Pathways for Productive Diversification in Ethiopia

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Advancing Economic Diversification in Ethiopia

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EXECUTIVE SUMMARY

Ethiopia will need to increase the diversity of its export basket to guarantee a sustainable growth path. Ethiopia has shown stellar growth performance throughout the last two decades, but, in this period, export growth has been insufficient to finance the country's balance of payments needs. As argued in our Growth Diagnostic report,[1] Ethiopia's growth decelerated as a result of the increasing external imbalances which have resulted in a foreign exchange constraint. This macroeconomic imbalance is now slowing the rate of economic growth, job creation and poverty alleviation across the country. Although export growth will not be rapid enough to address the foreign exchange constraint on its own in the short-term, the only way for the country to achieve macroeconomic balance as it grows in the longer term is to increase its exports per capita. With only limited opportunities to expand its exports on the intensive margin, the Government of Ethiopia (GoE) will have to strategically support the diversification of its economy to expand its exports base.

This report applies the theory of Economic Complexity in order to describe the base of productive knowhow and assess the opportunities and constraints to diversification in Ethiopia's economy. The theory of Economic Complexity offers tools to capture and quantitatively estimate the diversity and sophistication of productive knowhow in an economy and to analyze the potential to develop comparative advantage in new industries. These tools provide valuable inputs for informing diversification strategies and the use of state resources by providing rigorous information on the risks and potential returns of government industrial policies in support of different sectors.

Ethiopia's export sector vastly expanded throughout the growth acceleration period but did not make major gains in its diversity or economic complexity. The growth boom was accompanied by the increase in exports of a small variety of agricultural goods and services. Although the country managed to introduce some new products to its export basket in the last two decades, these have not significantly altered its export composition. The economy displays signs of low economic complexity, which has been found to limit long-term growth. Nevertheless, the country has indeed entered the initial stages of structural transformation, with the development of basic manufacturing capabilities and domestic services. The pace and success of Ethiopia's structural transformation will depend on its ability to diversify sustainably into a more productive tradable sector.

Throughout the growth acceleration, Ethiopia developed several niche capabilities. Ethiopia rapidly positioned itself among the top exporters of floriculture in the 2000s, but the industry has stagnated over the last decade. The textiles and apparel industries are the country's most successful manufacturing story, combining effective industrial policy and new knowhow introduced through foreign investment, although they are currently facing major bottlenecks that slow their growth. Ethiopian Airlines became Africa's top airline during the 2000s and by far the country's most successful public enterprise, driving the increase in transportation services exports.

This report provides a prioritization exercise to analyze the potential of promising new industries, which can serve as a quantitative input for the government's targeting efforts and hence update investment promotion and industrial policy strategies. Ethiopia's existing knowhow provides a minimal springboard to new opportunities for diversification, which suggests the country should promote "strategic bets" towards new sectors with future diversification potential. Given Ethiopia's reliance on agriculture exports and its recent developments in both the garment and footwear industry, some of Ethiopia's most "nearby" diversification opportunities are effectively in the agriculture and textile sectors. Nevertheless, to

[1] Harvard Growth Lab, "Ethiopia Growth Diagnostics," *CID Working Papers (Forthcoming)*, 2020.

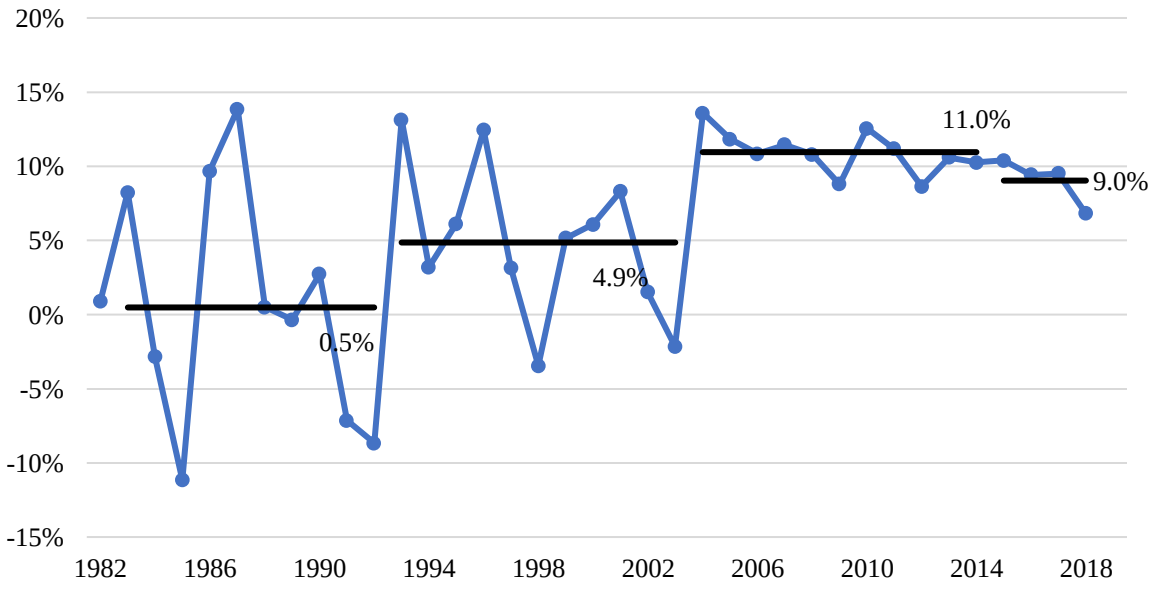
further expand the country's productive capabilities, Ethiopia will have to carefully strategize some "longer jumps" into other tradable manufacturing industries, such as machinery, chemicals, pharmaceuticals and electronics.

Accelerating structural transformation and the diversification of Ethiopia's economy will require that the government actively supports diversification efforts. Policy can play a major role in addressing the self-discovery and coordination failures that undermine diversification and structural transformation processes. In addition to reducing the foreign exchange constraint, to accelerate export diversification so that exports can grow at pace, Ethiopia will have to both address sector-specific constraints and target new foreign investments to overcome its currently low economic complexity. Targeted investment promotion has the potential to accelerate foreign investment flows into strategic sectors but will require the continuous expansion of government capabilities. An investment promotion targeting strategy will have to prioritize industries by leveraging both the country' comparative advantages and targeted industries' strategic value. Simultaneously, to consolidate the performance of the country's new emerging industries and attract adjacent sectors, the government will have to establish stronger processes to identify and address sector-specific constraints. Strengthening existing agencies and facilitating the emergence of additional problem-driven public institutions that practice iterative problem-solving tactics will be vital to increase the competitiveness of new industries and consolidate and accelerate the process of structural transformation.

1. ETHIOPIA'S GROWTH CHALLENGE

Ethiopia has shown stellar growth performance throughout the last two decades. After successive decades of low growth and recurring crisis, Ethiopia's economy has continuously and rapidly expanded since 2004 (*Figure 1*). The end of the war with Eritrea and of the 2002-2003 countrywide droughts marked the start of a growth acceleration which more than doubled the country's income per capita, raising millions of Ethiopians out of poverty. The growth acceleration coincided with an expansion of imports that supported increased public investment in basic infrastructure and agriculture productivity growth. An increase in foreign aid and external borrowing allowed the government to pursue investments in rural roads, electricity generation and distribution, railroads, education and health infrastructure, and permitted the economy to increase overall its capital and intermediate goods imports. At the beginning of the acceleration, growth was initially driven by productivity gains in agriculture, but services and industry – mainly construction – contributed more to growth over time. Manufacturing's role was only limited throughout the boom, with the sector's share of GDP remaining still substantially below regional and aspirational benchmarks.[2] In the latest period, high growth rates have been mainly the result of continuous public investment in infrastructure, as both agriculture and services growth rates have declined.

