products with the highest potential for a particular country to be plugged into the global value chain.

The completion of the quantitative analysis with the filtertool is then expanded to a qualitative analysis of the value chain. The qualitative analysis of the industry or products that were selected in the quantitative way uses the three paradigms described in the triangle of IsDB's value chain approach. Each selected value chain is assessed through its natural potential, dynamic potential and surplus and spillover potential. The qualitative analysis requires greater market study in the particular value chain and is described in Figure 9.

The natural potential is evaluated based on the capabilities of each chain, by mapping the entire process that takes place in a country for a particular value chain. It also takes into account of the existing skills and quality of labour and requires the mapping and identification of activities that takes place in the entire value chain. Another aspect of importance is also the existence of firms and its capabilities in the value chain. This requires a deeper understanding of how the firms work and act in the entire value chain. Government policies and infrastructure that has enabled the industry or products to exist also needs to be evaluated to provide the background on the existing ecosystem that the value chain is operating in. Finally, the natural potential would also require a better understanding of access and cost of raw materials that form as an input in the production process of the value chain.

Figure 8: The value chain filtertool



Source: Authors' own illustration

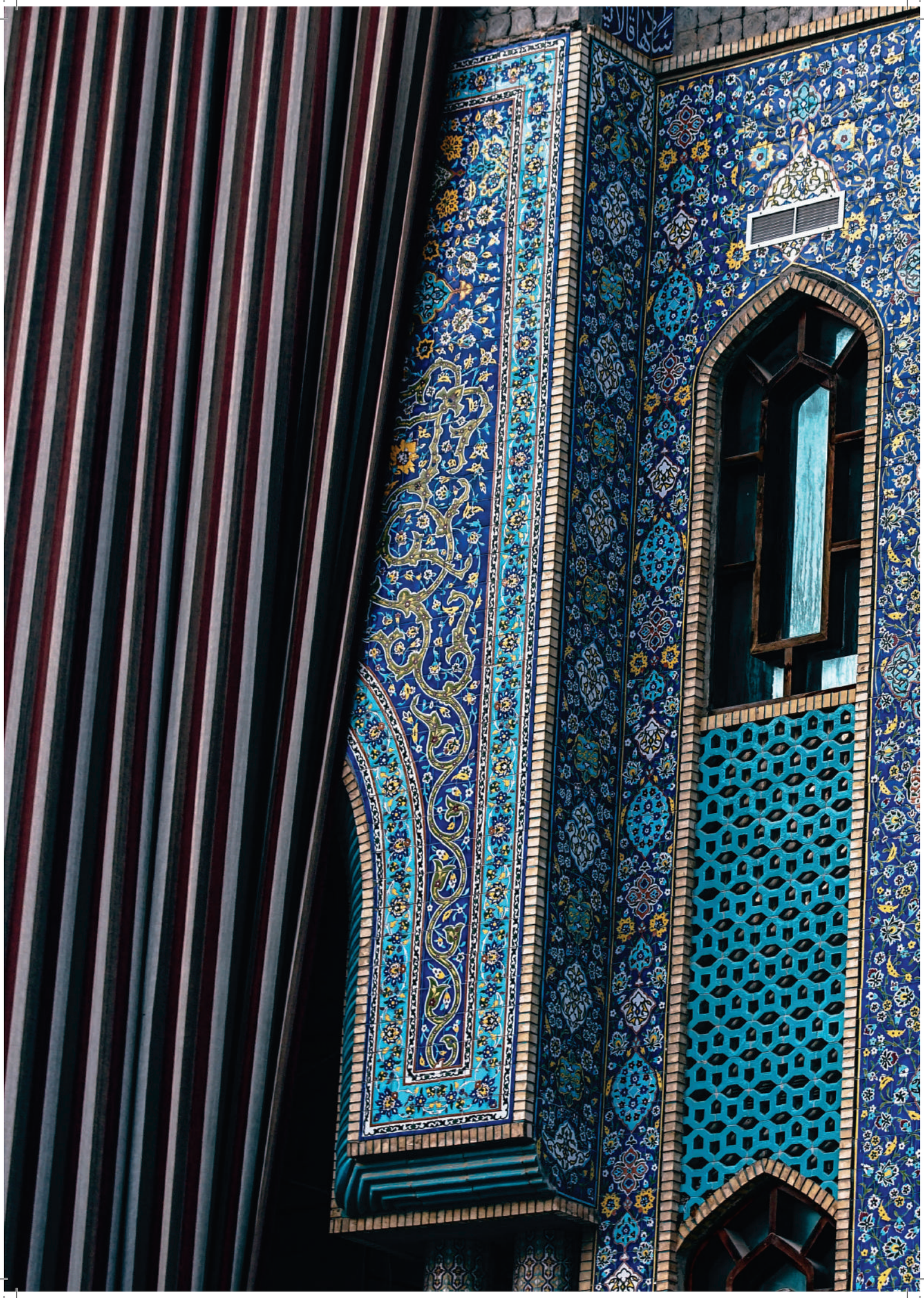
Figure 9: Qualitative framework

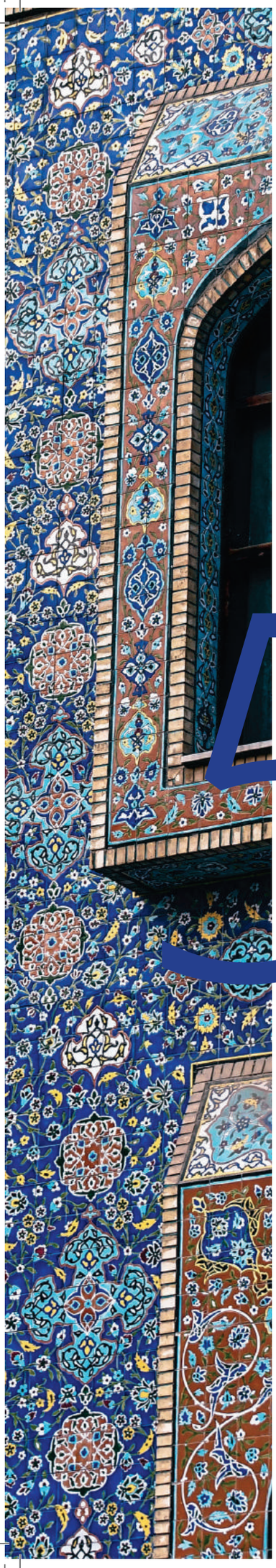
Natural Potential	Dynamic Potential	Surplus & Spillover Potential
Capabilities of each chain in the entire value chain	Buyer's perspective and global demand	Enablers to other industries
Skills and quality of labour	Investment environment and attraction	Local supply/vendor development
Mapping and identification of activities	Technological development	Skills spillover to other industries
Existence of firms and capabilities of firms	Access to market	Technology spillover effects
Government Policies and Infrastructure	Price competition	Infrastructure spillover effects
Access to raw material and cost (input cost)	Uniqueness/ Niche of product	Cost spillover effects

Source: Authors' own illustration

From the dynamic potential side, the qualitative analysis would require the buyer's perspective and global demand outlook. A particular product that exist in a country needs to be matched with the global market and the various different markets need to be identified. Besides the ability to sell to the markets, a basic level of understanding is also required to assess if the investment environment would attract potential investments in terms of FDI or build any network to procure from the particular country. Another important aspect of assessment is the technological development for the particular industry. An industry with higher potential to tap into newer technologies would be able to produce products with a niche. At the same time, potential market access to newer markets through better price competition would also prevail as a dynamic potential.

For the surplus and spillover potential, the qualitative analysis will assesses areas where the particular product or industry may offer gains to other sectors or the economy as a whole. First, the assessment needs to define how the product or industry may enable other industries or sectors and provide skills, technology and infrastructure spillovers to other industries. In the particular industry, assessment should also be made in terms of building and creating local supplier network or vendor development programs.





5

ISDB'S GLOBAL VALUE CHAIN APPROACH: QUANTITATIVE MEASUREMENT OF THE HIGHEST-POTENTIAL VALUE CHAIN

What is a Value Chain?

Value chains and value chain analysis stem from Michael Porter's work on how to raise the competitiveness of institutions (Porter, 1990). In his study, Porter explored the development of a systematic method of analyzing the roots of comparative advantage. Since then, this topic has been one of the most hotly debated in the field of the study of competitiveness.

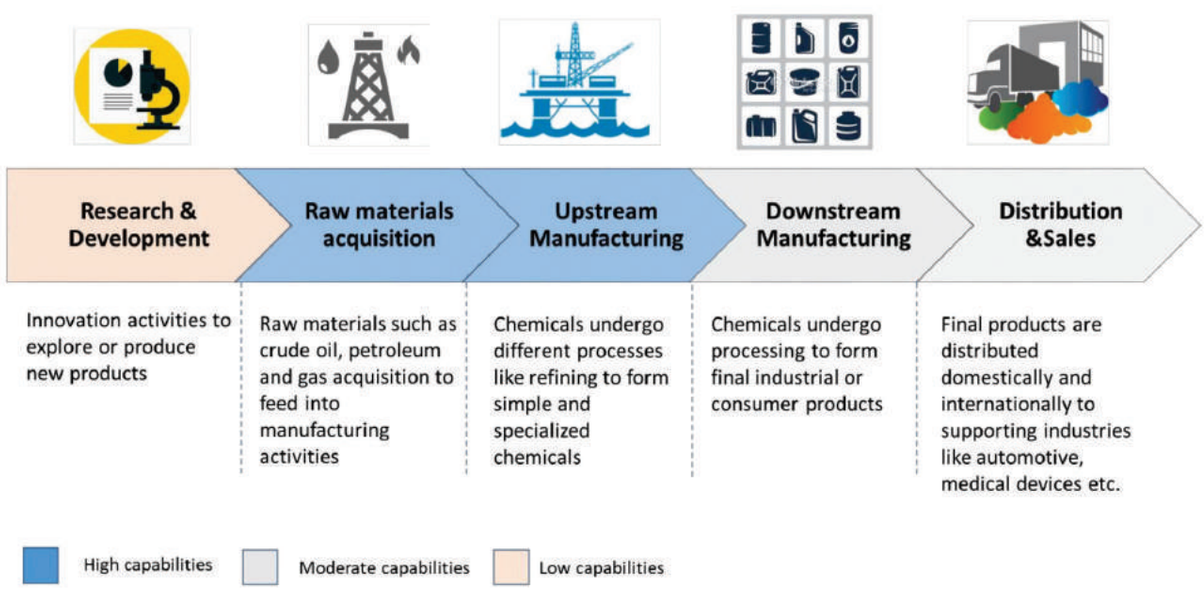
Value is the cost that a client is willing to pay in order to purchase a service or a product. This value is the sum of the costs associated with the chain of activities accomplished to develop the said service or product.

According to Porter, the first step in conducting a value chain analysis is to break down the key activities involved in the framework. The next step is to assess the potential for adding value through the means of cost advantage or differentiation. Finally, it is very important for the analyst to determine the strategies that focus on those activities that would enable the company to attain sustainable competitive advantages. Value chains encompass the full range of activities and services required to bring a product or service from its conception to sale in its final market, whether local, national, international or global. A value chain includes producers, input suppliers, operation, processors, retailers and buyers.

From Porter's work on value chains for firms, the concept of the value chain evolved further to encompass the country and industry levels. The World Bank, the Food and Agriculture Organization, the International Institute for Environment and Development, the Deutsche Gesellschaft für Technische Zusammenarbeit, the International Labour Organization and the US Agency for International Development all define a value chain as a set of activities that is required to bring a product or service through the different phases of production. The United Nations Industrial Development Organization defines a value chain as a set of actors connected along a chain producing, transforming, and bringing goods and services to end-consumers. Another definition comes from (Hobbs & Young, 2000), (Lundy, Gottret, Ostertag, Best, & Ferris, 2007) which defines a value chain as a strategic network among a number of independent business organizations, where network members engage in extensive collaboration through a sequenced set of activities.

The Bank's definition of a value chain is a combination of a set of activities and actors which takes into account all the above definitions. This is illustrated in Figure 10 below, which describes the entire high-level value chain of the plastics industry, beginning with research and development and ending at distribution and sales. Each link is defined as the main activity along the chain, and there are specific production activities that are sub-chains of these five main link. The objective of grouping different key activities together is to provide a differentiation between the links in terms of the required labour skills, cost, productivity, materials, resources and level of competitiveness.

Figure 10: Plastics industry value chain example

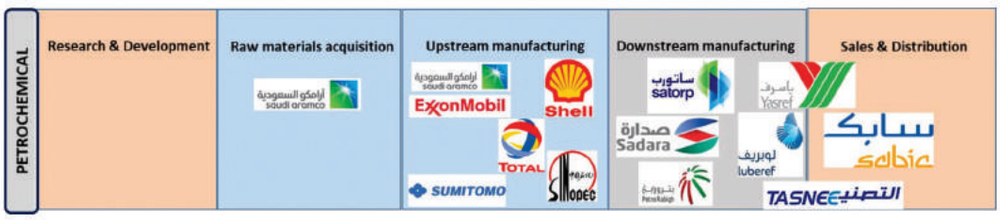


Source: Authors' own illustration

In addition to defined activities, value chains also consist of market players, which are set of actors in the value chain. Figure 11 below demonstrates how the major players in Saudi Arabia's petrochemical industry are mapped onto the previous activities-based value chain. In other words, the major market players for the five links and their sub-chains are identified.

Therefore, the Bank's definition of value chains is a hybrid approach that defines the value chain as both a set of activities and of actors that work along the whole production process to produce goods and services.

Figure 11: Saudi Arabia's petrochemical industry value chain – actor example



Source: Authors' own illustration

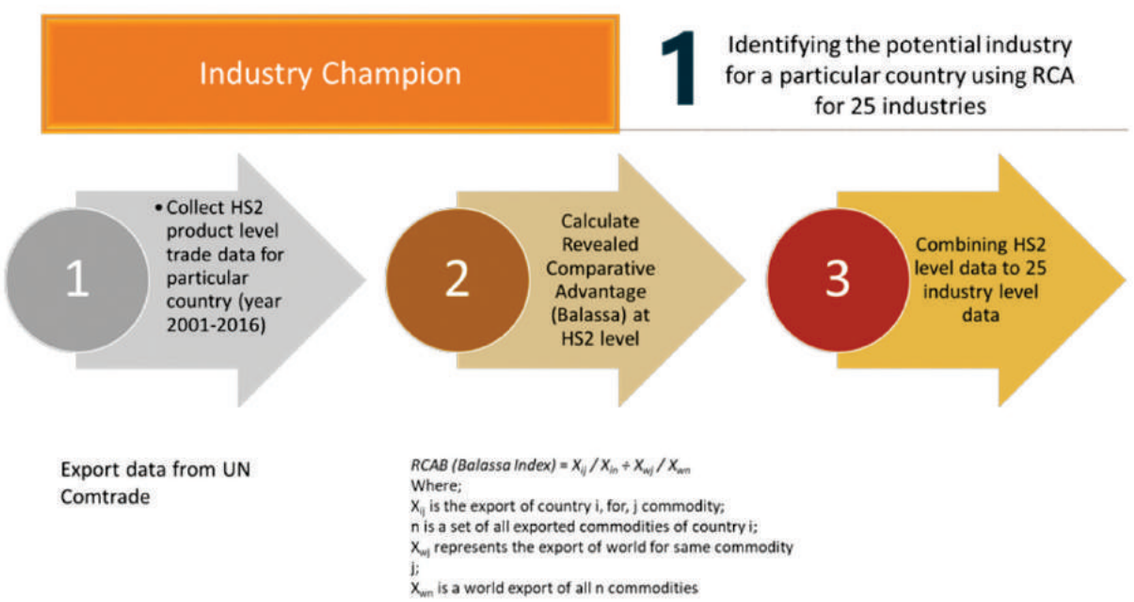
Identifying and Measuring the Highest-Potential Value Chains: Step 1

The first step in identifying the highest-potential value chains for a country starts with the first layer of the filtertool, the industry champion. Industry champions are sets of industries for a particular country that have proven a revealed comparative advantage. As indicated in Figure 12, the identification of an industry champion is a combination of three main processes, starting with the collection of HS2 product-level trade data for at least the past 15 years. Next is the calculation of revealed comparative advantage at HS2 level, and finally the HS2-level data is combined at industry level for 25 industries. The reason for combining the HS2-level data at industry level is to avoid specific bias to certain products and provide greater assessment of combined products in a particular industry to capture similar activities that are conducted within the industry.

For this first step, the main analysis performed is the revealed comparative advantage (RCA) and the use of the RCA index in calculations. The purpose of the RCA index is to measure the comparative advantage of industries in the global market. The RCA index is a standard approach or methodology to estimate a country's comparative advantage or comparative disadvantage in commodities, industries or sectors. Based on Ricardian theory, comparative advantage occurs due to technological dissimilarities across nations (Golub & Hsieh, 2000), while the Hecksher-Ohlin (H-O) theory considers cost dissimilarities arising due to differences in factor prices across nations, assuming constant technology (Leamer, 1995).

According to Balassa, it is not necessary to observe all elements affecting the comparative advantage of any country, but rather one should observe patterns of trade. Since data on trade explains revealed comparative advantage, it is a commonly accepted measure (Balassa, 1965). The Balassa index focuses on estimating the comparative advantage of any country and not on determining its sources. The revealed comparative advantage (RCA) index, introduced by Balassa (1965), is used to determine the products in which a country has a comparative advantage. It is defined as the ratio of the share of the commodity in the country's total exports to the share of world exports of the commodity in total world exports. A country is said to have a revealed comparative advantage if the value of the index exceeds 1 and a revealed comparative disadvantage if the index's value is below 1.

Figure 12: Industry champion step



Source: Authors' own illustration

HARMONIZED COMMODITY DESCRIPTION AND CODING SYSTEMS (HS)

The harmonized system (HS) is an international classification of products. It helps participating countries record the goods and services traded between them on a harmonized basis with respect to individual custom requirements. The HS was introduced in 1988 by the World Customs Organization (WCO) and was immediately adopted by most countries. Since this date, the HS has been subject to multiple amendments in the classification of products to better reflect the nature of the goods currently traded in the world's markets. In fact, the aim is to revise the HS classification every five years in order to actualize the traded products in the world markets. The different versions of HS are HS 1988/1992, HS 1996, HS 2002, HS 2007, HS 2012 and HS 2017.

The complete list of products and their corresponding HS codes can be downloaded from the United Nations Trade Statistics database. The harmonized system of products and services is a system of products codified with six numbers. Products are classified with respect to the level of technology and complexity involved. On one end of the spectrum are classified the simplest products, such as live animals, while much more complex products such as machinery are classified on the other end of the spectrum. The number of digits used to classify a given product determines the level of aggregation in the data, with more digits representing disaggregation. The HS can be codified using two, four or six numbers. At its most aggregate, the HS is codified with two numbers and is subdivided into 99 products. Greater disaggregation yields more than 5,000 products.

Source: Authors' description

There have been many other concepts to determine comparative advantage developed after Balassa (1965). Some studies have revised the definition of RCA, and some other measures also exist in the literature on RCA globally which expand RCA with various methodologies. These varieties include, among others, the normalized revealed comparative advantage index that provides comparisons over time and space and some measures that evaluate comparative advantage in bilateral trade (Yu, Cai, & Leung, 2008). However, due to limitations of the data for the Bank's member countries, Balassa's commonly used RCA index is also adopted here. The equation to calculate the RCA of a product is given as Equation 1.

Equation 1

$$RCA = \frac{Export\ value\ of\ a\ product\ i\ from\ a\ country\ n\ /\ Total\ exports\ from\ country\ n}{Export\ value\ of\ product\ i\ in\ the\ world\ /\ Total\ exports\ value\ in\ the\ world}$$

The last element of the industry champion step is to classify the products into industries. This is undertaken by selecting different products at HS2 levels in 25 manufacturing industries. The 25 industries are classified by the activities, thus providing an alternative to classification issues that is caused by the standard HS2 classification. Furthermore, one of the biggest issue in linking trade to GVCs is the absence of activity based classification. Therefore, the classification for the 25 industries provides an "activity based" classification that is more aligned towards GVCs. The composition of products for the 25 industries is described in Table 1 below.

Industries	Standard products at HS2
Manufacture of food	Cereals
	Milling products, malt, starches, inulin, wheat gluten
	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes
	Lac, gums, resins, vegetable saps and extracts nes
	Vegetable plaiting materials, vegetable products nes
	Animal or vegetable fats and oils, cleavage products, etc
	Meat, fish and seafood food preparations nes
	Sugars and sugar confectionery
	Cocoa and cocoa preparations
	Cereal, flour, starch, milk preparations and products
	Vegetable, fruit, nut, etc food preparations
	Miscellaneous edible preparations
	Residues, wastes of food industry, animal fodder
Manufacture of beverages	Beverages, spirits and vinegar
Manufacture of tobacco products	Tobacco and manufactured tobacco substitutes
Manufacture of textiles	Silk
	Wool, animal hair, horsehair yarn and fabric thereof
	Cotton
	Vegetable textile fibres nes, paper yarn, woven fabric
	Manmade filaments
	Manmade staple fibres
	Wadding, felt, nonwovens, yarns, twine, cordage, etc
	Carpets and other textile floor coverings
	Special woven or tufted fabric, lace, tapestry etc
	Impregnated, coated or laminated textile fabric
Manufacture of wearing apparel except fur apparel	Knitted or crocheted fabric
	Articles of apparel, accessories, knit or crochet
	Articles of apparel, accessories, not knit or crochet
	Other made textile articles, sets, worn clothing etc
	Footwear, gaiters and the like, parts thereof
	Headgear and parts thereof
	Umbrellas, walking-sticks, seat-sticks, whips, etc
	Bird skin, feathers, artificial flowers, human hair

Industries	Standard products at HS2
Manufacture of footwear, leather, luggage, and related products	Raw hides and skins (other than furskins) and leather
	Articles of leather, animal gut, harness, travel goods
	Furskins and artificial fur, manufactures thereof
Manufacture of products of wood, cork, straw and plaiting materials	Wood and articles of wood, wood charcoal
	Cork and articles of cork
	Manufactures of plaiting material, basketwork, etc.
	Pulp of wood, fibrous cellulosic material, waste etc
Manufacture of paper and paper products	Paper and paperboard, articles of pulp, paper and board
Printing and service activities related to printing	Printed books, newspapers, pictures etc
Manufacture of petroleum products	Mineral fuels, oils, distillation products, etc
Manufacture of basic chemicals and other products	Inorganic chemicals, precious metal compounds, isotopes
	Organic chemicals
	Fertilizers
	Tanning, dyeing extracts, tannins, derivatives, pigments etc
	Essential oils, perfumes, cosmetics, toiletries
	Soaps, lubricants, waxes, candles, modelling pastes
	Albuminoids, modified starches, glues, enzymes
	Explosives, pyrotechnics, matches, pyrophorics, etc
Medical and Pharmaceutical Products	Pharmaceutical products
Manufacture of rubber products	Rubber and articles thereof
Manufacture of plastic products	Plastics and articles thereof
Manufacture of glass products and non-metallic mineral products n.e.c.	Stone, plaster, cement, asbestos, mica, etc articles
	Ceramic products
	Glass and glassware
	Pearls, precious stones, metals, coins, etc
Manufacture of basic iron and steel	Iron and steel
	Articles of iron or steel
Manufacture of non-ferrous metals	Copper and articles thereof
	Nickel and articles thereof
	Aluminium and articles thereof
	Lead and articles thereof
	Zinc and articles thereof
	Tin and articles thereof
Manufacture of metal products	Other base metals, cermets, articles thereof
	Tools, implements, cutlery, etc of base metal
	Miscellaneous articles of base metal
Manufacture of general purpose machinery	Nuclear reactors, boilers, machinery, etc
Manufacture of electrical equipment and machinery	Electrical, electronic equipment
Manufacture of electronic and telecommunications equipment	Photographic or cinematographic goods
Manufacture of scientific equipment	Optical, photo, technical, medical, etc apparatus
	Clocks and watches and parts thereof
	Musical instruments, parts and accessories
Manufacture of transport equipment	Railway, tramway locomotives, rolling stock, equipment
	Vehicles other than railway, tramway
	Aircraft, spacecraft, and parts thereof
	Ships, boats and other floating structures
Manufacture of furniture	Furniture, lighting, signs, prefabricated buildings
Other manufacturing industries	Toys, games, sports requisites
	Miscellaneous manufactured articles

Identifying and Measuring the Highest-Potential Value Chains: Step 2

The second step is identification at a more disaggregated level of the highest- potential products that a country can produce to plug into the GVC. This step culminates in an index that ranks several products, called the product champion index (PCI). The stages of this step are described in Figure 13 below.

Figure 13: Product champion step.

Source: Authors' own illustration

For each manufacturing industry with significant RCA in the previous step, a more disaggregated level of data at HS4 is analyzed with a composite index consisting of multidimensional data that represents dynamic potential of the product which is the product champion index (PCI).

The reason of using a composite index is to summarize complex or multi- dimensional issues in a simple manner, making it easier for policymakers to compare different aspects of each product as it stands in comparison with others. As the index provides a single estimate for each product, it makes it possible to assess progress during certain timeframe and compare it with a different timeframe. The PCI is intended to estimate at HS4 level, three main dimensions of a product as described in the following table:

Figure 14: Indicators of Product Champion Index (PCI)

Dynamic Demand	Static Supply	Market Access
Indicator A: Global demand for product	Indicator C: Increase of product supply	Indicator E: Distance of export markets
Measurement: Global import growth trend	Measurement: National export growth trend	Measurement: Average distance
Indicator B: Potential for domestic demand substitute	Indicator D: Export Importance	Indicator F: Market concentration
Measurement: Trade imbalance	Measurement: Relative export rate	Measurement: Herfindahl-Hirschman index

Source: Authors' own illustration

Although there are different elements that can be added to the index especially for the dynamic demand indicators, most of the member countries do not have complete or accurate data that can represent technological, employment and complexity of products. As a compromise, to ensure consistency in comparing countries and products, data accuracy and availability were chosen against expanding the indicators.

"As a compromise, to ensure consistency in comparing countries and products, data accuracy and availability were chosen against expanding the indicators"

The formula for the PCI for product i in country is described as:

$$PCI_i = w_1A_i + w_2B_i + w_3C_i + w_4D_i - w_5E_i - w_6F_i$$

The indicators A, B, C, D, E and F are described in detail as follows:

A_i : Global import growth trend in % for product i

B_i :Trade deficit value in thousand for product i

C_i : Export growth trend in % of country n for product i

D_i : Relative exports of product i to total exports of industry in %

E_i : Relative average distance of all exports markets (capital) in km

F_i : Herfindahl-Hirschman index on export concentration

Each indicator are first normalized to represent numbers between -1 to 1. The closer the PCI index is to 1, the product has higher potential compared to products with lower values. Products that are close to -1 are the least potential products. In order to normalize the data, the values of indicator A, C, D and E which are in percentage are divided by 100 while B and E are values that are benchmarked against the largest value for example, average distance is calculated against furthest distance and results in percentage value. In addition, indicator F is already represented in 0 to 1 form.

Theoretically, the PCI is divided into three different dimensions which are dynamic PCI, supply PCI and market access PCI. Therefore, the weightage, w_1, w_2, w_3, w_4, w_5 and w_6 are assigned weights based on emphasis requirements on each dimension that are arranged according to importance. Based on data availability of the Bank's member countries and the vast differences between one member and another in terms of trade patterns, there is no one size fits all average weight or percentile and regression based methods that can be employed for this purpose. As a solution, the weightage methodology used for PCI is more flexible depending on country, while at the same time provides results in three different dimensions. The weights assigned to each indicator used to compute the PCI are obtained using the weighted moving average methodology. The moving average is usually used in statistics to determine coefficients by giving a weight to each indicator used in a calculation. The weight for each term decreases linearly; the most important data has weight N, and the least important has a weight of 1. In order to find the weights for each indicator, the indicators are ranked based on importance I, 1 being the most important. Then the weight for each indicator can be calculated using the equation:

$$W_x = \frac{I_{max} + 1 - I_x}{\sum_{x=1}^{n} I_x}$$

Where W_x and I_x are the weight and the importance of the indicator, respectively, and I_{max} is the importance of the least important indicator.

The three dimensions of results in the PCI is arranged according to the importance of the indicators. The sequence of the indicators for dynamic demand, supply and market access PCI is arranged as follows with the most important being ranked 1 and least important, ranked 6.

Figure 15: Types of PCI and ranking of indicators

Rank	PCI -Dynamic Demand	PCI - Static Supply	PCI- Market Access
Rank 1	Indicator A: Global demand for product	Indicator C: Increase of product supply	Indicator E: Distance of export markets
Rank 2	Indicator B: Potential for domestic demand substitute	Indicator D: Export Importance	Indicator F: Market concentration
Rank 3	Indicator C: Increase of product supply	Indicator A: Global demand for product	Indicator A: Global demand for product
Rank 4	Indicator D: Export Importance	Indicator B: Potential for domestic demand substitute	Indicator B: Potential for domestic demand substitute
Rank 5	Indicator E: Distance of export markets	Indicator E: Distance of export markets	Indicator C: Increase of product supply
Rank 6	Indicator F: Market concentration	Indicator F: Market concentration	Indicator D: Export Importance

Source: Authors' own illustration

As a result, the PCI calculated for each product can be determined from three different dimensions based on the preferred focus of a country or industry. The indicator A_i, global import growth trend in % for product i is calculated based on the average global import changes for that particular product in the past 5 years. This indicator provides an indication of global market demand. Products that show high increase in global market demand are highly preferred as producing or expanding along the value chain of the product will result in net benefit.

The indicator B_i, trade deficit value in thousand for product i , is the trade deficit which is represented in a positive value, while trade surplus is represented in negative value. The value is computed for the average past 5 years. This indicator is to reflect the opportunity in substituting the domestic demand. When there is a huge trade deficit for the product, a local production of the same product is more easily absorbed by the domestic market and expanding along this value chain would enable the country not only cater for the domestic demand, but also have a stable level of market absorption for the particular product. The indicator C_i, export growth trend in % of country n for product i, is the country's ability to supply the product in global market and is calculated in % for the past 5 years. The ability for a country to produce and supply to the global market shows that the country has already gained the factor endowment in a competitive way to access the global market. The indicator D_i, relative exports of product i to total exports of industry in % is used to determine the importance of the particular product exports compared to other exports. The relative exports is calculated based on the past 5 years export data of the particular product and compared against the largest export in the industry. The emphasis of exported products in one product compared to another is used as proxy to determine employment in producing one product to another. Due to lack of available employment data at product level, the export size is compared to gain an approximate value if the skillsets and know-how already exist and how does it compare to other products in size. A product with high relative exports would indicate higher employment and resource allocation for the particular product and expanding along this value chain would provide greater spill over effects. The indicator E_i, relative average distance of all exports markets (capital) in km is the average distance of the export destination described

in km. The average distance is used as a proxy for trade cost (shipping) and the higher average distance would be costlier to trade and makes the product less competitive. The indicator F_i, Herfindahl-Hirschman index on export concentration is used to determine how concentrated is the exports. The indicator is subtracted as less concentrated the market is, the country and product has more access to different markets. It is more likely for the product to be readily exported to different market locations rather than only one or few markets.

Based on the PCI – Dynamic Demand, the analysis to determine PCI for Turkey was undertaken at HS4 level for the selected industries in the previous step. The PCI - Dynamic Demand resulted in highest value for HS8703 – Motor cars and vehicles and HS6109 – T-Shirts, singlets and vests, both with a PCI value of 0.44. The top 10 products in the analysis also showed products in three common industries which are automotive, textile and agriculture. In the case of Turkey, the products ranked highly by PCI are connected quite well in the GVC given the nature of exports in these products, however, not all of them are the drivers of the economy. The PCI Dynamic Demand was able to categorize the products by potential highest demand in the world and match it with the comparative advantage of the country.

Figure 16: PCI Dynamic Demand for Turkey

Rank	Code	Product	Value Expo	World map	Count-ry map	Distance	Trade Balance	Concen-tration	PCI
1	‘8703	Motor cars and other motor vehicles princip	0.143	0.006	0.025	0.056	0.216	-0.003	**0.44**
2	‘6109	T-shirts, singlets and other vests, knitted or	0.143	0.003	-0.004	0.060	0.238	-0.005	**0.44**
3	802	Other nuts, fresh or dried, whether or not s	0.143	0.006	-0.002	0.058	0.222	-0.006	**0.42**
4	‘1101	Wheat or meslin flour	0.119	-0.006	0.010	0.052	0.238	-0.012	**0.40**
5	‘7113	Articles of jewellery and parts thereof, of pr	0.089	0.000	0.004	0.041	0.238	-0.008	**0.36**
6	‘8704	Motor vehicles for the transport of goods, in	0.058	0.003	0.011	0.057	0.238	-0.005	**0.36**
7	‘6204	Women’s or girls’ suits, ensembles, jackets,	0.111	-0.003	0.000	0.063	0.169	-0.004	**0.33**
8	‘1905	Bread, pastry, cakes, biscuits and other bake	0.098	0.006	0.008	0.040	0.185	-0.006	**0.33**
9	805	Citrus fruit, fresh or dried	0.094	0.003	-0.004	0.035	0.188	-0.009	**0.31**
10	‘5702	Carpets and other textile floor coverings, w	0.079	0.000	-0.004	0.095	0.139	-0.004	**0.31**

Source: Authors’ own illustration

"In the case of Turkey, the products ranked highly by PCI are connected quite well in the GVC given the nature of exports in these products, however, not all of them are the drivers of the economy"

The PCI-Static Supply shows similar top ten products in the table below, however, it provides more clarity in terms of the rank. The PCI for HS8703, although remaining as the first rank is separated from HS6109. At the same time, the ranking of the products also changed based on the different weightage assigned for PCI-Static Supply. The product of HS8703 increased in PCI value to 0.46, while HS6109 recorded 0.43. Another interesting observation is the drop in rank for product of HS8704 from the sixth place to the eight place. This shows that from the supply perspective, the value exported from products of HS 7113 and HS1905 have an effect in adjusting the rank of the products.

The ranking of products changed more obviously in PCI-market access. The product of HS5702 ranked at 9th and 10th place in the first two dimensions, ranked in the first place given the available market access of Turkish carpets to nearly all markets in the world. There are also new entrants to the top ten products such as products of HS1902 – Pasta, HS 6302 - Bedlinen and HS 0804 – Dates, figs etc. which show greater market access opportunity.

Figure 17: PCI- Static Supply for Turkey

Rank	Code	Product	Value Expo	World map	Country map	Distance	Trade Balance	Concentration	PCI
1	'8703	Motor cars and other motor vehicles princip	0.238	0.004	0.037	0.056	0.130	-0.003	**0.46**
2	'6109	T-shirts, singlets and other vests, knitted or	0.238	0.002	-0.006	0.060	0.143	-0.005	**0.43**
3	802	Other nuts, fresh or dried, whether or not s	0.238	0.004	-0.003	0.058	0.133	-0.006	**0.42**
4	'1101	Wheat or meslin flour	0.198	-0.004	0.014	0.052	0.143	-0.012	**0.39**
5	'6204	Women's or girls' suits, ensembles, jackets,	0.184	-0.002	0.000	0.063	0.101	-0.004	**0.34**
6	'7113	Articles of jewellery and parts thereof, of pr	0.149	0.000	0.006	0.041	0.143	-0.008	**0.33**
7	'1905	Bread, pastry, cakes, biscuits and other bake	0.163	0.004	0.011	0.040	0.111	-0.006	**0.32**
8	'8704	Motor vehicles for the transport of goods, in	0.097	0.002	0.017	0.057	0.143	-0.005	**0.31**
9	'5702	Carpets and other textile floor coverings, w	0.132	0.000	-0.006	0.095	0.083	-0.004	**0.3**
10	'2008	Fruits, nuts and other edible parts of plants,	0.137	0.006	0.011	0.053	0.096	-0.007	**0.3**

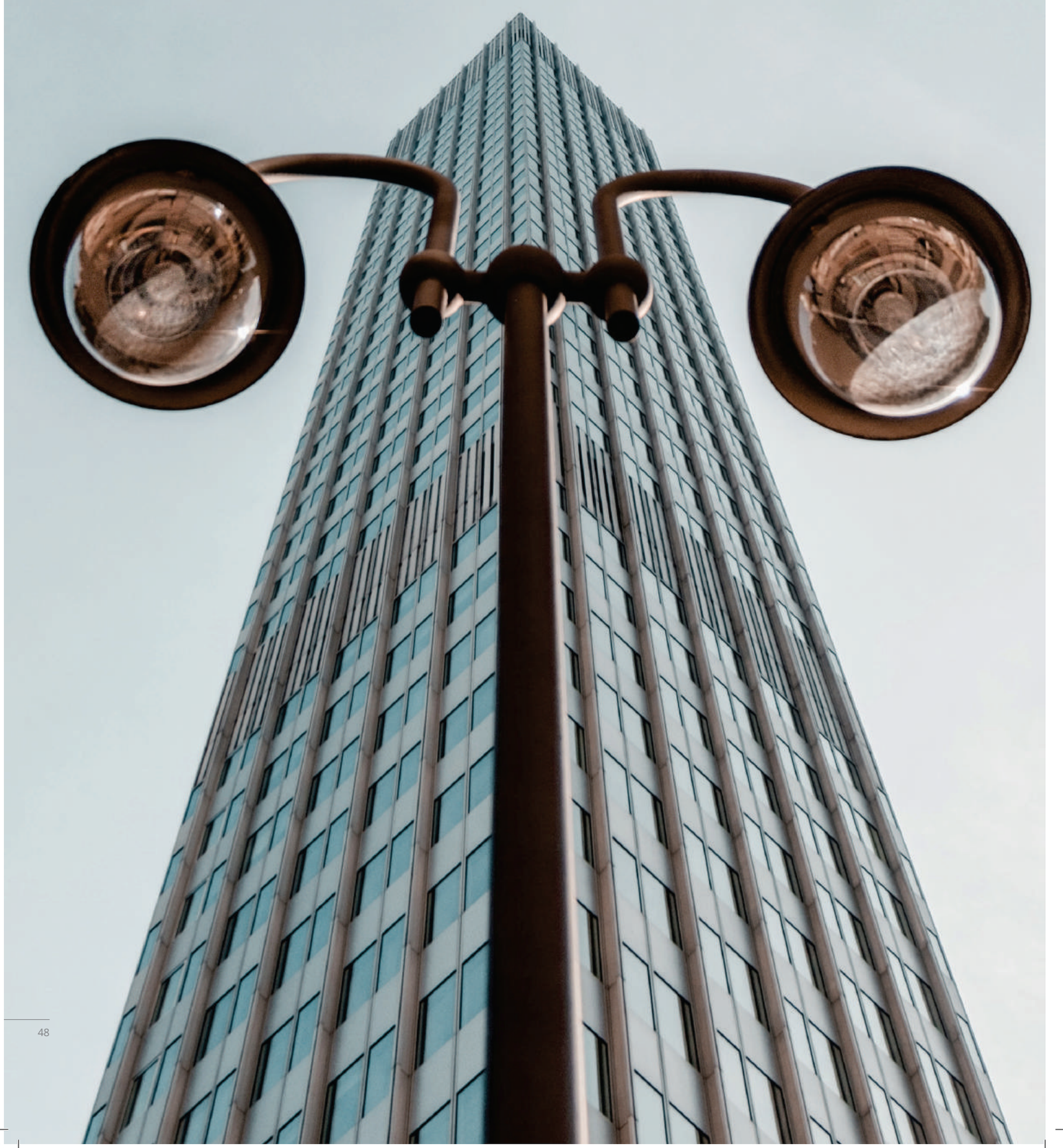
Source: Authors' own illustration

Figure 18: PCI- Market Access for Turkey

Rank	Code	Product	Value Expo	World map	Country map	Distance	Trade Balance	Concentration	PCI
1	'5702	Carpets and other textile floor coverings, w	0.026	0.000	-0.002	0.286	0.083	-0.019	**0.37**
2	'6109	T-shirts, singlets and other vests, knitted or	0.048	0.002	-0.002	0.181	0.143	-0.024	**0.35**
3	'1902	Pasta, whether or not cooked or stuffed wit	0.016	0.002	0.002	0.281	0.056	-0.012	**0.34**
4	'8703	Motor cars and other motor vehicles princip	0.048	0.004	0.012	0.167	0.130	-0.017	**0.34**
5	802	Other nuts, fresh or dried, whether or not s	0.048	0.004	-0.001	0.173	0.133	-0.031	**0.33**
6	813	Dried apricots, prunes, apples, peaches, pea	0.011	0.004	-0.005	0.286	0.038	-0.014	**0.32**
7	'8704	Motor vehicles for the transport of goods, in	0.019	0.002	0.006	0.171	0.143	-0.026	**0.31**
8	'6302	Bedlinen, table linen, toilet linen and kitche	0.020	0.002	0.000	0.255	0.061	-0.026	**0.31**
9	'6204	Women's or girls' suits, ensembles, jackets,	0.037	-0.002	0.000	0.188	0.101	-0.021	**0.3**
10	804	Dates, figs, pineapples, avocados, guavas, m	0.011	0.019	0.003	0.248	0.033	-0.017	**0.3**

Source: Authors' own illustration

"Currently, GVCs make up about two thirds of the world trade, where goods can cross multiple borders along the global value chain"



Identifying and Measuring the Highest-Potential Value Chains: Step 3

TheThe third step of the value chain analysis includes one of the most important elements in plugging into GVCs, the value-added factor. The general definition of value added is the difference between a product's market sales price and the cost of input material. However, value added that is related to the GVCs is the trade in value added, which is a statistical method used to estimate sources of value added when producing goods for export and import. Trade in value added shows the value added of source industries and countries in the production chain to the final exports and allocates the value added to these source industries and countries.