Figure 1. Ethiopia – Real GDP Growth

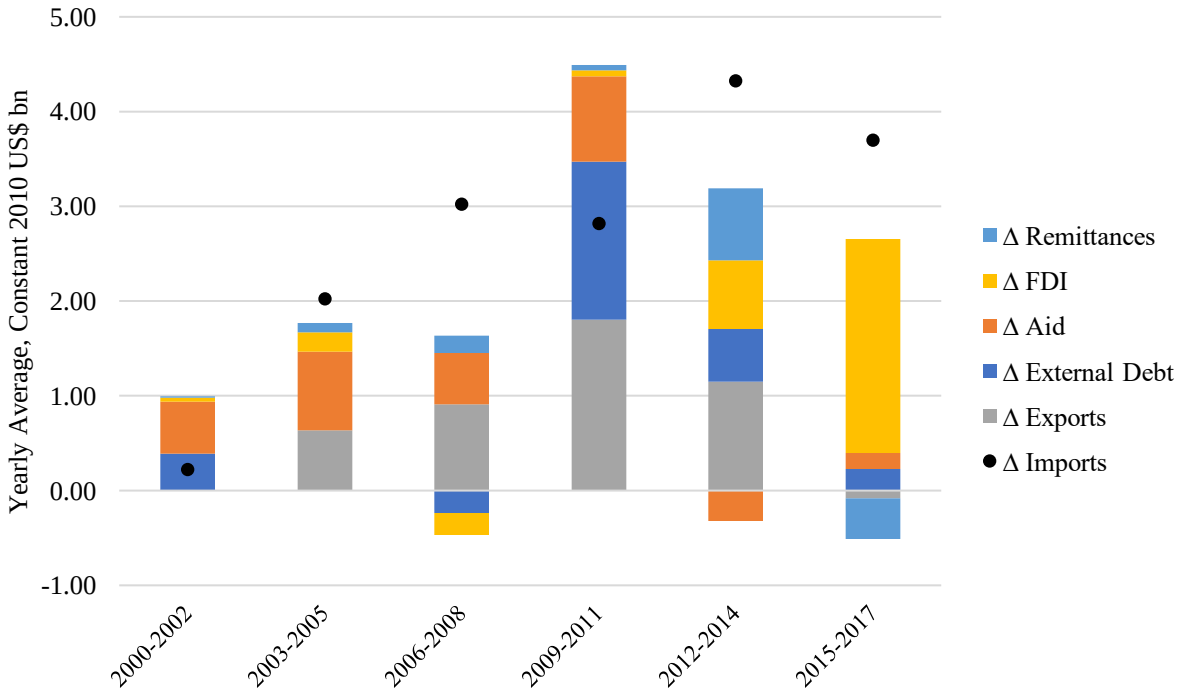


Source: World Bank World Development Indicators

[2] Regional (Kenya, Uganda, Tanzania, Rwanda) and aspirational peers (Brazil, Colombia, El Salvador, India) were selected for the purpose of the analysis by considering both present and historical export similarity between Ethiopia and possible comparators. Other manufacturing powerhouses are used throughout the report for specific comparisons in sectors of interest (Bangladesh, Vietnam, China, Thailand, Egypt).

Throughout the growth acceleration, export growth has been insufficient to finance the country's balance of payments needs. Ethiopia's investment boom was financed through succeeding influxes of foreign aid and external borrowing. Debt relief in the late 1990s and the early 2000s led to a drastic reduction of the debt stock, while major increases in foreign aid ultimately allowed the government to finance its state-led development model. Without these capital inflows, Ethiopia could not have financed rising imports through domestic sources of foreign currency earnings alone (*Figure 2*). Although exports grew rapidly until 2014, the pace and scale of export growth was insufficient throughout the period to match the country's import needs. The state-led development model failed to generate a domestic source of foreign exchange that could ultimately finance in a sustainable fashion the economy's demand for imports. Recognizing unsustainable external imbalances, the first and second Growth and Transformation Plans (GTP) prioritized additional public investment targeted to increase exports, but exports did not materialize, and the plans' targets were not met. Since 2014, exports had even shrunk in absolute terms, let alone as a share of GDP. The non-tradable sector (construction, utilities, wholesale and retail services) continued to expand despite the fall in exports, hence increasing import growth relative to exports and aggravating the current balance of payments constraint.

Figure 2. Sources of Foreign Exchange, Changes between Periods



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Source: World Bank World Development Indicators

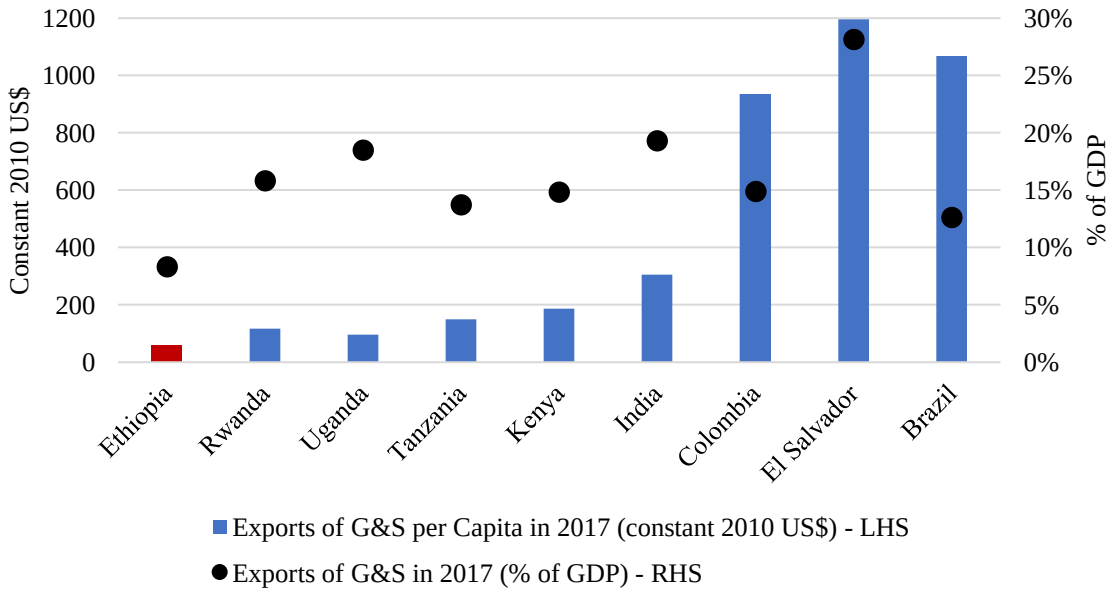
The binding constraint to sustained growth in Ethiopia is the shortage of foreign exchange to afford the imports on which production depends. As argued in our Growth Diagnostic report, Ethiopia's growth has deaccelerated as a result of the increasing macroeconomic imbalances which have resulted in a shortage of foreign exchange in the economy.[3] The public investment-led development model achieved its limits as investments failed to generate domestic sources of foreign exchange and inflows plateaued in the mid-2010s. For the last two decades, although aid, remittances and foreign direct investment contributed their share of foreign exchange, external borrowing was critical to completing the committed investments, especially since 2009. As Ethiopia reached a ceiling in its access to concessional lending in 2015, and given weak the country's export performance, Ethiopia was obliged to contract its imports, which led to a growth slowdown in the latest period. The Growth Diagnostic report has shown how the inability of firms to import key components of production is the most proximate cause of the country's slowdown. Shortages in foreign exchange have reduced the output for most economic sectors and increased the exit of firms. To remove the economy's binding constraint, Ethiopia will have to tackle multiple distortions that simultaneously interact between each other. The country's underfunded fiscal deficit, the incompletion of key public infrastructure investments, excess money supply growth, financial repression, exchange rate overvaluation and an intricate system of exchange rate controls will have to be addressed, whilst avoiding a fiscal crisis or an additional surge in inflation. The Growth Diagnostic report includes a therapeutics proposal for a sequencing of the reform package, which focuses on reducing the fiscal deficit and its monetization, as well as relaxing current exchange rate distortions, before addressing financial repression, which is currently a source of financing for the government. The approach would benefit from a moderate expansion of concessional borrowing to smooth the pace of fiscal consolidation.

Ethiopia will need to increase the quantity and diversity of its exports to guarantee a sustainable growth path. Ethiopia's exports achieved an unprecedented acceleration in the early 2000s, going from US$ 1.4 billion in 2003 to US$ 8.3 billion in 2014. Nevertheless, even after the growth boom, Ethiopia's exports per capita remain not only below the levels of more developed economies with similar export composition but also below regional peers (*Figure 3*). For Ethiopia to achieve sustainable growth and avoid further foreign exchange constraints in the future, the country will have to increase its exports per capita to a level that can support the country's growing import needs. Although Ethiopia can complement its access to foreign exchange through the growth of foreign direct investment, these liabilities would eventually have to be serviced, adding to pressures on the balance of payments. With only a small percentage of the population living outside the country, Ethiopia also cannot rely sustainably on remittances to fund its current account deficit. Only through an increase in its export base will Ethiopia be able to relax in the medium term its balance of payments constraint. Moreover, the country not only needs to increase its exports in their "intensive" margin but on the "extensive" one. Ethiopia's current exports, concentrated in few agricultural products and transportation services, are highly dependent on the fluctuations of global demand and international prices. Ethiopia's merchandise exports are concentrated on products with very little value-added that will not allow the country to support

[3] Harvard Growth Lab, "Ethiopia Growth Diagnostics."

higher wages and additional employment over time. The country presents a very low level of economic diversification with regards to comparable economies, reflecting a long path ahead toward expanding productive capabilities and diversifying its export base. With only limited opportunities for the country to grow based on its existing export basket, the Government of Ethiopia (GoE) will have to decide how it promotes diversification across multiple sectors. Ethiopia needs to increase the variety of products and services it exports, and that will ultimately require addressing the promise of different potential new industries and the constraints that prevent them from appearing and thriving.

Figure 3. Exports per Capita of Goods and Services, Ethiopia versus Peers



Sources: Atlas of Economic Complexity, World Bank World Development Indicators

This report applies the theory of Economic Complexity in order to assess the opportunities and constraints to diversification in Ethiopia's economy. The theory of Economic Complexity offers tools to capture and quantitatively estimate the range and sophistication of productive knowhow in an economy and analyze diversification opportunities that build on existing capabilities. These tools can provide valuable inputs for diversification strategies and the use of state resources by providing rigorous information on the risks and potential returns of government industrial policies in support of different sectors. The following report will apply the complexity framework to analyze Ethiopia's past export performance and suggest paths for diversification. Ultimately, the report will specify some of the groundwork requirements for prospective diversification endeavors.

2. CONCEPTUAL FRAMEWORK

Increasing productivity in a modern economy requires guaranteeing the availability and coordination of different types of productive knowledge.[4] Products and services require different types and magnitudes of knowledge. Productive knowledge can come in three forms: as embodied knowledge in tools; as codified knowledge in recipes, formulas, routines and algorithms; and as tacit knowledge or knowhow in brains. These three forms of knowledge are complements in production. Tools and codes are easy to move and mobilize, but knowhow moves very slowly from brain to brain through a long process of repetition and imitation and assumes that there is somebody with the required knowhow that can be emulated. Moreover, to be produced, most products in the modern world require more knowhow than what any single person can hold. Modern production hence requires teams of complementary workers that span the required knowhow: it requires collective knowhow. For these reasons, collective knowhow is most likely to become the hardest form of knowledge to mobilize. Ultimately, the knowhow that is embedded in a society does not depend uniquely on the knowhow of each individual but on the diversity of their knowhow and the ability of the economic system to combine them. Given the difficulties in transferring or codifying tacit knowledge, modern economies rely heavily on specialization and the division of labor. The "modularized" pieces of productive knowledge that each individual or group of individuals hold in the productive process can be called "capabilities". Most products require the interaction of different types of capabilities (e.g. accounting, finance, human resource management, the specifics of production, procurement, branding, marketing, contracts) within firms and across the economy. An economy's complexity can be defined as the span of collective knowhow in the system and is expressed in the diversity and sophistication of the products it is able to make. A product, whether a good or a service, cannot be made in a society that misses essential parts of the capability set it requires. Consequently, increasing the span of knowhow is reflected in a growing ability to make more and more sophisticated goods.

An economy's productive output allows us to infer what it *knows*. The fact that a country effectively makes a product, reveals that it has the required capabilities to produce it. Economies which can produce a more diverse set of products can be hence be understood as possessing a larger set of capabilities, while products that demand more capabilities will only be produced in places that possess them. More complex products will require more capabilities and hence will be made in fewer places, i.e. they will be less ubiquitous.

[4] César A. Hidalgo and Ricardo Hausmann, "The Building Blocks of Economic Complexity," *Proceedings of the National Academy of Sciences* 106, no. 26 (2009): 10570–10575; Ricardo Hausmann et al., *The Atlas of Economic Complexity: Mapping Paths to Prosperity* (MIT Press, 2014).

Taking this into consideration, we can define:

- *Diversity.* A measure of how many types of products an economy is able to make.
- *Ubiquity.* A measure of how many countries are able to make a product.

The span of capabilities that is embedded in an economy will be expressed in the *diversity* and in the *ubiquity* of its production. Economies with more embedded capabilities or productive knowhow will not only exhibit a larger diversity of products, but also will produce less ubiquitous products, as these products will require a larger set of capabilities. The larger the set of required capabilities, the fewer the countries that are likely to have them all.