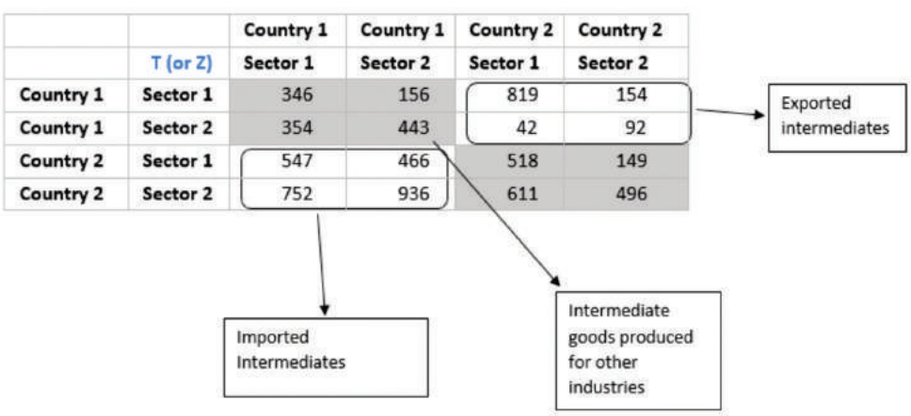
Since GVCs are organized at different levels of activities and production, the measurement of trade in value added actually indicates how a country exports in today's highly interconnected economy, which uses intermediate items imported from various industries in different countries, and it also acts as a more accurate indicator of exports. Currently, GVCs make up about two thirds of the world trade, where goods can cross multiple borders along the global value chain. Due to the complexity of production across different countries, conventional measures of international trade do not paint an accurate picture if the value of trade is merely used for analysis. As an example, for production which involves multiple countries, gross value for trade does not show the link of foreign value added in the upstream process connected to the final customer. The reason for this issue is that official statistical information for trade was designed before the GVC era. Therefore, with the evolving nature of GVCs, a joint initiative was developed by the Organization for Economic Co-operation and Development (OECD) and the World Trade Organization to include value added in trade to capture the contribution of all countries involved in production.

As an outcome of this initiative, the global input-output table was introduced and is generally used to derive data on the value added by each country and sector, which includes calculations of domestic value added, foreign value added and indirect value added. These calculations enable a comprehensive understanding of how a country participates in the GVC and the linkages between industries or sectors in the economy.

The two most commonly used input-output tables are the OECD Inter-Country Input-Output Table and World Input-Output Database. However, due to the limited number of countries covered by the OECD table, we use the Eora Input-Output Table, which covers 189 countries and includes all IsDB member countries.

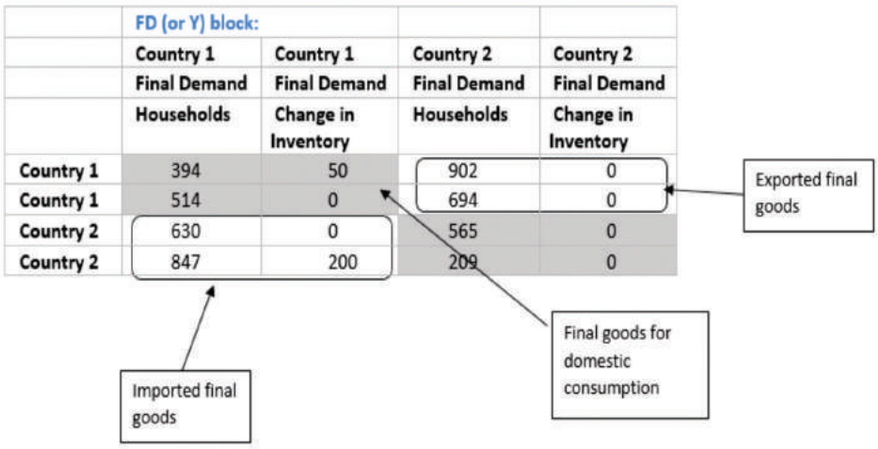
In general, an input-output table can be divided into three blocks: intermediate good demand (also known as the T matrix in Eora), final demand (FD matrix) and primary inputs/value added (VA matrix). The T matrix provides details for intermediate goods, which include the intermediate import required for an industry, intermediate export from the industry and how much intermediate goods are produced for other industries, as illustrated in Figure 19. The FD matrix (see Figure 20) provides details on final goods used domestically, final goods imported and final goods exported to other countries. The VA matrix include the primary input, which encompass six elements (compensation of employees, taxes on production, subsidies on production, net operating surplus, net mixed income, consumption of fixed capital). When these three blocks are stacked together, they create the global input-output table given in Figure 21.

Figure 19: Example of a T matrix from the input-output table for a two-country, two- industry universe



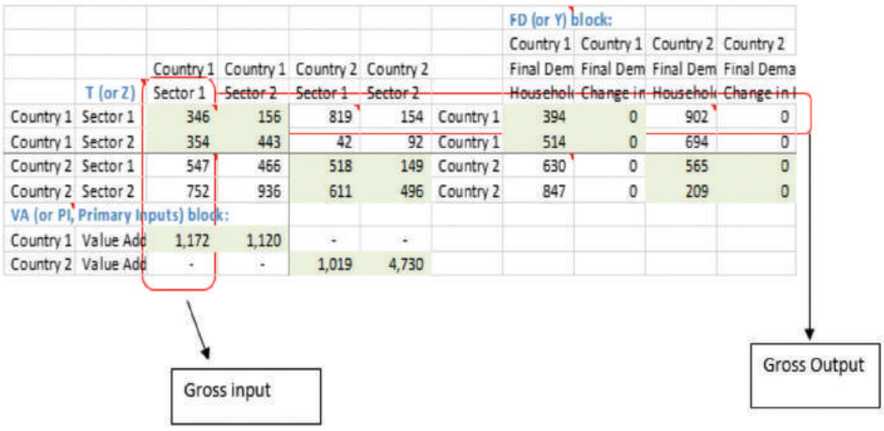
Source: Authors' own illustration

Figure 20: Example of a final demand (FD) matrix



Source: Authors' own illustration

Figure 21: Example of a global input-output table



Source: Authors' own illustration

The trade in value added is calculated using basic matrix algebra with the following steps:

The gross output for a sector is the sum of the T matrix and the FD matrix, which is the sum of output produced by the sector for intermediate goods (including exported goods and goods used by other sectors) and for final goods produced for export and domestic consumption.

(1) Gross output (X) = intermediate goods produced + final goods produced (Y)

The above formula can be deduced from the input-output table. The intermediate goods are represented by the gross output (X) and the multiplication with an A matrix. A is an input-output coefficient which represents a unit of intermediate goods needed to produce a unit of gross output. As a result, the formula is as follows:

(2) $X = AX + Y$

Next, in order to represent the gross output by using final goods produced, matrix B is created. This is a Leontief inverse matrix that expresses the total output required, both directly and indirectly, to produce a unit for final demand.

(3) $X = BY$

By combining and rearranging equation 2 and 3, the formula for matrix B is developed as equation 4.

(4) $B = (I - A)^{-1}$

Subsequently, the share of domestic value added (V) is calculated for each sector using the A matrix by subtracting one from the sum of the corresponding column from the A matrix. This is represented by gross output for a sector subtracted by the input, divided by the gross output.

The domestic value added share matrix is then multiplied by the Leontief inverse (B) matrix. This gives the value added share matrix VB, which represents information on value added production by source of country for the relevant sector.[REF]

$VB = V * B$

(5) Lastly, multiplying VB by gross export (diagonals of a square matrix) produces the Tv matrix.

$Tv = VB * Gross\ export$

Subsequently, the Tv matrix is used to calculate foreign value added (FVA), indirect value added (DVX) and domestic value added (DVA). These calculations can be performed at country level or at a more detailed country-sector level. For the country-sector specific level, DVA can be calculated by adding the rows of the Tv matrix that represent the different sectors for the specific country and the relevant column for the specific country-sector; DVX is calculated by adding all the rows of the VB matrix excluding the DVA amount, and FVA can be calculated by summing all the relevant country-sector specific columns excluding the column used for DVA.

FVA represents the imported intermediate input content of exports, and DVX represents the portion of exports that are used by another country to produce their exports. Using these two terms, a GVC participation index and position index can be calculated.

GVC position index defined in Koopman (2014) as

$$GVC\ position\ index = ln\left(1 + \frac{DVX}{Gross\ export}\right) - ln\left(1 + \frac{FVA}{Gross\ export}\right)$$

The GVC position index represent the upstreamness of a country by assuming that the higher the value, the greater amount of its intermediate goods are used for other countries' exports, implying that the country's production for the goods lies at the upstream stage.

In addition to the position index, a GVC participation index is required to capture the full picture. Thus, a GVC participation formula, mainly adopted from Aslam et al. (2017), is as follows:

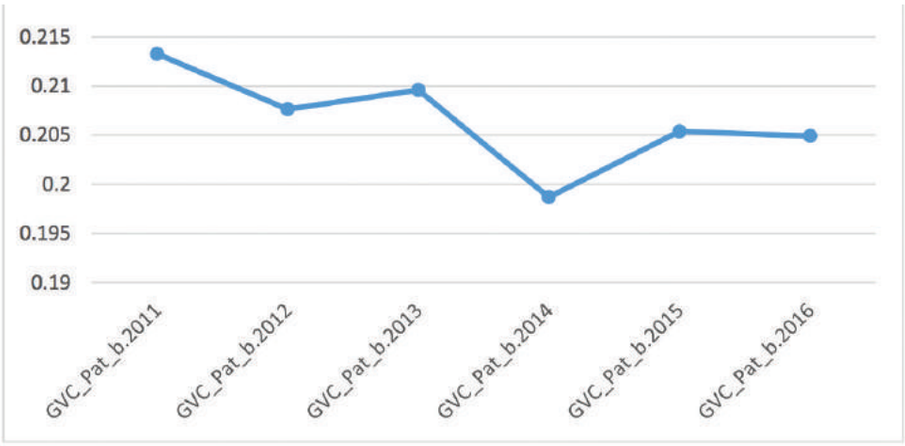
$$GVC\ participation = \frac{FVA+DVX}{Gross\ export}$$

The formula captures the different stages of production and the global linkages created in a particular production process. A higher FVA implies a backward participation, and a higher DVX means greater forward participation. The ratio combines both the forward and backward linkages, with the result that a higher GVC participation ratio for a country indicates that it is more closely linked with the global value chain.

Based on the GVC participation index, a general calculation of all industries were undertaken for 43 of the Bank's member countries as shown in Figure 22 below using Eora data. The GVC participation from year 2011 to 2016 showed a decreasing trend in general.


GEAR

Figure 22: GVC Participation of IsDB Member Countries for all industries

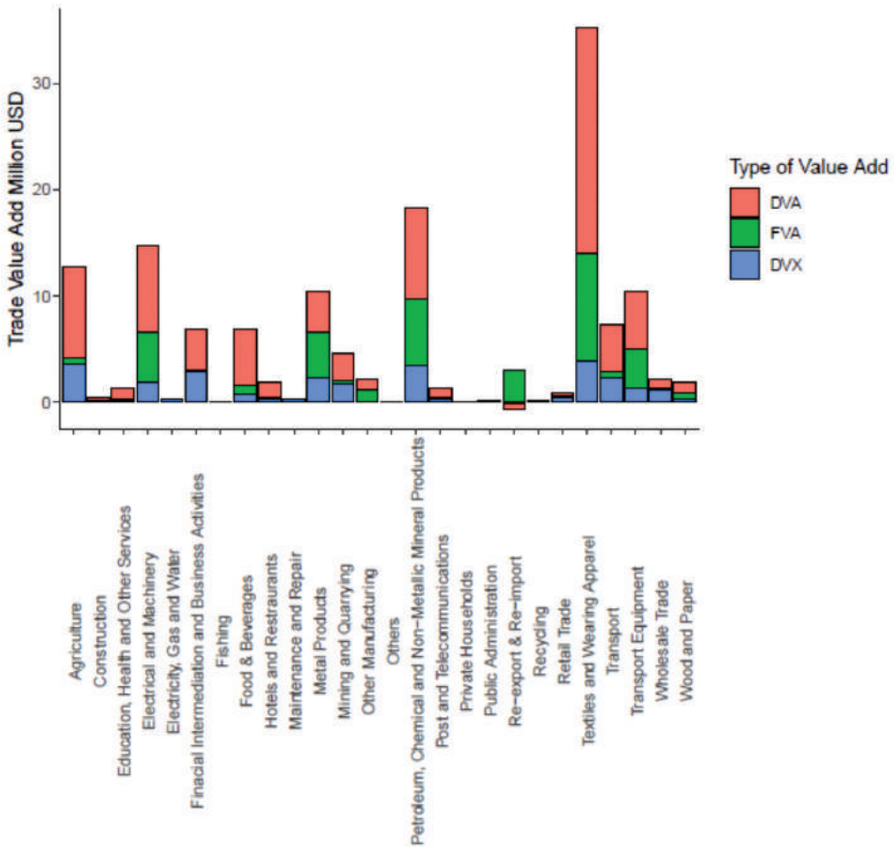


Source: Authors' own analysis based on Eora I-O Table

The calculations for analysis from the input-output table is coded both in R and in MATLAB, and the resulting code provides a template (illustrated below) for domestic value added (DVA), indirect value added (DVX), foreign value added (FVA), export breakdowns, the global value chain (GVC) position index and the GVC participation index. Turkey has been chosen as an example.

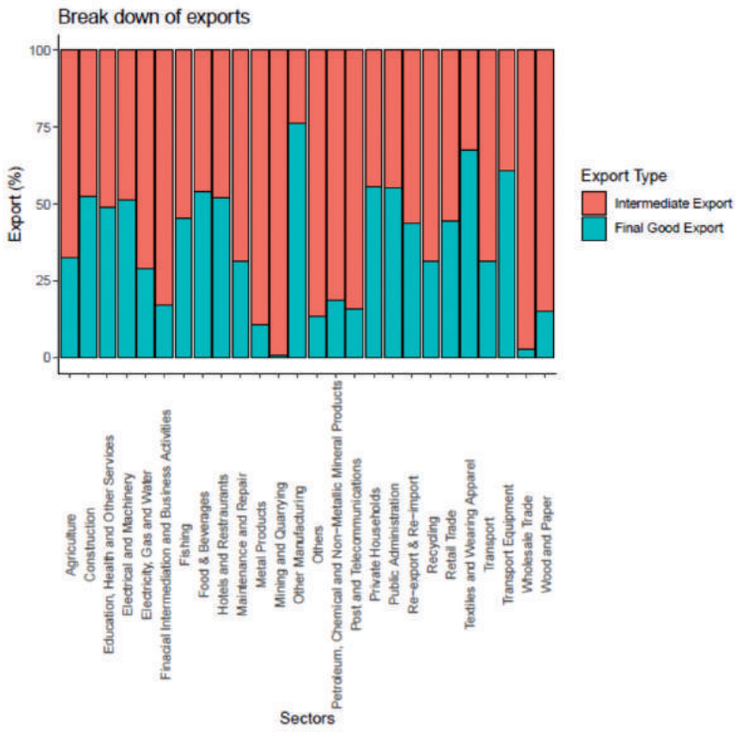
The first diagram (Figure 23) is a stacked bar chart of DVA, DVX and FVA for each sector.

Figure 23: Domestic, Foreign and Indirect Value Add stacked bar chart



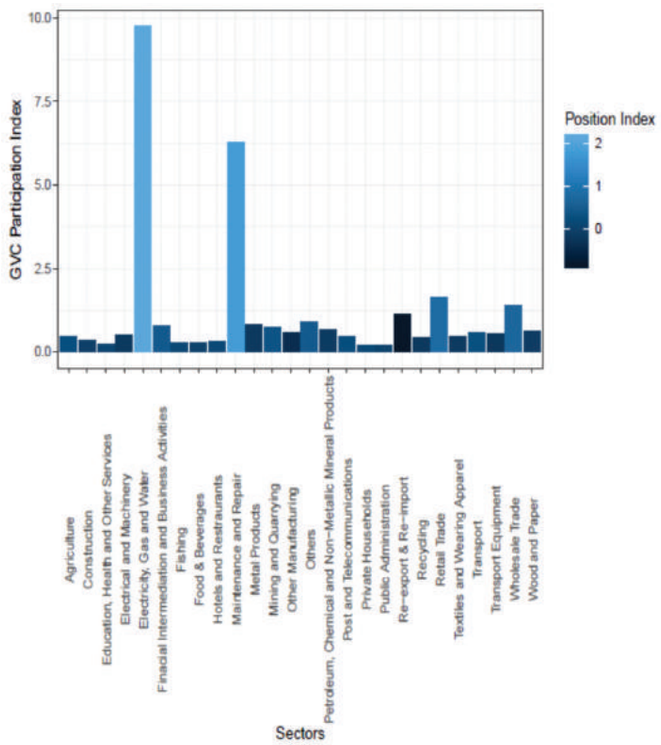
Source Figure 22 & 23: Authors' own analysis based on Eora I-O Table

Figure 24: Intermediate and final good export breakdown



Source: Authors' own analysis based on Eora I-O Table

Figure 25: GVC Participation and Position Index



Source: Authors' own analysis based on Eora I-O Table

Figure 26: GVC Compiled Data

Sector	Gross Output	Intermediate Export	Final Good Export	Gross Export	DVA	FVA	DVX	DVA%Gross Export	FVA%Gross Export	DVX%Gross Export	GVC_participation	Position Index
Agriculture	7898841	6116148.128	2.941042e+06	9057190.535	8546970.722	5.102198e+05	3612857.960	94.36669	5.6333121	39.889389	0.4552270	0.2808782541
Fishing	1633079	39113.639	3.220662e+04	71320.255	67267.490	4.052765e+03	14827.192	94.31751	5.6824881	20.789595	0.2647208	0.1336109465
Mining and Quarrying	8273712	2804780.211	2.639189e+04	2831172.105	2509567.841	3.216043e+05	1749143.706	88.64060	11.3594035	61.781610	0.7314101	0.3734844987
Food & Beverages	80603677	2837352.667	3.323070e+06	6160422.378	5358500.139	8.019222e+05	806182.573	86.98267	13.0173256	13.086482	0.2610381	0.0006117236
Textiles and Wearing Apparel	86881560	10174173.881	2.105334e+07	31227512.224	21143193.011	1.008432e+07	3967325.111	67.70694	32.2930599	12.704583	0.4499764	-0.1602495292
Wood and Paper	14973922	1278556.605	2.265549e+05	1505111.490	918444.166	5.866673e+05	365411.242	61.02167	38.9783300	24.278018	0.6325635	-0.1117968831
Petroleum, Chemical and Non-Metallic Mineral Products	60943361	12030627.039	2.738094e+06	14768721.233	8534283.153	6.234438e+06	3461283.917	57.78620	42.2137975	23.436585	0.6565038	-0.1416039987
Metal Products	29796030	7353523.771	9.013362e+05	8254859.972	3859914.224	4.394946e+06	2267105.763	46.75929	53.2407062	27.463891	0.8070460	-0.1841768101
Electrical and Machinery	45939798	6190567.689	6.524233e+06	12714800.700	8026364.613	4.688436e+06	1955590.599	63.12615	36.8738465	15.380427	0.5225427	-0.1708249460
Transport Equipment	21583441	3585198.240	5.555386e+06	9140583.780	5375357.875	3.765226e+06	1268464.887	58.80760	41.1924008	13.877285	0.5506969	-0.2150020811
Other Manufacturing	15494965	503520.821	1.613633e+06	2117154.029	963470.288	1.153684e+06	80636.345	45.50780	54.4921968	3.808714	0.5830091	-0.3975936707
Recycling	130417	89389.919	4.108296e+04	130472.882	89037.010	4.143587e+04	12518.556	68.24177	31.7582258	9.594757	0.4135298	-0.1841790811
Electricity, Gas and Water	27556964	26632.487	1.085629e+04	37488.781	27440.780	1.004800e+04	355441.605	73.19731	26.8026894	948.127924	9.7493061	2.1121286705
Construction	74471122	194980.083	2.165739e+05	411554.005	329822.259	8.173175e+04	61440.436	80.14070	19.8593004	14.928888	0.3478819	-0.0420049872
Maintenance and Repair	21150094	34574.387	1.574511e+04	50319.500	42422.075	7.897425e+03	308000.787	84.30544	15.6945625	612.090318	6.2778488	1.8172511180
Wholesale Trade	44015649	924988.743	2.789939e+04	952888.133	843164.000	1.097241e+05	1226816.334	88.48510	11.5149018	128.957040	1.4047194	0.7193761591
Retail Trade	48440687	189881.491	1.531963e+05	343077.807	307605.979	3.547183e+04	521327.847	89.66070	10.3392953	151.956156	1.6229545	0.8256949665
Hotels and Restaurants	31645763	718081.304	7.830154e+05	1501096.709	1389348.522	1.117482e+05	366945.603	92.55556	7.4444362	24.445167	0.3188960	0.1468913547
Transport	107923311	3399240.492	1.553938e+06	4953178.467	4408671.769	5.445067e+05	2392038.715	89.00692	10.9930765	48.293005	0.5828608	0.2897222533
Post and Telecommunications	17509701	795732.156	1.521541e+05	947886.271	872471.874	7.541440e+04	370323.162	92.04394	7.9560597	39.068312	0.4702437	0.2532409731
Financial Intermediation and Business Activities	144348331	3383886.654	6.941960e+05	4078082.647	3853020.209	2.250624e+05	2874189.135	94.48117	5.5188297	70.478933	0.7599776	0.4797223109
Public Administration	57912124	55374.296	6.863757e+04	124011.863	114299.852	9.712011e+03	14428.024	92.16848	7.8315180	11.634390	0.1946591	0.0346591650
Education, Health and Other Services	87035251	612804.488	5.829079e+05	1195712.381	1107961.180	8.775120e+04	204841.297	92.66118	7.3388218	17.131319	0.2447014	0.0873052953
Private Households	1200513	7118.001	8.972818e+03	16090.819	16020.575	7.024390e+01	2808.380	99.56345	0.4365465	17.453309	0.1788986	0.1565147377
Others	2304821	1096.593	1.683359e+02	1265.929	1124.119	1.418103e+02	1010.268	88.79792	11.2020769	79.804449	0.9100653	0.4805208055
Re-export & Re-import	2577512	1445226.129	1.132266e+06	2577491.772	-510567.038	3.088059e+06	-152422.575	-19.80868	119.8086777	-5.913601	1.1389508	-0.8485440213

Source: Authors' own analysis based on Eora I-O Table

The second diagram (Figure 24) displays a breakdown of the type export (intermediate or final goods) for each sector.

The third graph (Figure 25) is a bar graph that illustrates GVC participation for each sector, and the colour variant displays the GVC position index (the lighter the colour, the more upstream the production lies; the darker the colour, the more downstream the production process).

The final output of the analysis is a table with all the data for the value add calculations.

6

ISDB'S GLOBAL VALUE CHAIN APPROACH: GLOBAL VALUE CHAIN QUALITATIVE ANALYSIS

The Bank aims to make its MCs' markets work better by: (1) identifying the markets and products in which the country has a natural advantage, (2) analyzing global value chains to boost the chain so that the country can better specialize in these products, and thus, (3) promoting industrial development and economic growth. The third and final step of the GVC exercise is to conduct the qualitative analysis of the selected product or industry. The results of this analysis will identify bottlenecks, capacity gaps, and the products' potential in the whole chain from the initial production stage to the export distribution stage. At each stage of the value chain analysis, interventions, whether these are hard infrastructures and/or strategies and sectoral policies to strengthen the chain.

The specific objectives of the value chain analysis are to identify the competitive sectors in the Bank's MCs in order to single out areas of possible performance improvement and consequently to design custom-tailored projects to be supported jointly by donors and development partners. The qualitative analysis is organized in the framework below, similar to the quantitative framework, taking into account of natural potential, dynamic potential and surplus & spillover potential.

The natural potential identifies capabilities of each chain in the entire value chain, assesses the skills and quality of labour, maps the actors and activities, identifies policies, infrastructure and costs of the existing value chain. The dynamic potential assesses the buyer's perspective and global demand outlook of a particular industry or product , investment environment and attraction, technological development in the context of the product globally, access to market, price competition in global market and the uniqueness of the product. The surplus and spill over potential evaluates how improvements in the chain may have spillover potential to other industries and the entire economy. It is evaluated by assessing the enablers to other industries, local supplier or vendor development and skills, technology, cost and infrastructure spillover effects to other industries.

Before proceeding with the qualitative analysis on the highest-potential value chains, a summary of the findings based on the quantitative methodology is presented in the Figure 28 using a traffic light indication. All three methods aligned to natural potential, dynamic potential and surplus and spillover potential are presented together with the industries and products that are the result of the analysis. Green boxes represents high values, while yellow boxes represent medium value and red is low value. This table provides clear indications and maps out the industries and products from the three different steps in the quantitative method described in the previous chapter.

Once the selection of industry and product is completed with active engagement with the country, the qualitative analysis based on IsDB's GVC Qualitative framework is conducted on the selected product or industry. The guiding steps for a qualitative analysis for country engagement is described below:

Figure 27: IsDB's GVC Qualitative framework

Natural Potential	Dynamic Potential	Surplus & Spillover Potential
Capabilities of each chain in the entire value chain	Buyer's perspective and global demand	Enablers to other industries
Skills and quality of labour	Investment environment and attraction	Local supply/vendor development
Mapping and identification of activities	Technological development	Skills spillover to other industries
Existence of firms and capabilities of firms	Access to market	Technology spillover effects
Government Policies and Infrastructure	Price competition	Infrastructure spillover effects
Access to raw material and cost (input cost)	Uniqueness/ Niche of product	Cost spillover effects

Source: Authors' own illustration

Figure 28: Example of Quantitative Analysis presentation

Industry	Product	Natural Potential (RCA)	Natural Potential (RCA)	Natural Potential (RCA)
Petroleum	Crude Oil			
Wood	Sawn wood/Wood for veneering			
Mining	Manganese			
Agriculture/Agribusiness	Palm oil, fertilizers, rubber			
Transport	Ships, boats			

Source: Authors' own illustration

Step 1: Value Chain Assessment and Validation

This task is carried out to assess the selected value chains. Based on the quantitative methodology in the previous chapter, a product or an industry is selected. A qualitative assessment is conducted by a value chain expert or specialist through the following actions in the table below. The value chain assessment and validation is carried out in consultation with the relevant ministries or agencies as well as conducting survey, collecting data and summarizing the assessment and validation.

STEP 1: VALUE CHAIN ASSESSMENT AND VALIDATION		
NATURAL POTENTIAL	DYNAMIC POTENTIAL	SURPLUS & SPILLOVER POTENTIAL
Conducting a desk review available data and verifying drivers and constraints of the value chain; considering the competitors and available performance data as well as the production, trade, and main competitiveness factors impacting the performance of the industry or product under study	Undertaking a brief market assessment to identify local, national and regional trends, market size, supply and demand gaps, imports and exports, distribution networks, etc. Review of policies that support the product or industry. This review focuses on policies, incentives, available export promotion tools, financing of tangible and intangible capital outlays, training, employment, quality promotion, certification, standardization, competition, research and development, and partnerships in the particular industry or product environment.	Reviewing the economic and industrial environment in which the value chain operates and identifying similar industries with the processes, functions, machines and labour that are identical or similarly related to the value chain.

Step 2: Mapping the Value Chain

In consultation with stakeholders, a value chain mapping exercise is next conducted. The mapping exercise requires a complete on the ground data collection that is supplemented by guiding questions to describe and complete the mapping exercise of the value chain. The mapping exercise is described in the table below.

The guiding questions for the mapping exercise are as follows:

1. What is the nature of the product that define the chain?
2. What are the core functions (processes of transformation) in the value chain?
3. What is the productivity level of each processes of transformation?
4. How do actors interact and organize the transaction of products?
5. Through what channels do products flow to end-markets and what are the volumes of these flows?
6. What types of supplies and services feed into the value chain?
7. Which types of actors participate in the value chain, what functions do they perform, and how many are there?

STEP 2: MAPPING THE VALUE CHAIN		
NATURAL POTENTIAL	DYNAMIC POTENTIAL	SURPLUS & SPILLOVER POTENTIAL
Describing the structure and flow of the chain in logical clusters: the various actors and activities of the chain, the links among them, and the whole range of chain operations from pre-production (R&D, supply of inputs) to industrial processing, distribution and marketing. Quantifying the value chain. This involves adding detail to the basic maps drawn initially (structure and flow). Depending on the level of detail needed for the research entry point, this exercise may focus on elements such as size and scale of main actors, production volume, number of jobs, sales and export destinations and concentration, policy and regulatory framework, etc.	Describing the global value chain that connects the particular product from backward and forward linkage perspective. Identifying companies and actors that support the value chain beyond national borders. Creating a simple map of all values and processes that complete the value chain from a global perspective.	Describing local industries and processes that support the value chain. Map the local supporting industries in terms of location, cost and efficiency of delivery.

Step 3: Analyzing Value Chain Activities and Performance

This task is to analyze the performance and competitiveness capabilities of the value chain in the context of national and global trends in the target industry. This task is described as follows:

STEP 3: ANALYZING VALUE CHAIN ACTIVITIES AND PERFORMANCE		
NATURAL POTENTIAL	DYNAMIC POTENTIAL	SURPLUS & SPILLOVER POTENTIAL
Identifying key quantitative and qualitative indicators (time, cost, value added and productivity at each stage) for the selected value chain. Analyzing the value chain technological capacities, including utilization of inputs, the production system and the products manufactured. Analyzing the employment type by skills and income, working conditions and incentives/ Conduct performance analysis on existing government policies and infrastructure that support the product or industry.	Analyzing the value chain external sources of competitiveness, including its economic and social environment and its industrial and technological environment. Carrying out an economic performance analysis and benchmarking against potential competitors. Conduct technology foresights study to understand trend and market direction of the product by looking into IP registration, R&D in the particular industry and innovative solution trends.	Analyzing local industries and processes that support the value chain. Analyzing education, skills and training required for the particular product/industry that can have potential impact to other transferable industry. Analyzing machineries and technology that can be used commonly with other industries. Identifying local companies and vendors that can supply to the value chain from other industries and tapping the potential producing and supplying to this particular value chain.

The guiding questions that form part of the survey for this step are as follows:

1. What are the characteristics of the primary products used in the value chain in terms of quality, quantity, price and availability?
2. Who are the primary producers and input providers? How are they organized? What support do they receive? Under what contractual conditions do they sell?
3. What logistical activities are required to source inputs and supplies in the value chain? How do firms manage logistics and what is the quality of logistics services that independent agents provide? What are the frequency and the quality of interactions between buyers and suppliers?
4. In what way does the state of physical infrastructure, particularly roads, transport facilities, and trans-shipment points, impede the sourcing of products?
5. What are the common practices of communication and information exchange with suppliers and to what extent does trust exist in supplier relationships?
6. What is the current capacity of firms in the various segments of the value chain to produce, and how are they endowed in terms of human resources, machinery, facilities and other resources? In what way do these capacities affect the level of production, transformation and processing?
7. What type of processing and transformation technology is currently used by principal companies in the industry? What is the effectiveness and efficiency of this technology?
8. What technical, local and other knowledge is being used in the value chain? Who has access to knowledge and who provides knowledge? How is knowledge being shared and jointly developed?
9. How do the technologies used in the value chain compare with best practices in the country, the region and in other parts of the world?
10. What options are available to innovate, extend or adjust production capacities and technologies in the value chain, and what opportunities exist for technological upgrading and product development?
11. What type of knowledge is used in the various production and transformation processes in the value chain?
12. How great are the discrepancies and variance in the use of knowledge across actors in the chain (from artisanal to sophisticated)?
13. What is the share of foreign technology being used in the value chain? 14. How high is the percentage of share in exports to developed countries?
15. What is the size and quality of research and development facilities and activities that contribute to innovations in the value chain?
16. Are there technological innovations available on the market that could be applied in and adapted to processes in the value chain?
17. What are the costs incurred in introducing new technology, including the costs for the equipment, training of staff, redundancy of old equipment, etc.

Step 4: Identifying Value Chain Performance Constraints and Development Opportunities

This task is to define lacking competitiveness drivers (chain constraints) and to analyze opportunities for value chain development. It entails:

STEP 4: IDENTIFYING CONSTRAINTS AND DEVELOPMENT OPPORTUNITIES		
NATURAL POTENTIAL	DYNAMIC POTENTIAL	SURPLUS & SPILLOVER POTENTIAL
Defining the value chain vision and objectives by taking into consideration the findings of the mapping exercise and of the overall assessment. Identifying constraints and ranking them by assessing their impact on backward and forward linkages. Identifying and ranking potential development opportunities in the chain.	Defining the future view of the value chain based on global technology development. Benchmarking against countries that produce more complex products in the same value chain. Conduct market study to enter potential new opportunities.	Identify common constraints of the value chain with other industries in the country. Rank and develop a list of interventions that are cross cutting different industries.

The guiding questions for this step which are directed to the mapped stakeholders in the value chain are as follows:

1. How costly is it and how much time does it take to set up and run a business in compliance with the regulatory and administrative requirements?
2. What trade regulations affect businesses in the value chain?
3. What complementary services, ranging from roads, to construction of houses, to education and research, are available to foster development in the value chain?
4. What social norms and institutions influence business culture and behavior of actors in the value chain?
5. Number of days required to set up a business in the value chain?
6. Number of start-up businesses/enterprises failed in the various segments of the value chain? Level of foreign direct investment in the value chain?
7. Can the product be sold on the local market/exported?
8. Is there a duty or levy that must be paid to sell/export the product? How high is it?
9. What kind of administrative requirements must be fulfilled to produce, sell or export the product (accreditation, license, permits)?
10. Do exporters have to adjust a product's quality to be able to sell/export it? What efforts would this take?
11. Do exporters have to adjust production processes (safety, social standards and environmental standards) in order to sell/export the product?
12. What ethnic groups, societal classes and gender groups are engaged in the various segments of the value chain? Can individuals of any other group participate?
13. Which institutions build the basis for trust and business relationships in the chain?
14. What social norms guide the contractual relationships established between buyers and seller?
15. Are there ways to support initiatives addressing macro level constraints that affect businesses in the value chain?
16. How can labour regulations be improved so that they benefit workers while maintaining profitable businesses?
17. How can internal sales and export regulations be simplified and modified to increase the chances for more productive/competitive businesses in the value chain?
18. How can public and private support service providers be strengthened?
19. How can certain marginalized groups of the society be empowered so that they are able to participate and benefit in the value chain?
20. How can access to basic infrastructure be improved?
21. How do investors rate the attractiveness of businesses in the value chain in relation to other chains and other sectors?
22. How do investors rate the risks of financing activities in the value chain?
23. How do the legal system, financial infrastructure, and social norms and customs support or impede informal and formal financial transactions within the value chain?
24. How much and what type of funding is actually provided by a) informal financial sources and b) formal financial institutions? Is there any form of specific value chain finance?
25. How much and what type of finance do businesses need?
26. Are there ways that financing can be improved for the benefit of some or all of the actors in the chain? How can government and donor support contribute to this? What would be the impact of this improvement?
27. Can new mechanisms of formal, informal and value chain finance be introduced? What are the constraints to their introduction?
28. How can businesses practices, accounting and contracting among small and medium-sized enterprises be formalized in a way that would allow more substantial formal and informal finance?

Step 5: Defining Development Interventions

This task establishes the intervention development strategy and entails:

STEP 5: DEFINING DEVELOPMENT INTERVENTIONS		
NATURAL POTENTIAL	DYNAMIC POTENTIAL	SURPLUS & SPILLOVER POTENTIAL
The formulation of the value chain upgrading or deepening strategy, including required interventions and related investments and planning of actions. Identification of specific projects that will enable to deliver the outcomes of the strategy with development impact along the value chain.	Recommendations on policy measures and support programs to be undertaken in order to enhance the competitive performance of the industry should be duly considered. The same applies to support services (technology, financing, investment and export promotion, etc.). Identification of projects that can be disruptive but at the same time create a niche for the country based on proven capabilities in the country. The projects could be of industrial upgrading that may require technology or research capacity to achieve it.	Recommendations on industrial partnership with other sectors and policy recommendations on industries that support the value chain. Recommendation and listing of potential vendors and local suppliers and producers that may support the value chain through a vendor/supplier development plan. Identification of projects that may have cross cutting impact to the particular value chain and other industries. The projects could be industrial deepening in nature and provide common hard infrastructure to the country.

The intervention development strategy draws back to the initial quantitative analysis that focuses on potential product or industry champions. The projects and policy recommendations is guided by the intervention framework as described below. The aim of the framework is to provide a systematic tool for the Bank and its MCs to categorize the type of industrialization and at the same time act as an intervention strategy tool that guides the Bank's future interventions. The intervention framework guides the thinking and long-term relationship of the Bank and its MCs. The framework can coordinate policies that cut across areas such as human capital and skills, infrastructure, finance, trade and science and technology. The main thrusts of the interventions are distinguished as soft or hard interventions (see Figure 29). Soft interventions cover broad areas of science, technology and innovation that are required in upgrading a country's position in industrialization. Hard interventions are economic and social infrastructure areas such as energy, health, education and infrastructure that would support greater deepening of industries.