International trade data provides a gateway to understand a country's complexity. The Atlas of Economic Complexity, a data visualization tool powered by Harvard's Growth Lab, uses the methods of economic complexity combined with trade data to synthetize not only global trade flows across countries but insights on country's latent capabilities and knowhow, and their growth prospects.[5] International trade data offers an unparalleled dataset because it can link countries and products in a standardized classification across the globe, which allows the estimation of comparable indicators of economic complexity. Using trade data has some drawbacks, as the data does not include information on goods that are not currently traded. Countries do produce goods they do not export as well as generally non-traded goods, but it is not unreasonable to assume that goods that are exported are those in which the country does have a comparative edge, according to standard trade theory. Also, countries do re-export goods they do not produce, although this noise is largely filtered out for most countries by focusing on products in which countries show comparative advantage. Lastly, although international trade in services is increasingly important as a share of global trade flows, existing trade datasets provide very little disaggregation of these types of flows which does not allow an analogous type of complexity analysis for services.[6]

A stylized fact in international trade data is indeed a systematic relation between the diversity of country's exports and the average ubiquity of the products it exports. While some products tend to be exported by almost every country, few countries tend to export most products. The negative relation between diversity and average ubiquity is what would be expected if places differ systematically in the completeness of the set of capabilities they span. Countries with very complete sets will be able to make many products and among them, products that are made in few other places precisely because they require more capabilities that those places can provide. To make products and economies more easily comparable – as larger and richer countries are expected to have larger export volumes than smaller ones – Balassa's definition of "revealed comparative

[5] Harvard Growth Lab, "The Atlas of Economic Complexity," 2020, http://atlas.cid.harvard.edu/.

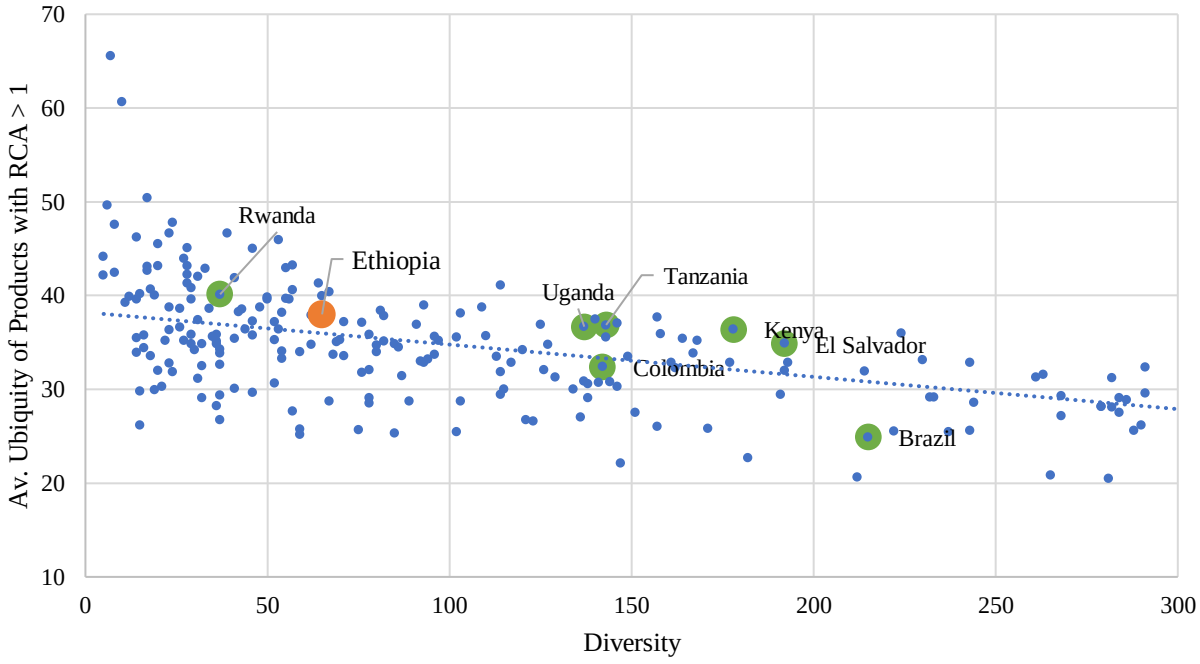
[6] Recently, the methodology was adapted to perform analysis inclusive of services at a national scale using employment indicators in the Dun & Bradstreet business database, although this effort could not currently be replicated for Ethiopia given issues of data representativeness. See Ricardo Hausmann et al., "A Roadmap for Investment Promotion and Export Diversification: The Case of Jordan," CID Working Papers, 2019.

advantage" (RCA) can become of use.[7] In terms of trade data, a country can be defined as having revealed comparative advantage producing a product if the country's export share in that product is larger than the product's share in the global trade basket. Formally, we can define, if X_{cp} is the exports of a country c of product p.

$$RCA_{cp} = \frac{X_{cp}/\Sigma_c X_{cp}}{\Sigma_p X_{cp}/\Sigma_c \Sigma_p X_{cp}}$$

Economies with an RCA larger than 1 can be thought as having a comparative advantage in the production of a specific product. This definition of RCA can help us specify empirically the concepts of "diversity" and "ubiquity", as diversity can be defined as the number of products in which the country has RCA>1 (i.e. in which it has comparative advantage), while the average ubiquity of its products is the average number of countries that have RCA>1 in the products the country exports. Using international trade data, the negative relation between diversity and average ubiquity holds, as most diversified economies tend to have larger RCA in less ubiquitous products (*Figure 4*). As we can preliminarily observe, Ethiopia's exports show a low degree of diversity and high ubiquity relative to most regional and aspirational peers.

Figure 4. Diversity and Ubiquity (HS92 4-Digit, 2017)



Source: Atlas of Economic Complexity

[7] Bela Balassa, "Trade Liberalisation and 'Revealed' Comparative Advantage," *The Manchester School* 33, no. 2 (1965): 99–123.

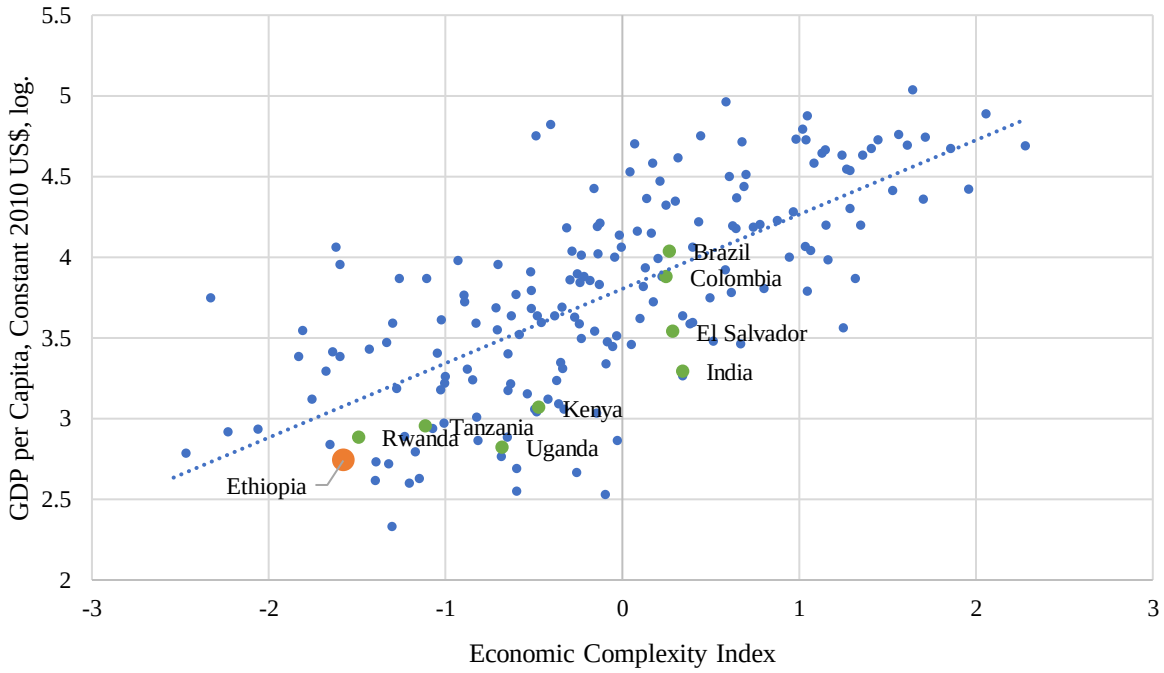
The Economic Complexity Index captures the diversity and ubiquity of an economy's capabilities. In some cases, the low ubiquity of a product can originate not in larger embedded capabilities but in the overall scarcity of a natural resources, such as the case of diamonds; a way of correcting our measure of ubiquity when this problem arises is the diversity and ubiquity measures themselves, since it is likely that if a low-ubiquity product does not require many capabilities, then the economies that produce it will not be diverse. In the same way that diversity measures can "correct" our understanding of ubiquity, ubiquity can become a tool to correct our measures of diversity, to account for the rareness of the products and services that diverse economies make. The process of correcting the diversity measure by ubiquity and ubiquity by diversity can be iteratively repeated through algebraic methods until the process converges. The Economic Complexity Index (ECI) is a measure of the span of an economy's capabilities (ultimately reflected in the diversity and average ubiquity of the products the economy it makes competitively), while the Product Complexity Index (PCI) measures the span of capabilities that a product requires.[8]