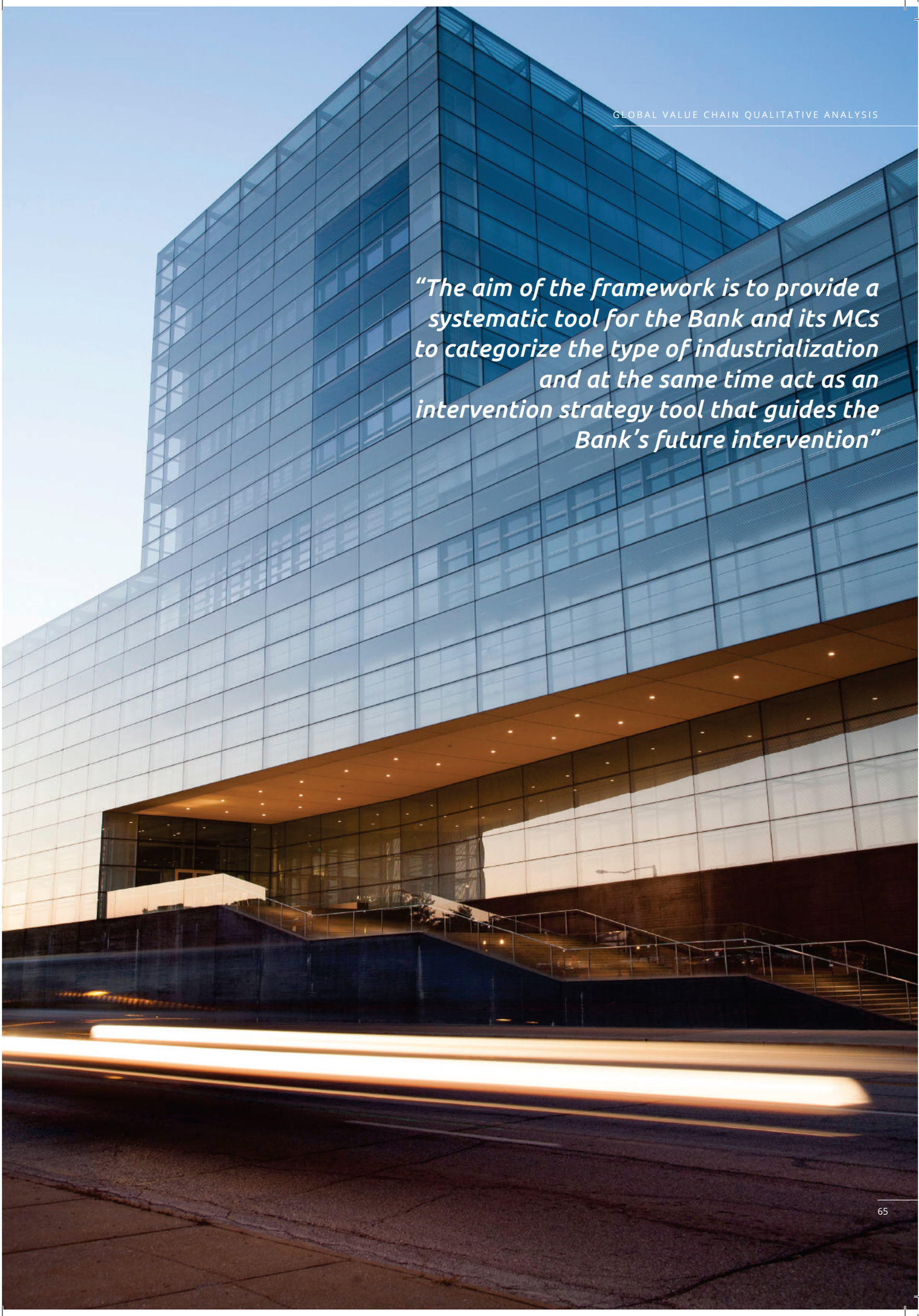
The framework is divided into two paradigms of interventions, namely the industrial upgrading interventions and the industrial deepening interventions.

Industrial upgrading

The industrial upgrading interventions are aimed at efforts to close gaps to move into more complex, science, technology and innovation-driven products that would allow countries to have first-mover advantages, attract quality investments and provide more sustainable and inclusive growth.

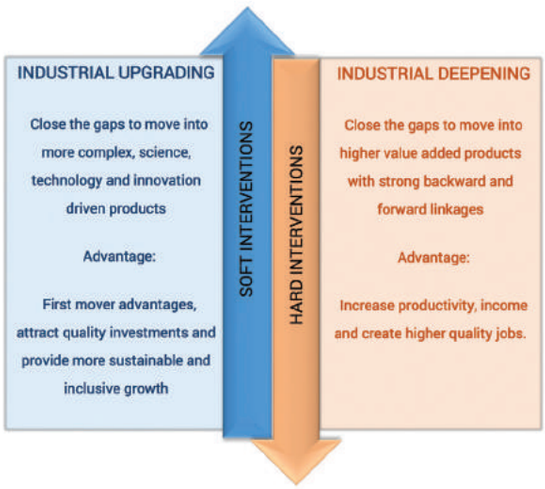
Industrial deepening

The industrial deepening interventions, on the other hand, are aimed at efforts to close gaps to move into higher value-added products with strong backward and forward linkages in an economy that would allow countries to increase productivity and income and create higher-quality jobs.



"The aim of the framework is to provide a systematic tool for the Bank and its MCs to categorize the type of industrialization and at the same time act as an intervention strategy tool that guides the Bank's future intervention"

Figure 29: Industrialization intervention framework



Source: Authors' own illustration

Both paradigms support the speed and nature of the private sector needs and reduce incoherent policies. The intervention framework attempts to improve the business environment or to alter the structure of economic activity towards sectors, technologies or tasks that are expected to offer better prospects for sustainable and inclusive growth than would occur in the absence of such interventions.

How does the intervention framework connect to the highest-potential value chains?

Based on both the industrial upgrading and deepening approaches of interventions, the methodology in the previous chapter is connected to this intervention framework by the products of industry. The PCI identifies the highest-potential products that a country can competitively produce to integrate into the GVC. The product-level value chain based on the highest PCI is connected to industrial upgrading with soft interventions (see Figure 19 below). Essentially, a product that is produced in a country competitively for the global market usually already has the necessary hard infrastructure required to compete more intensively at the global market, thus requiring an upgrade in skills, education or research and development that may innovate new products or strengthen the market share of the particular country in the world. On the other hand, industries that are selected by the GVC value added and industry champion indices will represent broad industries with highest spillover effects for the economy. An industrial deepening approach to increase the productivity and competitiveness of the entire industry will require hard interventions that support industry-wide improvements.

Ultimately, both these intervention types are interchangeable based on the qualitative analysis undertaken for a particular country. The projects and policy recommendations that are developed at this stage should address both the quantitative and qualitative framework of selecting and measuring the highest potential value chains.

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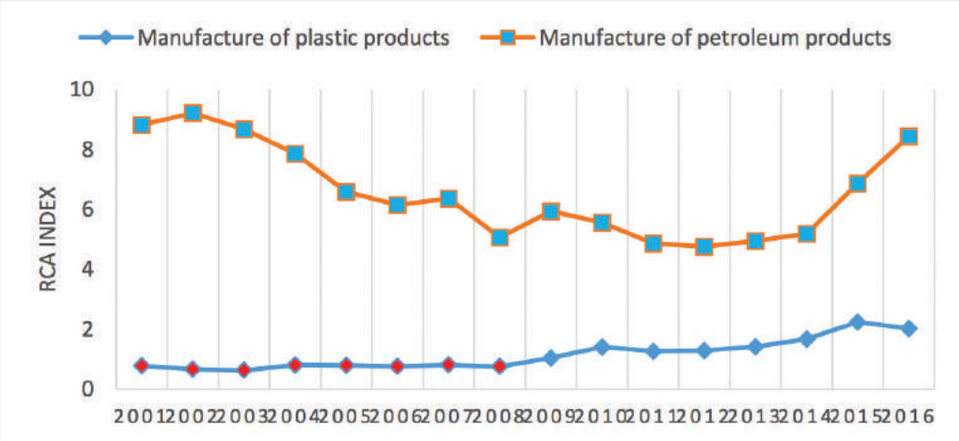
INDUSTRIAL UPGRADING OR DEEPENING FOR KINGDOM OF SAUDI ARABIA?

This article analyzes and provides recommendations for boosting Saudi Arabia's economic diversification in untapped areas of the economy through specializing in value chain and using either an industrial upgrading or deepening approach. By seizing the opportunities in industries with potential upgrading or deepening, the transformation in the selected value chains would increase the non-oil exports from $46 billion to $248 billion, contributing to the non-oil revenue and increasing the proportion of high-income jobs from 12% to 30%, in line with the objective of inclusive development by 2030.

Industrial Upgrading or Deepening for Kingdom of Saudi Arabia?

Saudi Arabia has embarked on a journey to transform its economy with Vision 2030, which lays out a strong foundation for inclusive development, the most important thrust of which is economic diversification, requiring an increase in non-oil revenue from SAR 163 billion to SAR 1 trillion. Against this backdrop, the journey towards Vision 2030 is set at a time when

Figure 30: Revealed comparative advantage of Saudi Arabia in the world, 2001–2016



Source: IsDB staff estimates based on UN Comtrade data

Figure 31: Projection of global plastics market in $ billion (2016–2030)

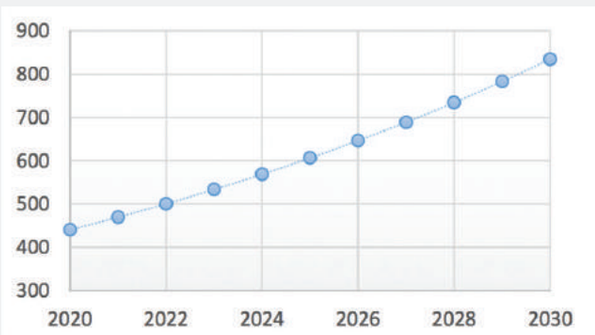
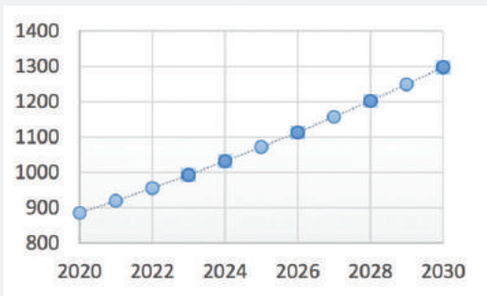


Figure 32: Projection of global petrochemicals market in $ billion (2020–2030)



Source: IsDB staff estimates and projection based on UN Comtrade data

the world is experiencing radical economic changes spurred by disruptive technologies that are significantly changing the market landscape and the value networks of industries.

Conventional industrial policies today fail to understand the importance of specialization in the areas of revealed comparative advantage, while advocating that countries diversify into new industries which in many cases may result in low value added and create low-income jobs. Typically, countries incentivize private investments in the promoted sectors of the economy and attract foreign direct investments with the hope of technology and knowledge transfer. However, given the expansion of multinationals within the global value chain, oftentimes a multinational's expansion into a new country is seeks only efficiency and profit, resulting in minimal benefits to the host country.

The term 'premature deindustrialization' (Rodrik, 2013) is used to refer to the effect of constant offshoring of industries that are mature in the developed world to the developing countries, in turn creating lower-income jobs with lower value added. As a result of this phenomenon, developing countries are able to diversify their economy but at the cost of lower value added and lower- skilled jobs, which then places them in the middle-income trap for a very long period of time.

Recognizing this background, the path to economic diversification in Saudi Arabia should be based and built upon the comparative advantage in the industries in which the country is already or likely has the potential to become a global leader. Specialization based on comparative advantage would allow the country to diversify its economy with higher value added and create quality jobs that are essential for inclusive development.

The Opportunities for Saudi Arabia

Out of 25 industries, Saudi Arabia recorded significant revealed comparative advantage for two industries, petroleum products and plastics. The petroleum products industry, as described in Figure 30, shows a relatively consistent RCA* value, while the plastic products industry gained comparative advantage in 2009.

The global plastics market is expected to grow by 6.6% annually and reach over $800 billion in 2030, as revealed in Figure 31. Currently, Saudi Arabia is one of the largest exporters in the plastics value chain; however, the majority of the exports are represented in the upstream value chain and consist mainly of raw materials (97%). The development of the downstream value chain would enable Saudi Arabia to fully reap the benefits of the lower cost of raw materials such as ethylene and propylene that are used to produce downstream plastic products. Although there are currently some existing efforts by the government to promote downstream plastics manufacturing with the introduction of Plaschem Park, private investments and take-up rate has been rather slow. More specialized downstream plastics manufacturing, such as plastics in the medical devices industry, offers a range of products with great market potential that may also have a multiplier effect, further enhancing the whole plastics value chain. It is envisioned that targeted investment in the medical device industry would produce a spillover effect into more specialized pharmaceutical products due to the expansion and strengthening of research and development.

The sales of the global chemicals industry are expected to grow at 4.9% per annum between 2018 and 2030, with petrochemicals capturing around 40% of the market—a potential market of $1.3 trillion in 2030. The main value chain of the petrochemical industry in Saudi Arabia is the production of olefins (e.g., propylene, methanol and ethylene), which use ethane for feedstock and contribute up to 75% of the petrochemical production in the country. Due to lower ethane feedstock prices, the majority of investment has been in companies producing basic chemicals (olefins). There is a lack of investment in the chemical conversion industries (downstream) that produce special chemicals. Particularly with the rising demand for more specialized and efficient products from different industries, an expansion in the petrochemicals industry would enable Saudi Arabia to tap into the $1.3 trillion market.

Both the plastics and petrochemicals industries would be significant game changers that may help the country avoid being trapped in the conventional diversification dilemma and the negative consequences of premature deindustrialization. Having strength in the upstream value chain for both these industries provides sufficient value added in the downstream sector due to cost and resource advantages. At the same time, specialization along expanding the value chain would create quality jobs, particularly in research and development, and may have spillover effects into the services sector.

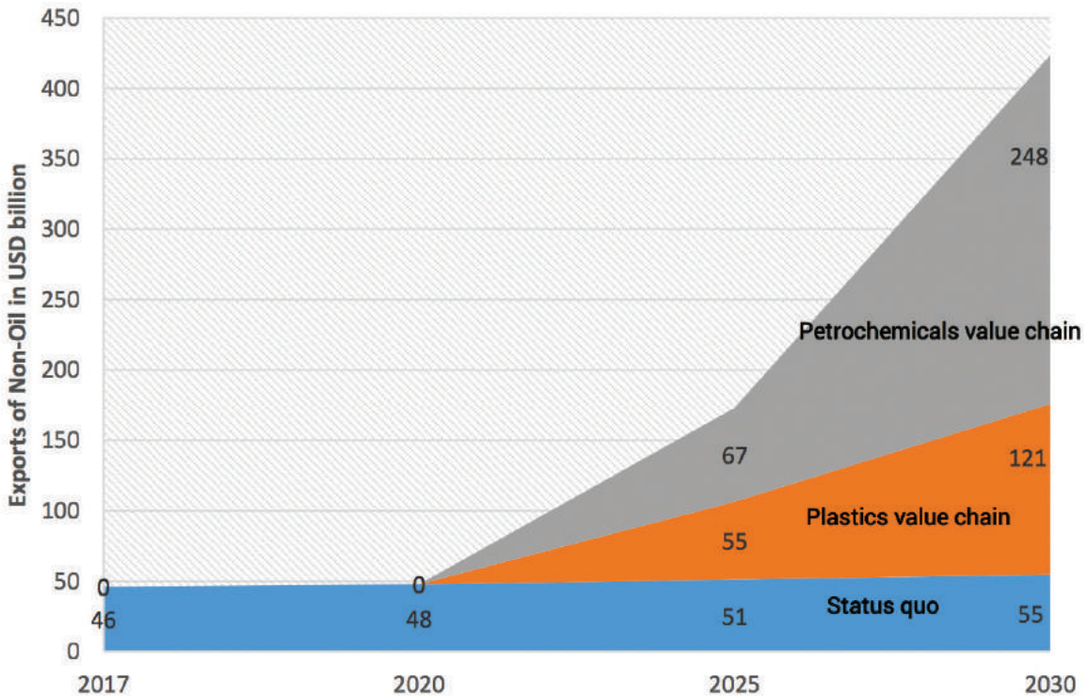
Recommendations/Interventions

- (Industrial Upgrading Intervention) - Expand and specialize in the downstream manufacturing of plastics for the medical devices industry by investing in the manufacture of disposable syringes to tap into $4.15 billion market and create around 26,577 jobs.
- (Industrial Upgrading Intervention) - Strengthen research capability in the medical devices industry to produce breakthroughs in disruptive technologies that may increase exports by $52.7 billion and create 27,451 jobs.
- (Industrial Upgrading Intervention) - Create an entity to produce specialized chemicals for the automotive industry that has a $11.5 billion market and the potential to create 54,392 jobs.
- (Industrial Deepening Intervention) - Invest in the development and mass production of graphene through an ethane conversion process to tap into a market of $181.7 billion and create 134,500 jobs.

The opportunity in the plastics value chain is mainly in the expansion of the downstream value chain. Currently, the exports in the plastics value chain are concentrated in the upstream value chain, amounting to $14.1 billion, and the major market players are SABIC, Petro Rabigh, Saudi Kayan, Sipchem, Sadara, Sharq, Saudi Polymers, Natpet, Advanced Petrochem and Petrochemya. All these large players are concentrated in the upstream portion of the value chain. Expansion in the downstream value chain of plastics manufacturing in medical devices, particularly the manufacture of syringes, could increase exports by $4.15 billion. With the strengthening of downstream manufacturing in medical devices in Saudi Arabia, the research and development in this sector will also be expected to accelerate, yielding breakthroughs in the pharmaceutical industry. This has the potential to increase the export value by $52.7 billion, as illustrated in Figure 33.

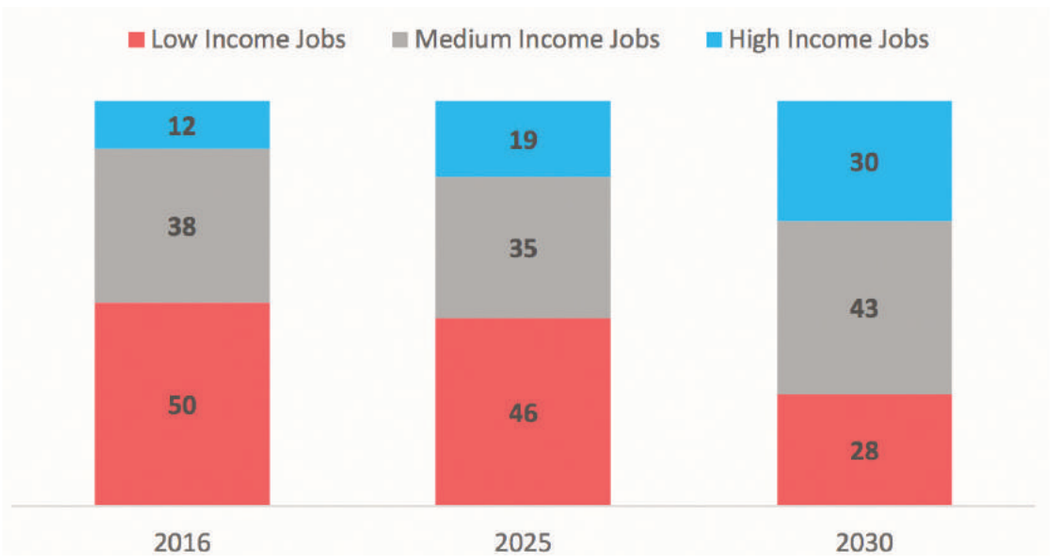
The current petrochemical industry contributes $23.9 billion in exports for Saudi Arabia, and the major players are SABIC and Petro Rabigh. By expanding the value chain with more specialized chemicals, including strengthening and investing in research and development for chemicals specific to the automotive industry, the establishment of a specialized cluster for automotive chemicals may provide an increase of $11.5 billion in exports. With more complete capabilities in the value chain, especially in research and development, Saudi Arabia also has the potential to be a market leader for the graphene industry. The development of the graphene industry could be a potential game changer that may provide future market opportunities of $181.7 billion, as displayed in Figure 33.

Figure 33: Non-oil exports in $ billion with interventions



Source: IsDB staff estimates and projection based on country authorities' data

Figure 34: Types of jobs created through intervention, in percentage



Source: IsDB staff estimates and projection based on country authorities' data

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7

ANNEX A: PRELIMINARY GVC ANALYSIS – REPUBLIC OF GABON

As part of the GVC mainstreaming approach, IsDB conducted a full preliminary GVC Analysis based on the described methods in this book to analyse two selected industries in Gabon, the wood and manganese industries. While engaging the country from day one, both for the quantitative and qualitative analysis, IsDB organized and met several ministries, agencies, companies, factories and employees in both industries. The results of this analysis provide guidance to the next steps in the qualitative analysis and eventually would shape the intervention strategy in the Member Country Partnership Strategy (MCPS) of IsDB for the Republic of Gabon.

The Wood Industry Value Chain

Introduction

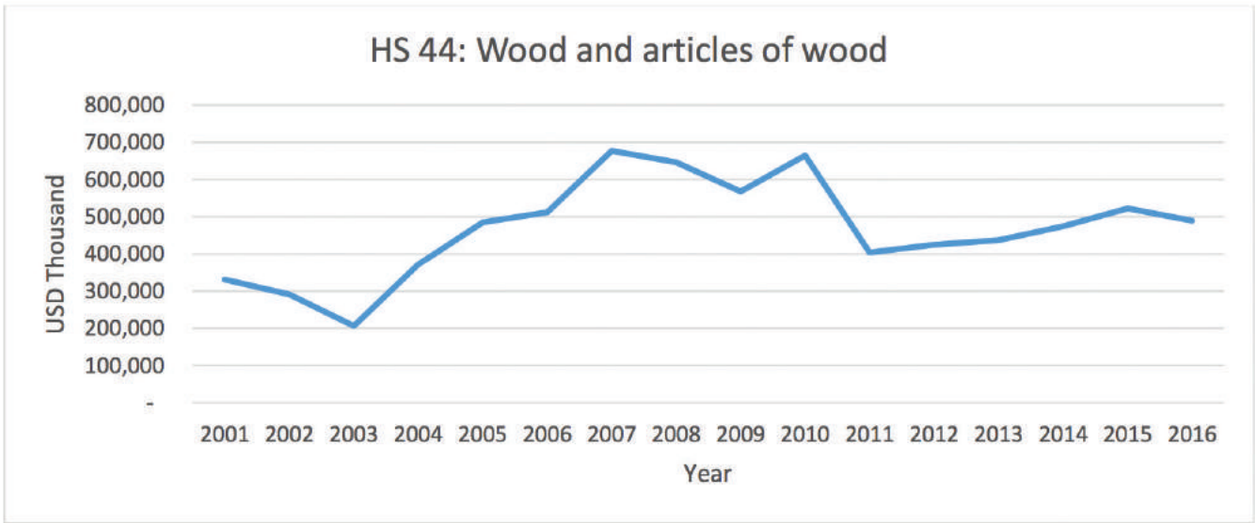
The timber or wood industry in Gabon is one of the main industries that fuels the economy of Gabon and was selected as the main pillars of development under the national strategy "Gabon Emergent 2025". Employing nearly 14 percent[1] of the working population and located in the Congo Basin, the second largest tropical forest after Amazon, the Gabonese forest provides great opportunity for the country to further enhance the wood industry.

Although total production of logs has considerably fallen since 2007, value-added in the wood industry has increased, and the industry is export-oriented. Total production of logs was 1.6 million m^3 in 2017 compared to 3.4 million m^3 in 2007. However, the value add in the sector has risen owing to the increase in volume of the products of first transformation with the production of sawn wood, veneer sheets and plywood. In terms of exports, as shown in Figure 35, the wood exports from Gabon peaked between 2007 to 2010 with around USD 680 million exports a year. Since the drop in export value in 2011 to about USD 400 million, the export values are recovering steadily and recorded USD 489 million in 2016.

In terms of the revealed comparative advantage (RCA), the wood industry has shown significant RCA values for year 2001-2016 as shown in Figure 36. The values signify that the wood industry has a natural and proven potential among Gabon's export products.

[1] *14% is accounted for percentage of workers in private and para-public workers (formal jobs)*

Figure 35: Gabon's wood export, in USD thousand, 2001-2016



Source: UN Comtrade (2018)

Figure 36: Gabon's RCA Values (2001-2016)

Source: IsDB staff estimates based on UN Comtrade (2018)

The trend of exports for the wood industry is a reflection of the crucial changes in policies to strengthen the wood industry. The first crucial policy change took place in 2001 with the introduction of the Forestry Code. This was the first move towards eliminating illegal logging. In 2009, the government banned the exports of unprocessed logs in a move to produce more value added products. The policy essentially forced the industry to move away from the profitable logging activities into more capital-intensive sub-chains such as sawn wood, veneer and plywood. The recovery in export value since 2012 is an indication that the policy has been successful in turning log exports to mainly three more value added exports, which are sawn wood, veneers and plywood.

In a recent change in direction towards sustainable forest management, the government of Gabon introduced a policy in September 2018 requiring that all forest concessionaires operating in Gabon to be certified by the Forest Stewardship Council (FSC), an international certification scheme that advocates socially equitable, environmentally sustainable and economically viable forest management. Ongoing concessionaires that fail to obtain the certification by 2022 will lose their concessions, which will be then reallocated by the government. This new policy is another positive commitment by the government to adhere to sustainability efforts. In addition, the certification boost the marketability of Gabonese wood products in foreign markets.

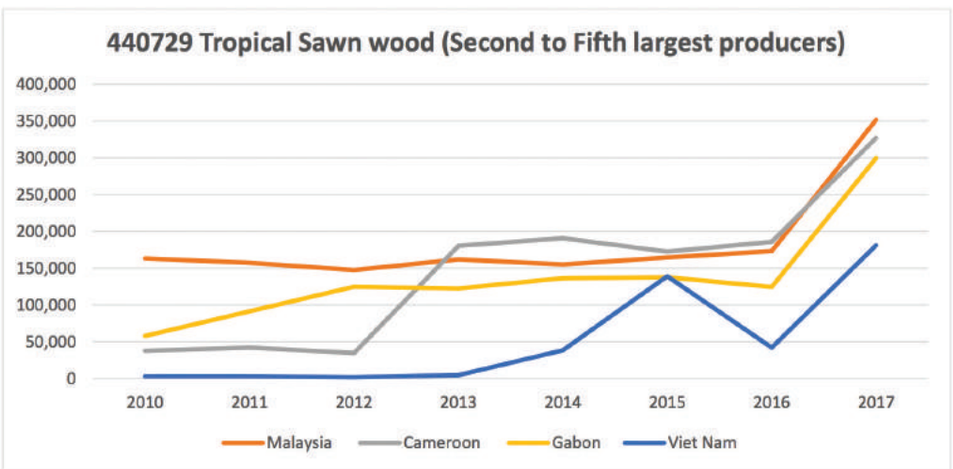
In terms of resources, the forests cover about 18 million hectares of the country and 12 million hectares are allocated for concessions of wood production. The rainforest in Gabon can be divided into three types: the evergreen forest, where most of the harvesting are taking place, located in the west of the country, known for two type of species, Okoume and Ozigo. The second forest type lies on the north west of the country called semi-deciduous forest known for its Limba, Wenge and Ayous trees. The third type of forest is the humid central Gabonese forest which covers most of the country possessing all types of timber that can be found in the region including Azobe, Mahogany, Aiele and Ayous. Although there are various different species of wood available in different parts of the country, Okoume species, one of the highest quality woods, dominates wood production due to its availability. However, there are huge potential to also develop other species of wood for niche products which is unexplored.

Figure 37: Gabon's main exports in the wood value chain

Product	Rank by size	hs4 code	Annual growth in value between 2012- 2016 (percent, p.a.)	Annual growth of world imports between 2012- 2016 (percent, p.a.)	Value exported in 2016 (USD thousand)	Annual growth of world imports between 2012- 2016 (percent, p.a.)	Ranking in world exports
Sawn wood	1	'4407	8	1	322,728	1	23
Veneer sheets	2	'4408	1	3	117,824	3	8
Plywood,	3	'4412	-9	0	29,501	0	36

Source: IsDB staff calculation based on UN Comtrade

Figure 38: Global Tropical sawn wood exports (2010-2017) in USD thousands, excluding Thailand



Source: IsDB staff estimation based on UN Comtrade

Gabon in the Wood Industry Global Value Chain

Since 2016, most of the wood products exported at least undergo one process of transformation thanks to Gabon's transformative plan for the wood industry. Gabon's connection to the Global Value Chain (GVC) for the wood industry is mainly through exports and some imports of machineries to support the industry. The main exports at product level for Gabon is sawn wood which recorded a huge growth between 2012 and 2016 at 8 percent annually with an export value of USD 322.7 million. The other highest exported wood products were veneer sheets and plywood as shown in Figure 37 above.

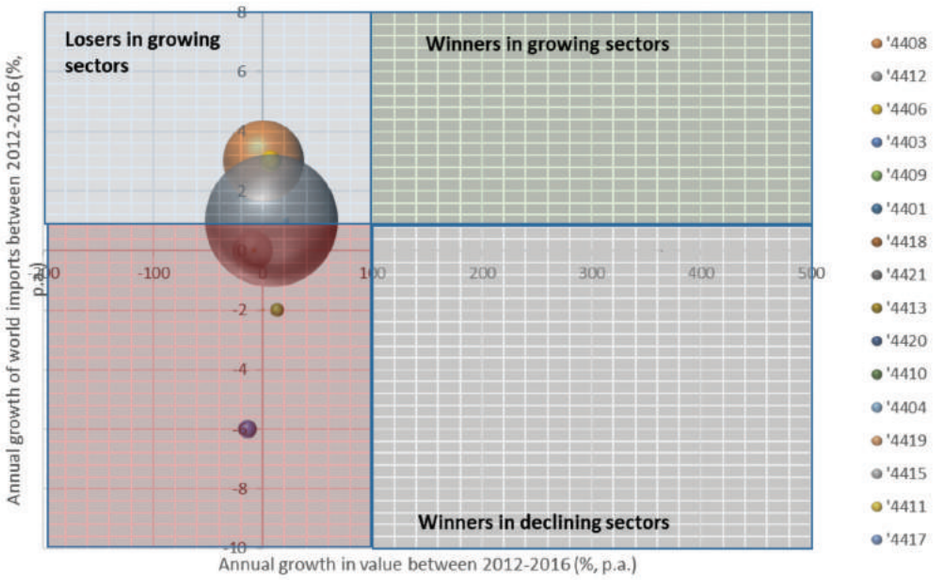
Although Gabon has increased its production in sawn wood and veneer sheets, the competition globally for both these products are quite high due to a few newcomers for tropical sawn wood global market. The global market share for sawn wood stood at around USD 3 billion. Thailand, a newcomer to the market, exported around USD 1.7 billion in 2017.

As shown in Figure 38, Gabon's export for sawn wood has increased in the past three years with similar growth rates for competitors such as Malaysia and Cameroon. Vietnam, a newcomer to the market, has also increased its exports although most of the output is consumed locally for the furniture production. However, these numbers do not include newcomer, Thailand, as its exports are much larger than those of its competitors (standing at USD 1.4 billions).

The veneer sheets exports for Gabon has seen a slight decrease of 1 percent for the period of 2012-2016 while plywood exports fell by 9 percent for the period of 2012- 2016. As shown in Figure 39, despite a global increase in demand or imports for all the 3 products, Gabon's position is in the blue quadrant (losers in growing sectors). This verifies that these products are relevant products in the global value chain and has the opportunity to move to the green quadrant if it records growth in exports.

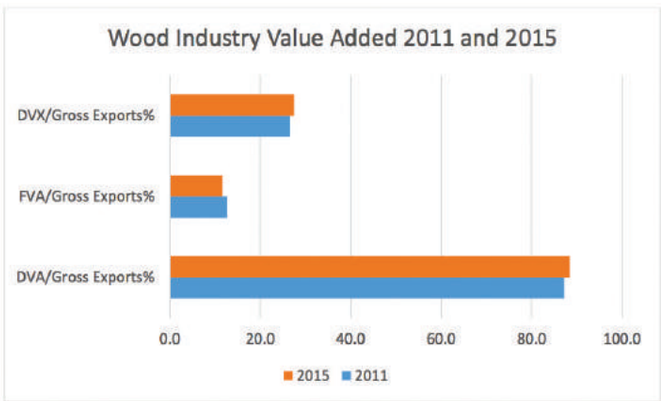
"This shows that Gabon's wood industry is still weakly linked to the GVC and there are huge opportunities of growth owing to the strong domestic value added numbers for the industry"

Figure 39: Quadrants of Product Champions



Source: IsDB staff estimation

Figure 40: Wood Industry Value Added 2011 and 2015 in percent

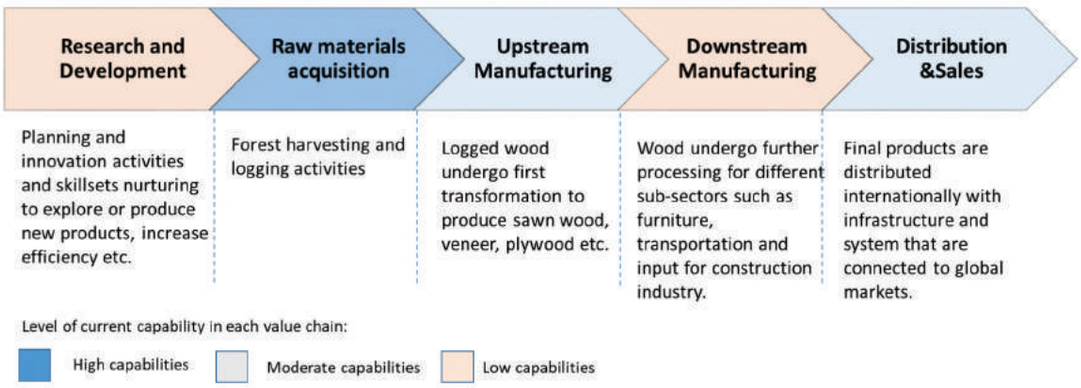


Source: IsDB staff calculation

An analysis of the wood industry value add in gross exports indicates there is a high domestic value add, low foreign value add, and moderate indirect value add. The results of the analysis using the Eora Input-Output Table[2] show: a high domestic value add of 88 percent of gross exports in 2015, a low foreign value add of 11.6 percent of gross exports, and moderate indirect value add of 27.5 percent of gross exports. Since the wood industry has currently a high domestic value add, any positive intervention and expansion in the industry value chain will have positive spillover effects to the domestic economy. At the same time, the indirect value add of 27.5 percent also represents the opportunity of transforming the exported products locally to gain higher value added. In terms of trend, the value added from year 2011 to 2015 did not show significant changes. The domestic value add increased around 1 percent while the foreign value add dropped by 1 percent. At the same time, the indirect value add increased 1 percent. In terms of the GVC participation index, the wood industry only recorded 0.39 with unchanged value from 2011 to 2015. This shows that Gabon's wood industry is still weakly linked to the GVC and there are huge opportunities of growth owing to the strong domestic value added numbers for the industry.

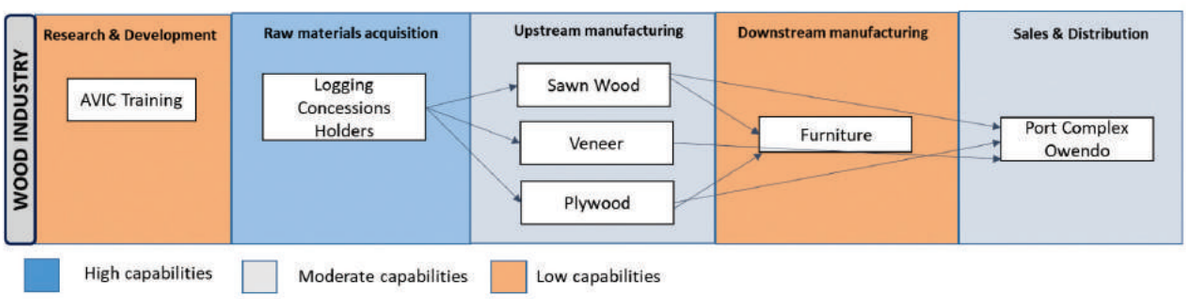
[2] Eora Input-Output Table used with methodology from M. F. S. Hamid, K. I. W. Kane, A. E. Demirhan and A. Khodary, Making Markets Work for Development through Global Value Chains,Islamic Development Bank, 2018.

Figure 41: Macro level value chain assessment



Source: IsDB staff estimation

Figure 42: Mapping of main actors in the wood industry



Source: IsDB staff illustration

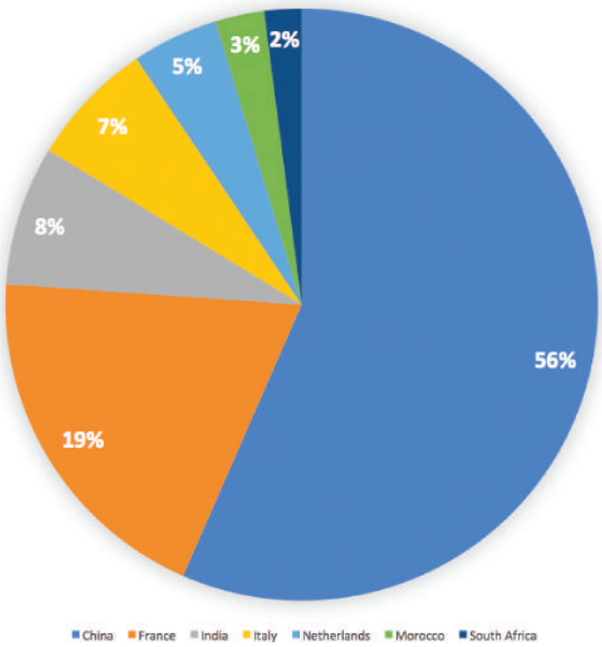
Based on the wood industry value chain, at the current stage, Gabon has high capabilities in raw material acquisition, which is the process of harvesting. Even though this process is not fully developed to its actual potential, the resources, policies and skills are already present at this stage. Upstream manufacturing which is the first transformative process for the value chain has resulted in producing three main products (sawn wood, veneer sheets and plywood), which can be considered still at very basic transformation level. Downstream manufacturing already exist in the GSEZ, however, they do not have capability to enter the exports market. In terms of distribution and sales, the establishment of GSEZ and the extension of Owendo Port has considerably upgraded the infrastructure needed to connect and export the wood products globally. However, based on the survey with some of the major wood companies, there still exist many issues in the port that delay the exports and increase their costs.

The preliminary GVC analysis on the wood industry shows low capabilities along the research and development (R&D), and downstream manufacturing value chains. The research and development chain, which should be connecting all the chains with flow of planning, skillsets and innovation activities, appear less emphasized. However, recognizing the importance of building skills and enhancing training for the industry, the government, contracted AVIC International Holding Corporation of China, for construction and equipment of three training and professional development centers in Gabon: Nkok in Libreville, Port-Gentil and Mvengue in Franceville. The government signed a contract with EXIM Bank of China to finance the project. The centers' capacity is around 600 trainees per center plus 400 apprentices and others; continuing education and other types of learners; so the total capacity is about 1000 students per center. The specializations vary from mechanical engineering and aeronautical engineering to carpentry.

Meanwhile, downstream manufacturing, which is the second level of transformation for the wood products also remains weak although many efforts have been undertaken by the government especially in promoting GSEZ to produce more downstream wood products such as furniture.

The opportunity of enhancements along the R&D and downstream manufacturing value chains would enable the wood industry to create higher value added products and hence create more high-skilled jobs. Among the main constraints in downstream manufacturing is access to capital and lack of skilled workers. The issue of skillsets ties closely to the research and development chain where there is limited emphasis on vocational training and research that are related or specific for the wood industry.