The Economic Complexity Index is a predictor of countries' income per capita and future growth. Countries' economic complexity is significantly correlated with their income per capita (*Figure 5*). Separating countries with significant shares of natural resources within their exports can help tighten the relationship between complexity and income, as the income generated by extractive activities is not as directly related to knowhow. Moreover, economic complexity has been found to be a driver of economic growth: countries whose economic complexity was found to be greater than what is expected for their level of income have tended to grow faster than countries that show income greater than predicted for their level of economic complexity.[9] The latest growth projections from the Growth Lab predict a significant slowdown of growth in Ethiopia to 4.3%, below growth rates predicted for peers such as Kenya and Uganda. This prediction is consistent with Ethiopia's current ranking in terms of the Economic Complexity Index, as it will be described in the next section. Identifying diversification strategies to increase the complexity of Ethiopia's economy in the medium-term will be for this reason vital to ensure medium-term growth.

[8] *Appendix 1* includes a technical breakout of the methodology to calculate ECI, PCI and the other complexity indicators.

[9] A regression in which growth per capita is found statistically associated over ten-year periods to economic complexity, controlling by initial income and the increase in natural resource income is explained in detail in Hausmann et al., *The Atlas of Economic Complexity*. Economic complexity is not simply about export-oriented growth or simply export diversification: although trade data is utilized to calculate the complexity indicators, the contribution of complexity's explanatory power goes far beyond export growth as ECI's contribution to growth remains strong even after accounting for real export growth. Moreover, ECI has been found to capture more information about growth than other factors such as governance or human capital indicators.

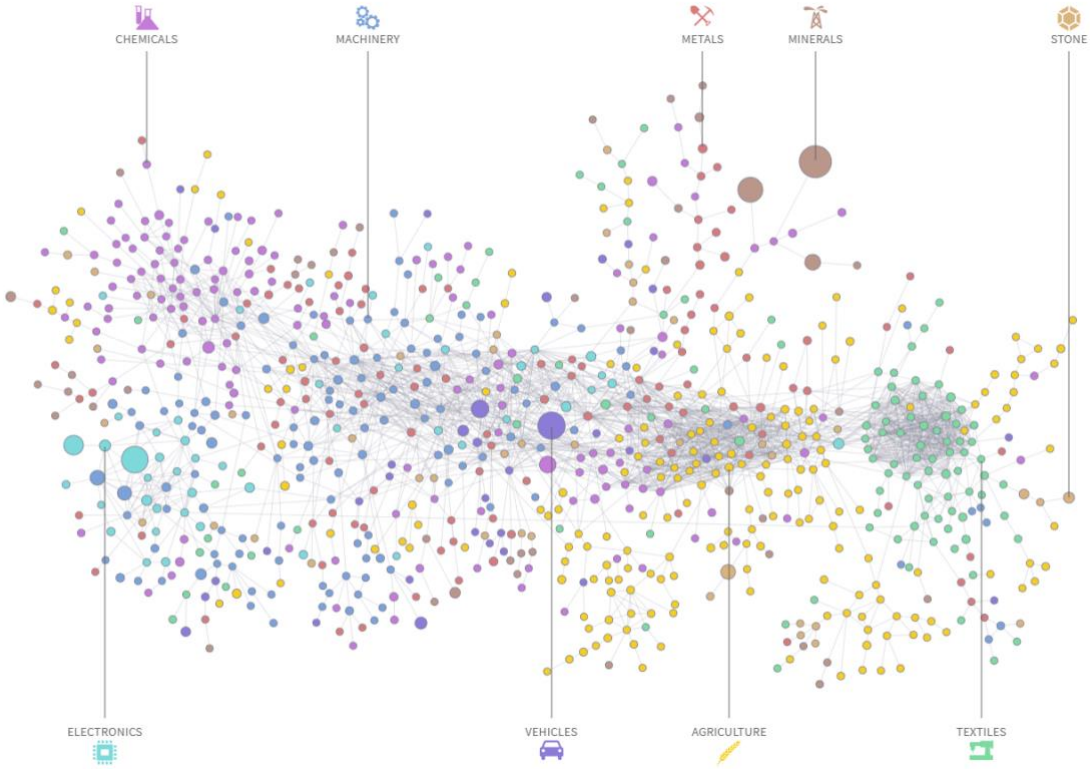
Figure 5. ECI and Income per Capita (2017)



Sources: Atlas of Economic Complexity, World Bank World Development Indicators

The theory of Economic Complexity also provides a pathway to understand the evolution of country's comparative advantages. The concept of *proximity* allows us to measure the similarity in the capability requirements of different products. Two products are close to each other if they require similar capabilities. We can identify the proximities between all pairs of products in a dataset by calculating probability that countries export the same two products. Using all pairs of products, one can build a Product Space, that is a matrix connecting all pairs of products. To visualize this matrix, we use a network representation that highlights the strongest links in the matrix (*Figure 6*). In the Product Space, each node represents a product, and the size is proportional to the total world trade represented. Products that are closer in the two-dimensional representation have a higher probability of being co-exported, indicating that the capabilities that are needed to be competitive for each pair of products are more similar. Some sections of the Product Space have more dense networks of products, but others are sparser. Products are not necessarily close to those that are related by backward or forward linkages, as these may imply different capabilities, while some products in very different sectors might involve similar capabilities.