Figure 43: Gabon's export destination



Source: Author's own illustration based on UN Comtrade

In terms of industry actors, there are currently 40 main logging concession holders and the main companies are Rougier Gabon, Sunly Gabon, Societe Nouvelle des Boissons Gazeuses (SNBG), Precious Wood, CBG (Compagnie des bois du Gabon). Some of the concessions are held by locals, however, the local companies besides SNBG, lack access to capital and have, on average, smaller concessions which limit them from adhering to the sustainable forest requirements.

In terms of the upstream manufacturing, there are currently 8 sawmill, 24 veneer and 1 plywood company operating in GSEZ. Among the key companies are Gabon Wood Industries, Gabon Ecowood, Otim Veneers and Plywood, Gabon Veneer, Solid Wood Gabon, Evergreen Gabon, Sun Veneer and Green Ply.

There are also many foreign companies especially from China, focusing on the first and second transformation in the wood industry have shown interest to setup their plants in GSEZ and some of them will commence operations in 2019 and 2020.

For downstream manufacturing, there are currently 11 companies operating in GSEZ, producing furniture. However, these companies face major challenges to export their products. Firstly, they lack the volume to supply the global market. Most of these companies also have problems in investing for new machineries and know-how to produce more high value added products. They also do not have the required skills and certification to export the products to Europe. Therefore, some of these companies are instead targeting local markets. Although the volume of furniture exports is very low, it is expected to increase in the coming years as there is a rise in investment from Chinese companies in GSEZ and at the same time, the establishment of AVIC training facility in GSEZ would facilitate the production of more downstream products.

Besides exports, the wood value chain in general is highly dependent on the imports of machineries and equipment that support the entire industry. Most machineries are imported from China, Italy and France. The wood industry in the upstream and downstream manufacturing also face challenges to invest in more sophisticated machineries. Without an upgrade in machineries, there are only very limited types of products that can be manufactured and this reduces their competitiveness at the global level.

In terms of Gabon's export destination, China is Gabon's main export destination and before the policy change in 2009, the main export destination for logs was China, while the processed wood products were concentrated in the European market. However, after the policy change, China shifted its log imports from Gabon to sawn wood and surpassed the European market. Below is a pie chart Gabon wood industry export by country for 2017.

The government of Gabon has taken a proactive approach to coordinate and systemize the whole wood value chain especially with the development of the Nkok Gabon Special Economic Zone (GSEZ) which was setup as a PPP initiative by the government of Gabon, OLAM and Africa Finance Corporation.The economic zone is located 12 kilometers from the merging point of all routes from the forest areas and is well connected to railway and the national highway. To improve the capacity of export, an expansion of the port in Owendo was undertaken, which also directly connects through waterways.

Barriers to the development of the Wood Value Chain in Gabon

One of the biggest constraints for the wood value chain is the high logistics cost, where it can be around 15 percent – 25 percent of the total production cost. Even though large part of the forest covered is allocated for logging, and the logging concession are spread throughout the country (Figure 44). Due to the location and roads

Figure 44: Map of major wood industry in Gabon

Source: BCPSGE VISION GABON 2025

network that are not connecting the areas efficiently, there exist two main issues. First, the transportation from the logging sites to the plant and secondly the transportation from the plant to the port. There is also huge issues of unpaved road that are nearly impossible to pass in rainy season making log supply unpredictable.

There are three means of transportation for logs, which is road, rail and river. The rail is considered the cheapest mode of transportation besides river. River transportation is rarely used due to the fact that many species do not float in water. Currently, road is mainly used to transport the logs although it is quite challenging. Based on survey, many companies agreed that railway will be the best mode of transportation. However, today, not all areas are covered by railway and the railway line is built for the manganese industry and operated privately, thus creating uncertainty for the wood industry to use the railway line.

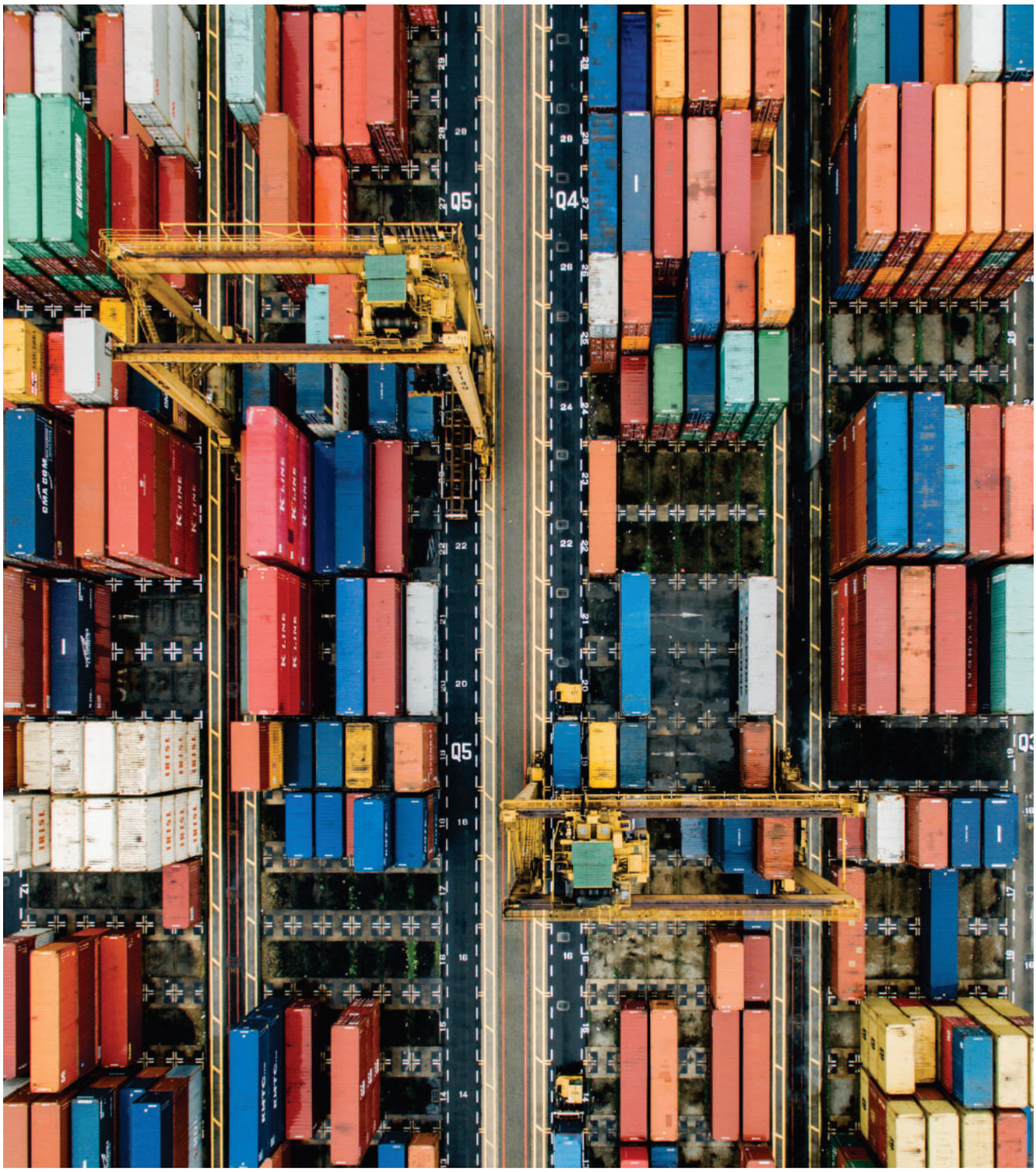
Besides transportation, logistics issues at the port in Owendo also seemed to contribute to the high logistics cost. There is huge capacity gap and delays in the port that add up to the cost. Many companies agreed that if the port issue is solved, productivity will increase and export numbers will rise. A big challenge in the wood industry is also the information asymmetry between operators. As a result, there is a huge delay in processing goods for exports due to the lack of digital communication in clearing the exported goods as well as missing information on logs and its inventory. Inventory issues lower earnings. GSEZ has begun a program of stocktaking with a new software. However, this program needs to be expanded in scale to increase efficiency.

Another common issue among the companies in the entire value chain is uncertainty in policies and regulations. The lack of clarity in regulations has caused some companies to halt production. Clearer consultative policy making with better coordination could perhaps provide more certainty to the companies.

In terms of power, the production of industries in the GSEZ area is stable and currently the utilization is only 28 MW compared to 60MW that is currently available. However, power might be an issue for concession holders that depend on diesel- powered generator, which, due to the road condition in rainy season, can lead to the halt of production.

The expansion in the downstream manufacturing sector requires more supporting industries to be present. The supporting industries would allow Gabon to explore other more sophisticated downstream products with higher value add. There are also opportunities to recycle the current waste produced in GSEZ. Currently there is no clear use of the wood waste from the different plants in GSEZ.

The wood value chain also depends a lot with the usage of machineries and equipment which are largely imported and is costly to maintain. There are also issues such as unavailability of parts and services which reduces efficiency in the entire value chain. Although the government of Gabon has promoted downstream expansion of the wood value chain, the lack of skills, technology and capital seems to be the main issue in attracting such investments.



The Manganese Industry Value Chain

Introduction

Gabon has one of the highest reserves of manganese, and has been one of the biggest producer and exporter of the metal since the early 1960s. Apart from crude oil, manganese has been an integral part of Gabon's economy and is one of the major source of income that generates employment. Manganese exports as a share of the country's GDP has increased by an average of 4.86%[3] over the past 5 years.

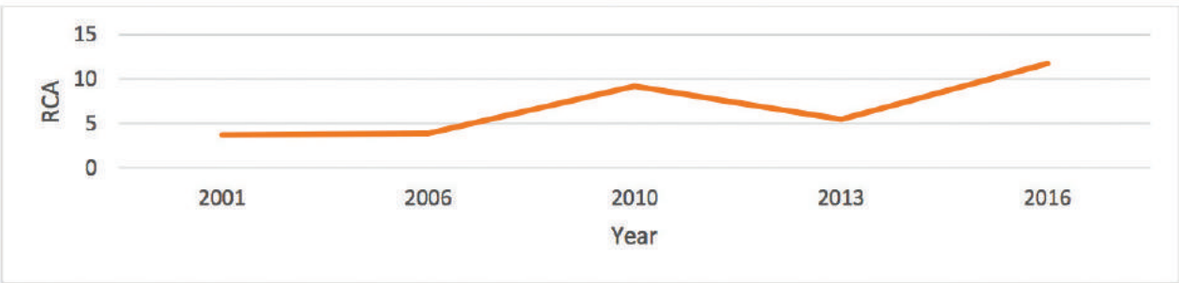
Gabon's involvement in the mining industry is mainly focused on extraction and export of raw materials. Besides Manganese, there are also untapped latent assets in the mining industry such as Iron which has one of the largest untapped deposits in the world, in addition to diamond, phosphates, potassium and magnesium salts. The Government of Gabon, through the national strategy "Gabon Emergent 2025", decided to change the course, by moving away from just exporting raw minerals, and towards upgrading the entire industry by developing a complete value chain. The key upgrade in the manganese industry is to develop upstream transformation of manganese, and produce higher value added products.

Gabon in the Manganese Global Value Chain

The revealed comparative advantage (RCA) index (Balassa, 1965) is used to determine the products at HS2 level in which Gabon has a

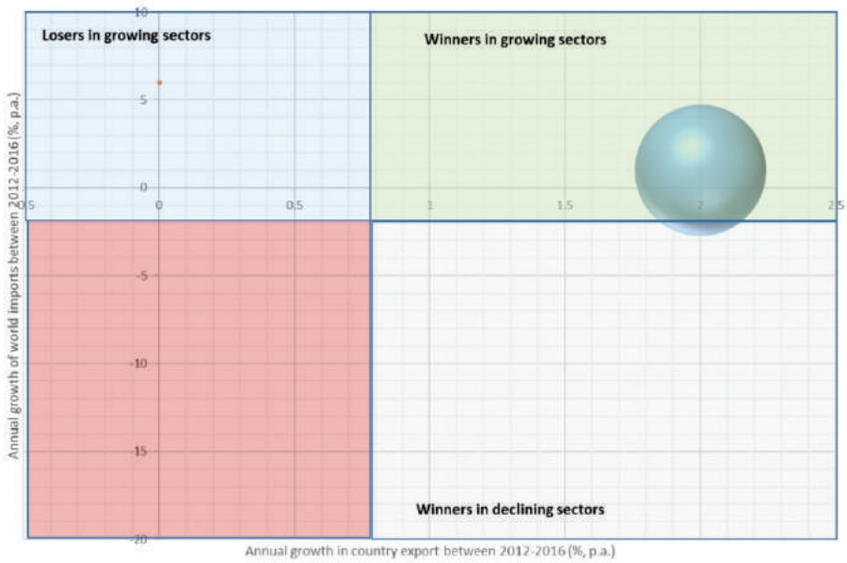
[3] *GDP and Mn Ore export data from National Statistics and UN Comtrade respectively.*

Figure 45: RCA calculation for ores, slag and ash for Gabon for the past 16 years



Source: IsDB staff illustration. Data from UN Comtrade

Figure 46: Market potential of ore, slag and Ash at HS4 level



Source: IsDB staff illustration. Data from UN Comtrade

comparative advantage. As shown in Figure 45, Gabon has very high revealed comparative advantage for ores, slag and ash products all throughout the period from year 2001 to year 2016, which shows the importance of this mining product as a potential sector with natural potential to plug into the Global Value Chain (GVC).

At a more disaggregated level, the main exports within of the mining industry are manganese ores and concentrates, incl. ferruginous manganese ores and concentrates (HS4 product 2602). The Product Champion Index (PCI) combines demand, supply, trade and resilience indicators into a single index that indicates the HS4 products with the highest potential for trade (Hamid, Kane, Demirhan, & Khodary, 2018). The PCI for each HS4 product within manganese is computed and summarized in Table 2. Manganese ores and concentrates, incl. ferruginous manganese ores and concentrates has high PCI. Manganese market is growing in Gabon, as well as in the world as shown in Figure 46. Therefore, HS4 2602 has very great potential for high value-added trade.

In fact, the export of manganese has increased by over fivefold over the past 10 years as illustrated in Figure 47. Even when the price of manganese and steel have declined[4], Gabon was still successful in increasing the value of its exports. The value of manganese exported have only declined for three periods over the past 10 years.

The first decline was observed in 2008, and was due to the global financial crisis, when the quantity of ore exported to the struggling economies of the United States of America and Norway, the second and third consumer of Manganese ore from Gabon at the time respectively, substantially decreased their manganese ore import from Gabon by 32% and 66%, respectively[5]. The decline was also due to lower demand from the European Union market (especially France, Belgium, and Spain) as it was hit by the financial crisis. However, manganese export rebounded quickly with increasing demand from the Chinese market.

[4] *Source: Data derived from National Statistics*

[5] *Data from UN Comtrade*

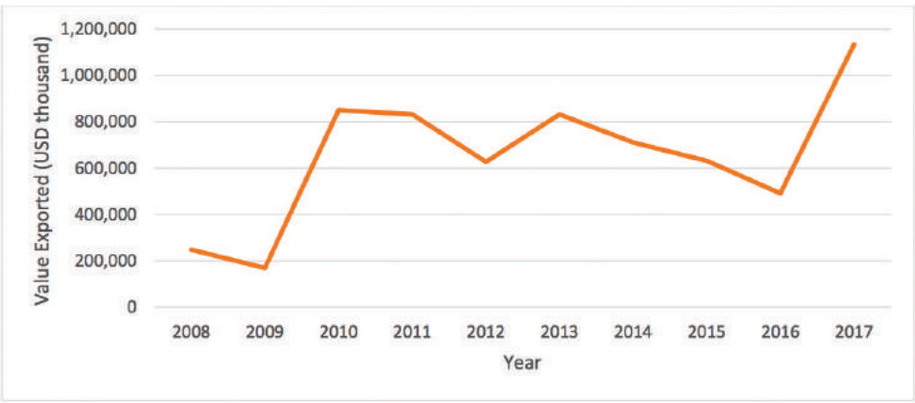
Table 2: Product champion index for the Ores, slag and ash at HS4 level.

	Value exported in 2017 (USD thousand)	Trade balance 2017 (USD thousand)	Annual growth in value between 2013-2017 (%, p.a.)	Annual growth of world imports between 2013-2017 (%, p.a.)	Share in world exports (%)	Ranking in world exports	Average distance of importing countries (km)	Concentration of importing countries	PCI
All products	5,424,225	3,148,645	-16	-3	0	108	9,699	0.2	
Manganese ores and concentrates, incl. ferruginous manganese ores and concentrates, with a ...	1,134,217	1,134,150	2	1	25.2	2	9,423	0.22	0.368
Precious-metal ores and concentrates	1,227	1,227		6	0	43	5,776	1	-0.049
Slag, ash and residues containing metals, arsenic or their compounds (excluding those from ...	97	97		-14	0	94	5,724	1	-0.106
Ores and concentrates (excluding iron, manganese, copper, nickel, cobalt, aluminium, lead, ...	4	4		-1	0	54	3,835	0.38	-0.020
Niobium, tantalum, vanadium or zirconium ores and concentrates		-9		-4					-0.011
Slag and ash, incl. seaweed ash "kelp"; ash and residues from the incineration of municipal ...		-355		-9					-0.026

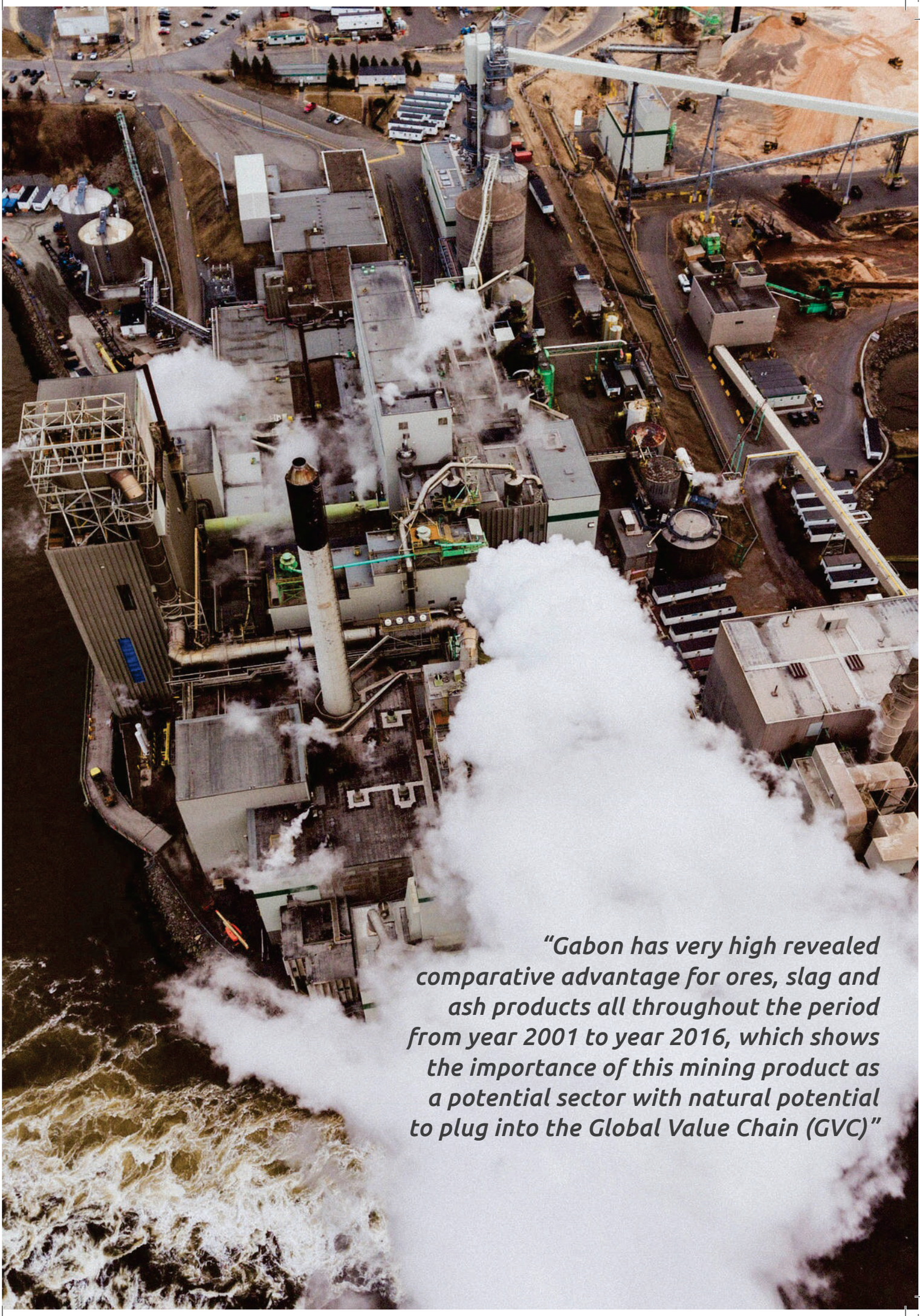
High PCI **Low PCI**

Source: IsDB staff illustration. Data from UN Comtrade

Figure 47: Manganese export in Gabon for the past 10 years

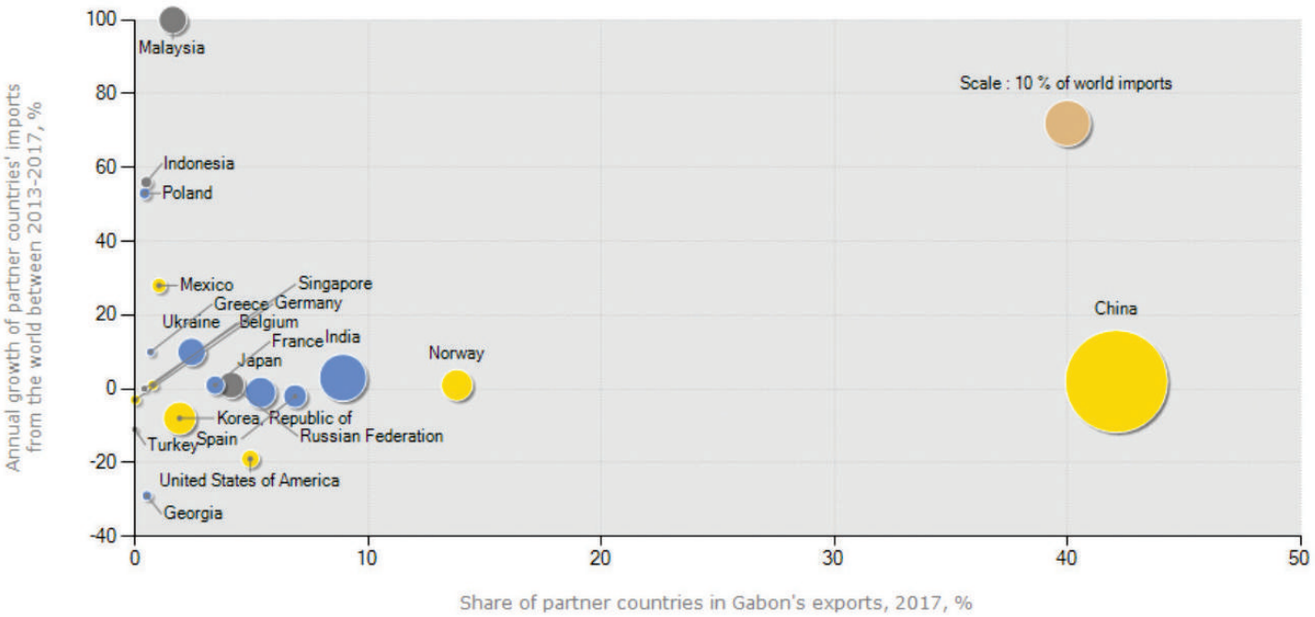


Source: IsDB staff illustration. Data from UN Comtrade



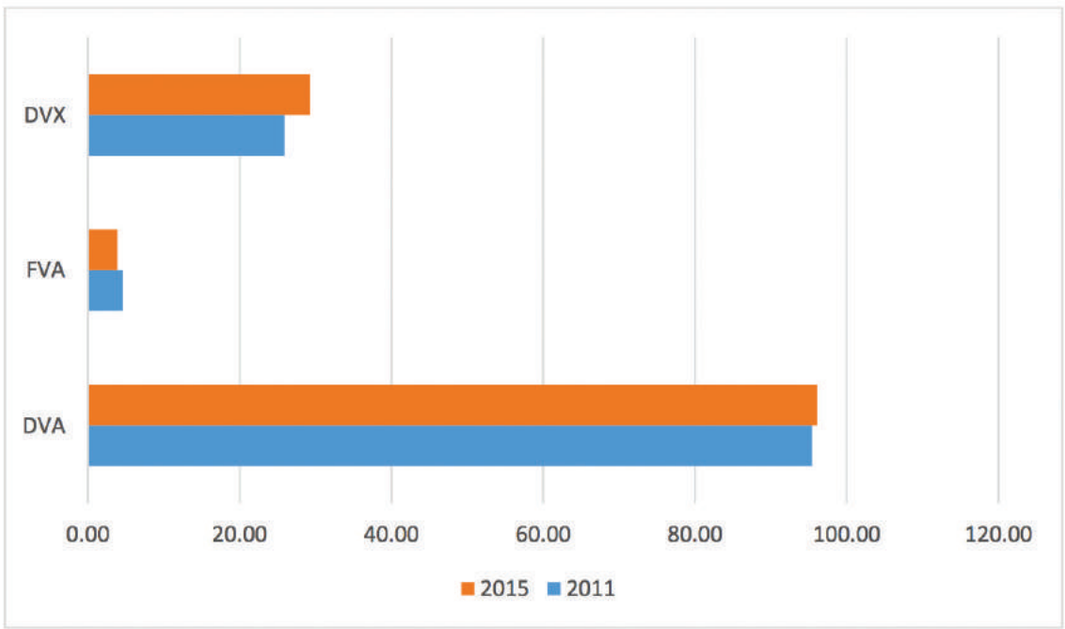
"Gabon has very high revealed comparative advantage for ores, slag and ash products all throughout the period from year 2001 to year 2016, which shows the importance of this mining product as a potential sector with natural potential to plug into the Global Value Chain (GVC)"

Figure 48: Import share of Gabonese manganese



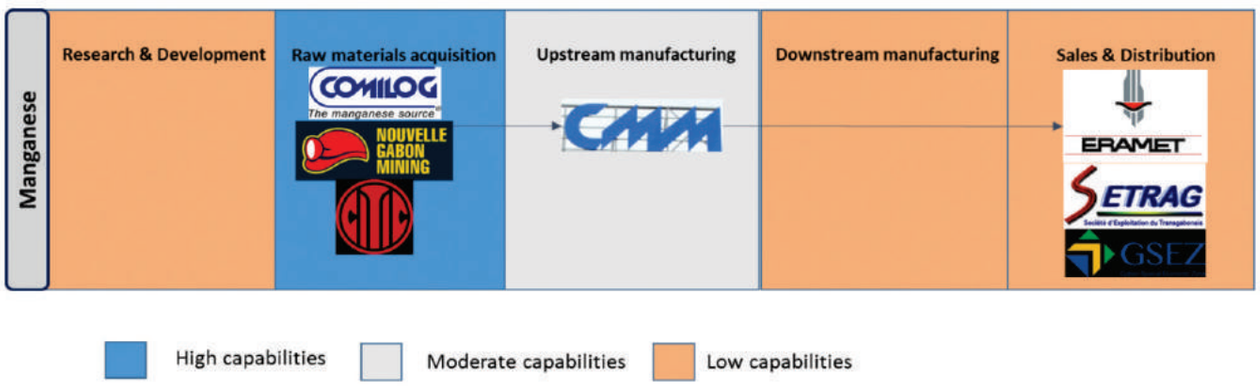
Source: Illustration from Trademap.org

Figure 49: Value of domestic (DVA), foreign (FVA) and indirect (DVX) value add with respect to gross export of Mining and Quarrying sector



Source: IsDB staff illustration. Data from Eroa

Figure 50: Manganese value chain initial mapping in Gabon



Source: IsDB staff illustration

The second decline in manganese demand occurred between 2011 and 2012 amid the slowdown of the Chinese economy, the largest consumer of Gabonese manganese ore (World Bank, 2017) as shown by the import share of manganese from Gabon in Figure 48. Manganese demand recovered as the Chinese steel production stabilized.

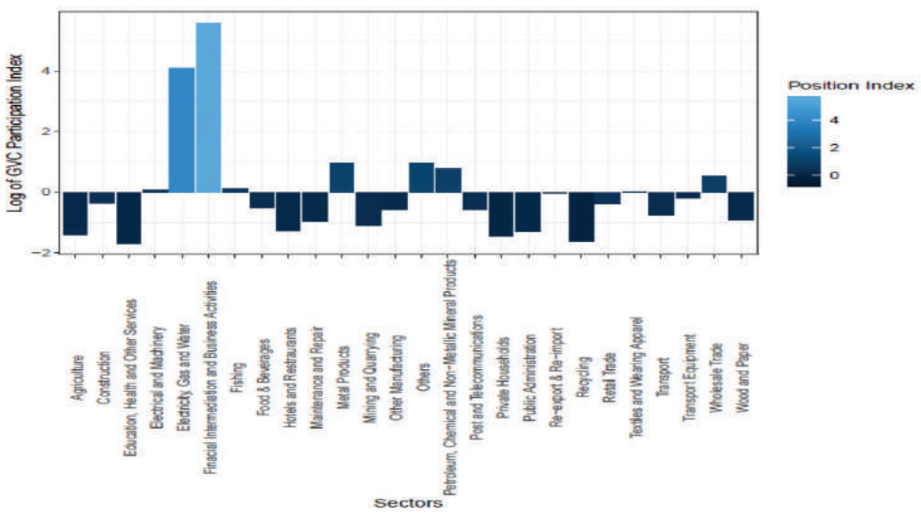
The last decline of manganese export was due to the long and steep decrease in manganese price by as much as 60% (Polle, 2017). However, manganese exports have risen over recent years because of the increased capacity of production of manganese (SA, Annual Report 2017, 2017) and the increase in the price of manganese ore.

The value add analysis for Gabon shows that the mining industry has very high domestic value added (DVA), and indirect value added (DVX), and very low foreign value added (FVA) which suggests its importance in the Gabonese economy and its potential to recapture the transferred value added from other countries (Figure 49).

Based on data and surveys, the initial mapping of the actors and broad activities is shown in Figure 50. There are three main companies in the manganese value chain in Gabon which are Compagnie minière de l'Ogooué, Nouvelle Gabon Mining and Compagnie industrielle et commerciale des mines de Huazhou. All three companies are concentrated in the extraction and exports of manganese ore.

As shown in Figure 50, the Manganese Value Chain has high capabilities in raw materials acquisition and moderate capabilities in upstream manufacturing. The country has low capabilities in the other activities such as research and development, downstream manufacturing, and sales & distribution. The reason being, current estimations show that only 2.5% of ore are further processed in Gabon to produce 20,000 tons of manganese metal and 65,000 tons of silicomanganese through the "Complexe Métallurgique de Moanda" (CMM) which is an upstream activity, while there is no activity in the downstream side of the value chain (EYENE,

Figure 51: Gabon's Global value chain participation and position index per sector



Source: IsDB staff illustration. Data from Eora

2017) (Moanda, 2015). Furthermore, as shown in Figure 49 both the DVA and the DVX have increased between 2011 and 2015, which is due to the fact that the increase production of manganese ore has outpaced the increase of upstream transformation activities of manganese between 2011 and 2015. As illustrated in Figure 51, the Gabonese mining industry is poorly connected to the GVC as shown by its low GVC Participation (Aslam, Novta, & Rodrigues-Bastos, 2017) and Position (Koopman, Wang, & Wei, 2012) indices. The Gabonese mining industry has moderately weak forward linkage and very weak backward linkage into the GVC. Hence, the moderate and low capabilities for the upstream and downstream activities respectively. However, the manganese value chain in Gabon has high potential for development not only because of its highest grade ore in the world, but also because of the high potential of increasing production through increased efficiency.

In terms of production of manganese ore, the "Compagnie minière de l'Ogooué" (Comilog) is the main company developing the manganese in Gabon. It was established before the independence of the Republic of Gabon, and started operations to develop the Moanda mine since 1962. Comilog is a subsidiary of the French multinational mining and metallurgy company Eramet, and is the second largest producer of manganese in the world. The government of Gabon has a 28.5% participation in the company as shares. The production capacity of manganese ore has increased over the past few years, and has reached an annual production of 4 million tons of manganese. Comilog comprises nearly 2,000 employees with locals representing about 98% of its workforce and more than 90% of the senior management roles are held by the locals (Comilog SA, 2015).

The Huazhou Mining Industrial and Commercial Company (CICMHZ) produces manganese ore extracted from the M'Bembelé site, 36 km from Ndjolé, with reserves that are estimated at 30 million tons with a production of 707,000 tons / year., CICMHZ employs 340 people, with 75% of which are locals and 25% Chinese (Génération Nouvelle, n.d.). The joint venture agreement to develop the mine of manganese in M'Bembelé was signed in 2010 and the government of Gabon has 10% shares in the project.

Nouvelle Gabon Mining (NGM), which is a subsidiary of an Indian company, Coalsale, is a joint venture between Coalsale and the government of Gabon. The government of Gabon owns 10% of the shares in this project. NGM develops the manganese mine of Binioni, in the region of Franceville / Haut-Ogooué. . The production started in 2017 with a capacity of 300,000 tons of manganese ore per year (EYENE, 2017). The production will increase in 2 phases in 2019 to 1.5 million

Table 3: Gabon is also the second largest exporter of Manganese ore, however with the most expensive price

	Value exported in 2017 (USD thousand)	Trade balance in 2017 (USD thousand)	Unit value (USD/unit)
World	4,684,370	2,365,110	168
South Africa Metadata	2,527,273	2,525,843	162
Gabon	1,125,828	1,125,759	255
Brazil Metadata	365,636	345,255	136
Ghana	301,385	301,337	116
Côte d'Ivoire	89,472	89,472	190

Source: IsDB staff illustration. Data from UN Comtrade

tons and 2.5 million tons of manganese ore respectively (Mining, 2018). In addition, there is a project to start a dolomite transformation plant with a capacity of 200,000 tons of manganese a year by the end of 2019 (Mining, 2018). NGM has created 380 jobs with 85% of them locals and 15% foreign (Mining, 2018) (Nouvelle Gabon Mining, 2016).

Based on available data, the initial mapping of the manganese industry in Gabon shows that the number jobs generated by this industry is 4,383. Comilog through the Moanda mine project and Eramet though the Transgabon railway concession created the majority of these jobs. Along the manganese value chain, in terms of absolute numbers, 60% of jobs were created through the extraction of manganese ore, 10% through the upstream transformation while indirect jobs through logistics represented 30% of employment (Comilog SA, 2015) (Génération Nouvelle, n.d.) (Nouvelle Gabon Mining, 2016) (SA, Le Gabon industriel en marche, 2015). In addition, the manganese industry contributes $US1.1billion in exports for Gabon every year.

Barriers to the development of the Manganese Value Chain in Gabon

Even though Gabon has the highest manganese grade in the world, the manganese value chain is not highly connected to the Global Value Chain and has huge potential to be developed further. An overwhelming effort has been concentrated in increasing the output of the manganese ore. Gabon has one of the most expensive manganese ore in terms of unit cost as illustrated in Table 3. Mining manganese in Gabon is easier than in other manganese powerhouses such as South Africa because of favorable geological parameters (Mining, 2018). However, the services between the mines and the final clients including port costs are very high compared to services costs incurred in other manganese producing countries such as Australia and South Africa making the manganese from Gabon one of the most expensive in the world. In fact, the cost of logistics seems to be one of the largest challenge that is faced by the manganese value chain.

The connectivity between Libreville, where the mineral port is located, and Franceville where the mining sites are, is about 600km apart and poses cost and delay risks. In fact, the main constraint to the development of the manganese value chain is that of infrastructure risks owing to poor state of the railway infrastructure. The reason behind the infrastructure challenge is the issue faced in the Owendo-Ndjolé stretch whereby it was built more than 40 years ago and the conditions is quite challenging.

The railway line is the main transportation mode to deliver the manganese ore from the mining site to the ports. The Societe d'Exploitation Transgabonais (Setrag) has the concession on the railway line (also called Transgabonais) that operates along the Libreville-Franceville road since 2005. The main route of transportation is from Comilog's manganese mine in Moanda, CICMHZ's manganese mine, M'Bembelé and NGM's manganese mine, Binioni. The railway line is 710 km long with a 648 km main line between the port of Owendo (GSEZ Mineral Port) and Franceville.

To overcome this issue, Setrag decided to launch a vast rehabilitation program (plan de remise a niveau), one of the main components being the modernization of the railway. The investment program includes infrastructure and superstructure works, security and signaling. Setrag through PREPARCO (Promotion et Participation pour la Coopération économique), majority owned by Agence Française de Développement (AFD) and the International Finance Corporation (IFC), and the Government of Gabon co-financed this vast rehabilitation program. This rehabilitation is to be completed by 2022 (Nzuey, 2016).

In terms of capacity, the railway service has the capacity to absorb up to 6 million tons of manganese ore annually (Montégu, 2018). Therefore, from the current level of production in the country, the capacity of the Transgabonais is sufficient. However, as an expansion strategy, Comilog is in discussion with the IFC to increase its annual production from 4 to 6 million tons, and eventually 8 million tons of ore (Montégu, 2018).

In terms of logistics costs of production, transportation and export, a better regulatory framework in the pricing of the Transgabonais is required to ensure that the transportation costs incurred by the manganese exporters remain competitive compared to the railway costs found in neighboring countries. The reason being, in the current state railway costs are 30% higher in Gabon than in Congo, and the export costs are up to 30% higher in Gabon than in other central African countries (Industries, 2018). This is mainly due to the poor quality of the railway and port infrastructures, and heavy administrative processes.

The development of the upstream and downstream sub value chains of the manganese industry in Gabon will require the development of many supporting sectors such as the energy sector. The main reason is related to the fact that upstream manufacturing of manganese is very much energy intensive. Therefore, cheap electricity is required to make it profitable. Industrial grade cheaper electricity in Gabon is from hydroelectric energy from the two Poubara dams. However, the required hydroelectric energy is not available near the export port due to poor power interconnectivity throughout the country. Even the prices of this electricity is pale in comparison with the prices observed in other countries such as in most European Union countries which have industrial electricity prices as low as 27XAF (Statista, 2018), while in Gabon it is 110XAF for hydroelectric and 250XAF for self-generated electricity though diesel generators (Lastrourville, 2019). Therefore, finding ways of reducing energy costs are paramount to developing the manganese sub value chain activities. Gas based energy generation might be an opportunity to provide the electricity required to develop the upstream and downstream industries of manganese in Gabon. Although the government of Gabon is attempting to promote more local transformation of the manganese industry, the lack of skills, technology, and targeted investments to relax infrastructure constraints (transport and energy) seem to be the main reasons why the sub activities of the manganese value chain are so weakly developed.

Despite the fact that Gabon has the highest manganese grade and one of the highest reserves in the world, the country does not have yet a well-developed manganese value chain. Most of the manganese extracted in Gabon is directly exported without any transformation; therefore, the industry is missing out on high potential value addition. In terms of linking the industry to the global value chain, there is very limited backward linkage. There is also a great opportunity to increase the backward linkage by focusing in upstream sub value chains such as the transformation of manganese ore into manganese alloy. The main constraints in the manganese value chain at the current state are in logistics and energy. Removing or reducing these constraints can help expand the value chain in upstream and downstream industries, and can therefore increase value added exports and number of skilled jobs created.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