Figure 6. The Product Space, 2017

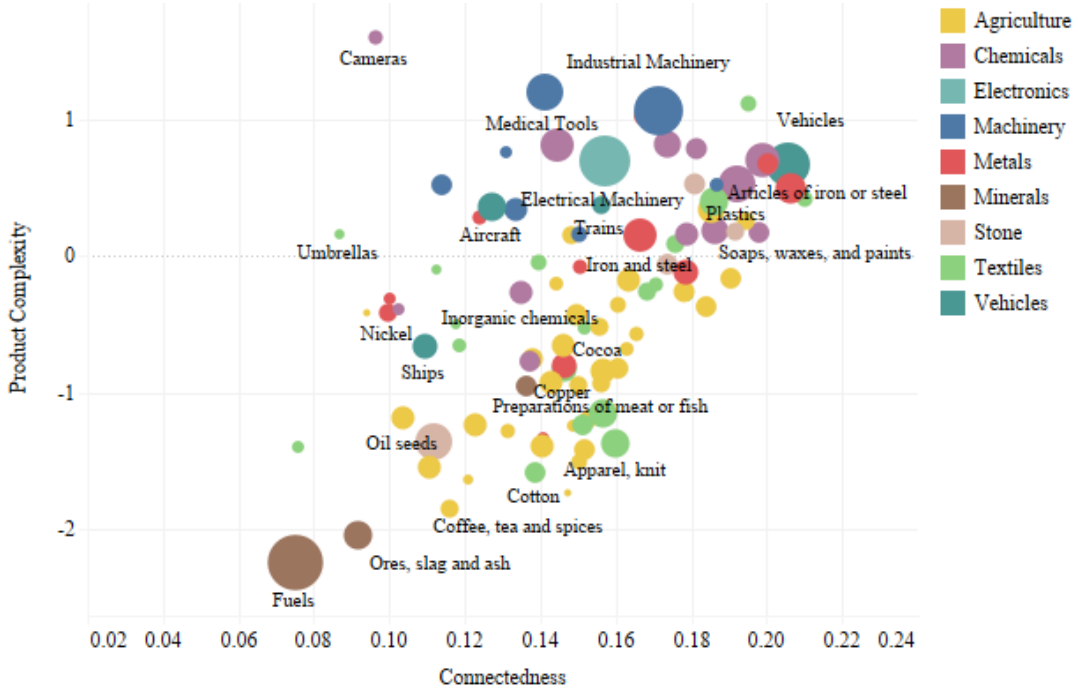


Source: Atlas of Economic Complexity

The challenge of diversification comes from coordination or "chicken and egg" problems. For a country to diversify its production, it needs to practice activities it has never practiced. But for a person or an organization to "do" something new, it needs to know how to do it, and it typically does not know how to do what it doesn't do already. One cannot make watches without watchmakers, but it is hard to acquire the knowhow to become a watchmaker in a country that does not make watches. Diversification hence tends to favor products for which the country already has most of the requisite capabilities and hence has fewer "chicken and egg" problems to overcome. The structure of the Product Space allows us to identify how far are products from the country's existing capabilities, and thus how likely are these products to be feasible. The Product Space has a very irregular topology. While some products are located in a central, highly connected part of the Product Space, such as vehicles, others such as oil and minerals are highly disconnected from the rest of the network, which ultimately implies that the capabilities required in those sectors are not of general use in others. The theory of Economic Complexity allows us in this way not only to understand how *complex* products are but also how *connected* they are. Connectedness is related to how many products are near any particular product: The more connected a product is, the easier paths to diversification it opens. Generally, complexity and connectedness are positively associated (*Figure 7*). While garments and machines are similarly connected, i.e. the capabilities

needed to make one kind of garment or machine are similar to the capabilities needed to make another, machines are more complex than garments, and both are more complex and connected than oil.

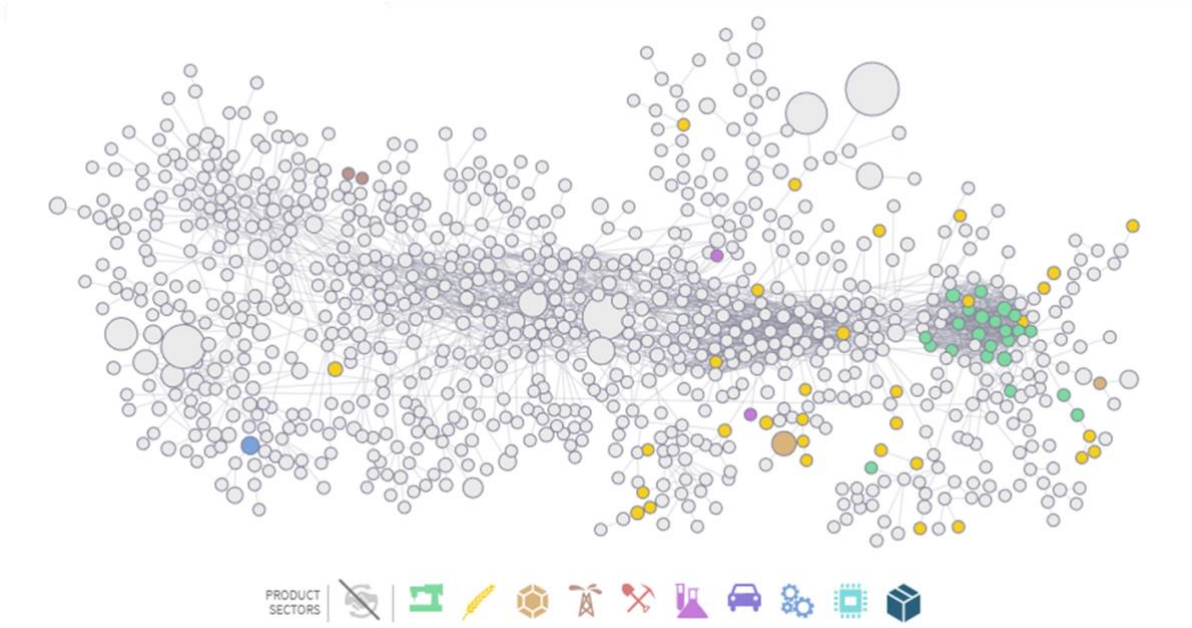
Figure 7. Connectedness and Economic Complexity (HS92 2-Digit, 2014)



Source: Atlas of Economic Complexity. Product connectedness is calculated by estimating the weighted proximity of each product to all other products at a 4-digit level, then grouping products at 2-digit chapter. Product nodes are sized by global trade and grouped by HS 2-Digit chapters.

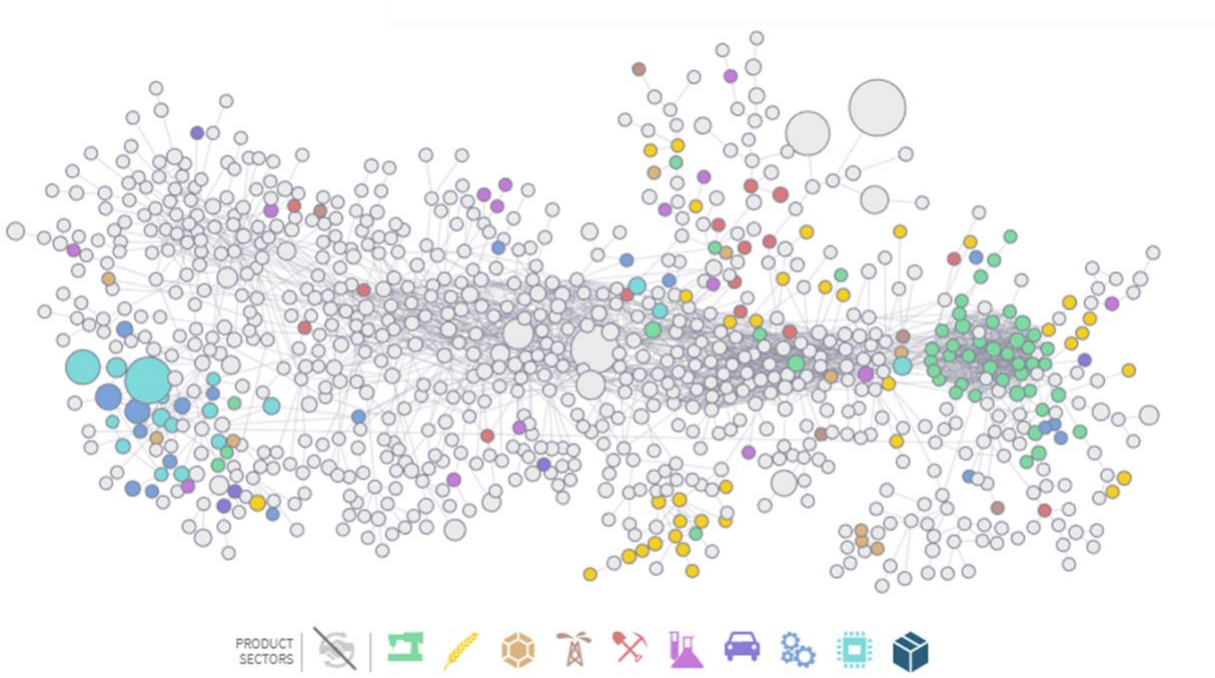
The Product Space can illustrate the products in which a country has comparative advantage. *Figure 8* illustrates Ethiopia's occupation of the Product Space, by highlighting the products in which the country shows revealed comparative advantage (or RCA > 1). Although Ethiopia's economic complexity is further discussed in the next section, it is notable to first understand how the Product Space can help us understand where a country "is" in terms of diversification, what are nearby products, and how difficult the tasks that the country will have to confront to achieve diversification will be. It is useful in this context to compare Ethiopia's occupation of the Product Space with Vietnam's (*Figure 9*). Whereas Ethiopia has only sparsely populated the Product Space with largely unconnected agricultural products and a newly developed textile cluster, Vietnam has earned in the past decades a clear advantage in the production of electronics and machinery products, which have become themselves a cluster. Moreover, Vietnam also presents comparative advantage in more connected agriculture and textile products. The following sections will provide a more thorough analysis of Ethiopia's complexity profile.

Figure 8. Ethiopia's Position in the Product Space, 2017



Source: Atlas of Economic Complexity. Colored circles represent the industries in which Ethiopia has a comparative advantage (RCA > 1)

Figure 9. Vietnam's Position in the Product Space, 2017



Source: Atlas of Economic Complexity. Colored circles represent the industries in which Ethiopia has a comparative advantage (RCA > 1)

Countries differ in their diversification opportunities and challenges, based in their position in the Product Space. The work of diversification is not the same for countries with high economic complexity and low economic complexity. In many cases, an economy with low economic complexity might struggle to find nearby opportunities to expand its capabilities, given a relatively large distance to high-complexity and highly connected products. *Figure 10* introduces the Complexity Outlook Index (COI), which provides a measure for this concept. COI measures how well positioned is a country in the Product Space by looking at the distance between the products that the country currently is good at and other products, weighted by their product complexity. The figure shows that countries with low complexity (i.e. few capabilities) tend to be poorly positioned in the Product Space because they have developed few products and these tend to be in the periphery of the network, which ultimately implies a more challenging diversification process. Other high complexity countries, such as Germany, have already developed comparative advantage in all complex products, so that there are few diversification opportunities left in globally existing products. To diversify, they need to innovate at the global technological frontier. In between, there are countries with intermediate levels of complexity, and this means that they already have comparative advantage in more products than countries like Ethiopia and that these products are more connected and hence offer greater diversification opportunities.

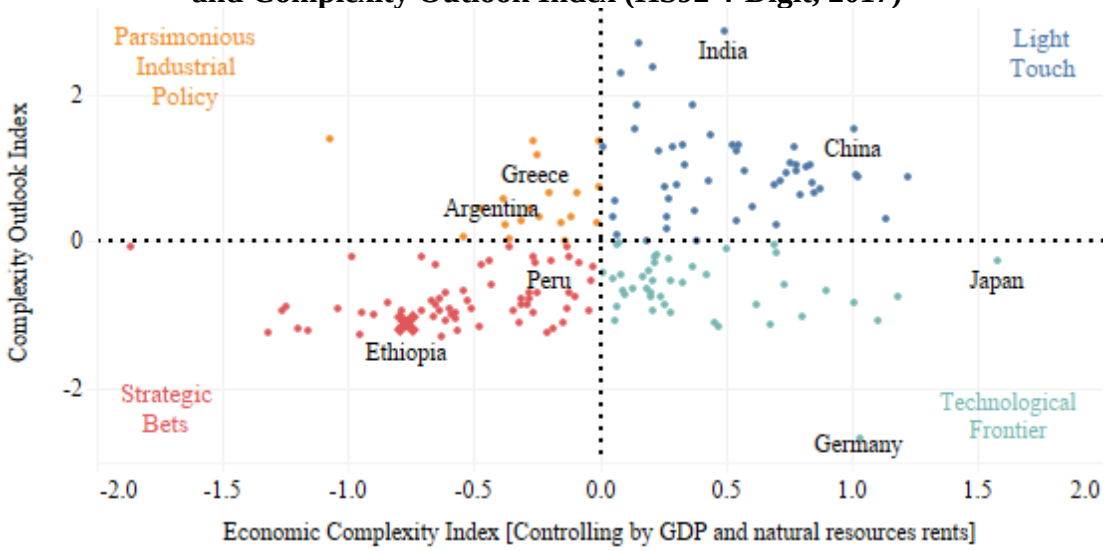
Figure 10. Economic Complexity and Complexity Outlook Index (HS92 4-Digit, 2017)

Source: Atlas of Economic Complexity

Different complexity profiles suggest different strategic approaches towards diversification. *Figure 11* compares countries' complexity outlook with how high or low is their economic

complexity relative to their income and natural resource wealth. Countries at the right-side of the graph are expected to grow faster on average in the medium-term, as their high economic complexity reflects that they are rich in capabilities relative to their income and wage levels. Countries that appear higher along the y-axis are better positioned in the Product Space, meaning that their availability of nearby complex products will ease the task of diversification. Based on the ECI (relative to income and share of natural resources) and COI, countries can be placed in different quadrants, that imply different strategic approaches towards diversification.[10] A "light touch policy" should mainly leverage countries' existing successes to enter more complex production. Countries that need more capabilities to grow but are well-positioned in the Product Space (upper-left quadrant) require a "parsimonious industrial policy" that emphasizes industries in the vicinity of countries' current capabilities but with higher sophistication. Countries in the bottom-left quadrant are trapped in a low-income, low-diversity equilibrium as they need more capabilities to grow but it is hard to accumulate them because all diversification opportunities are relatively distant, implying serious coordination failures.[11] These countries need policies that facilitate the coordinated appearance of missing capabilities and it is recommended that they place "strategic bets" into areas with diversification potential, to increase their future opportunities. This type of strategy emphasizes sectors that are sophisticated and provide larger strategic value, even when these sectors are farther away from current capabilities. Ethiopia's diversification strategy, as the next sections will show, will require this strategic approach.

Figure 11. Economic Complexity relative to GDP and Complexity Outlook Index (HS92 4-Digit, 2017)



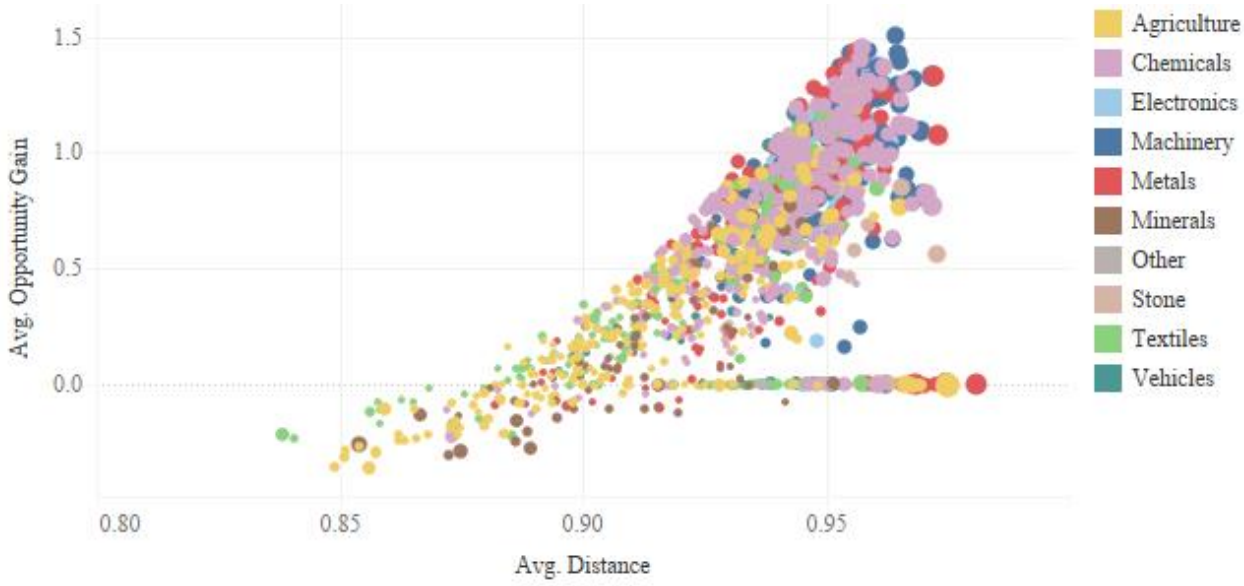
Sources: Atlas of Economic Complexity, World Bank World Development Indicators

[10] Ricardo Hausmann and Bailey Klinger, "Policies for Achieving Structural Transformation in the Caribbean," *IADB Private Sector Development Discussion Paper* 2 (2009).

[11] Ricardo Hausmann and Dani Rodrik, "Economic Development as Self-Discovery," *Journal of Development Economics* 72, no. 2 (2003): 603–633.

The measurable concepts of "distance" and "opportunity gain" provide additional resources to seize the tradeoffs of diversification. While the Product Space is based on the technological proximity between any pair of products, we can define the "distance" between a country and a specific product as the inverse of the weighted proximity between that particular product and the products for which the country already has comparative advantage. We can also estimate the "opportunity gain" (OG) that a country would derive from moving into a particular product. OG measures how much closer a country would get to all other products, weighted by their complexity, if it were to develop comparative advantage in a specific product. Products with higher OG have more linkages to higher complexity products and open more opportunities for future diversification. By construction, distance and opportunity gain are specific to country-product pairs.[12] Moreover, for less developed countries, distance and opportunity gain tend to be positively correlated, as products that are closer provide fewer opportunities for future diversification, because the more complex products are farther away (*Figure 12*). The fifth section of this report will apply this framework to identify diversification opportunities for Ethiopia.

Figure 12. Distance and Opportunity Gain, Ethiopia (HS92 4-Digit, 2017)



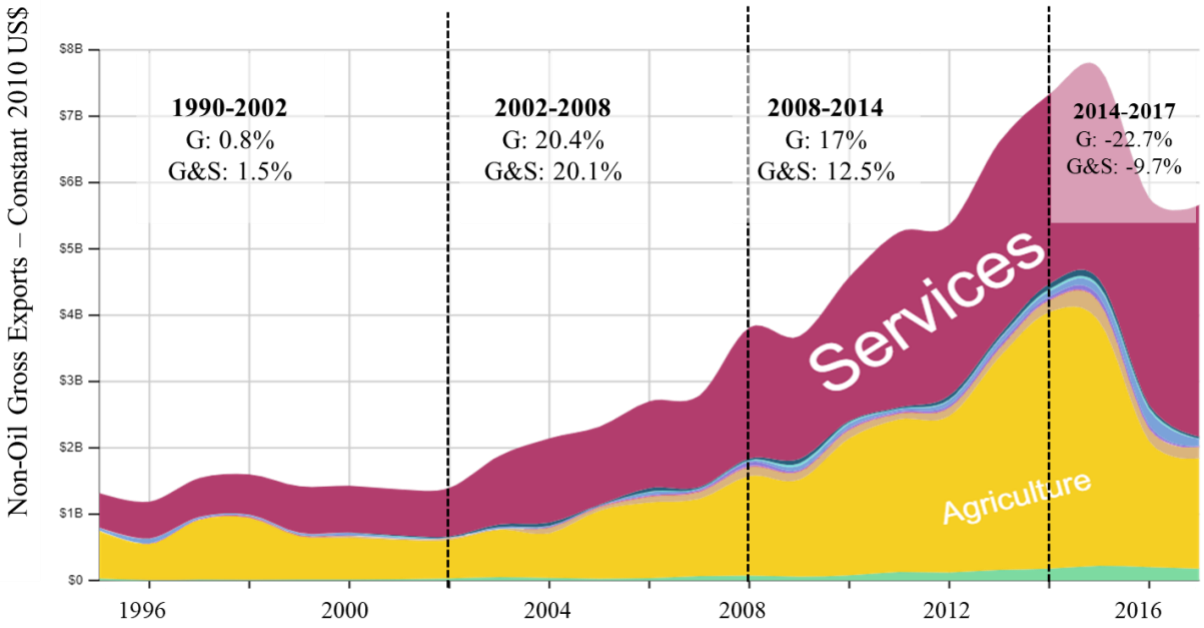
Source: Atlas of Economic Complexity. Product nodes are sized by global trade

[12] Although the matrix of product-to-product proximities that is estimated to construct both indicators is the same for all countries in the dataset, countries differ in which products they have comparative advantage and hence in both the distance of the country to any product and in terms of the value that a particular product would add to the country's diversification opportunities.

3. Export Performance and Economic Complexity

Ethiopia's export sector expanded rapidly from the early 2000s to 2014, after which it has declined. Ethiopia's virtuous growth cycle did not only see rapid growth in investment, but also in exports. After decades of stagnation, the end of the war with Eritrea marked the beginning of a growth acceleration in exports of both goods and services. From 2002 to 2008, exports grew from a low base at an annualized 20% rate (*Figure 13*). After that, until 2014, export growth kept growing at a two-digit pace. Merchandise exports hit a peak value in US$ in 2014, after which goods export value fell at a rapid rate and then stagnated. Although there are inconsistencies in different reports of trade flows, all reporting fails to show any significant increases in merchandise exports since 2015.[13] In the same period, transportation services kept growing, while tourism services stagnated. Ethiopia's export slowdown not only partially explains the deceleration of growth in the last period but has also prevented Ethiopia from completing the goals set in the second Growth and Transformation Plan (GTP II), which expected a much larger role for merchandise exports – both agriculture and manufacturing goods – in the process of structural transformation (*Figure 14*).

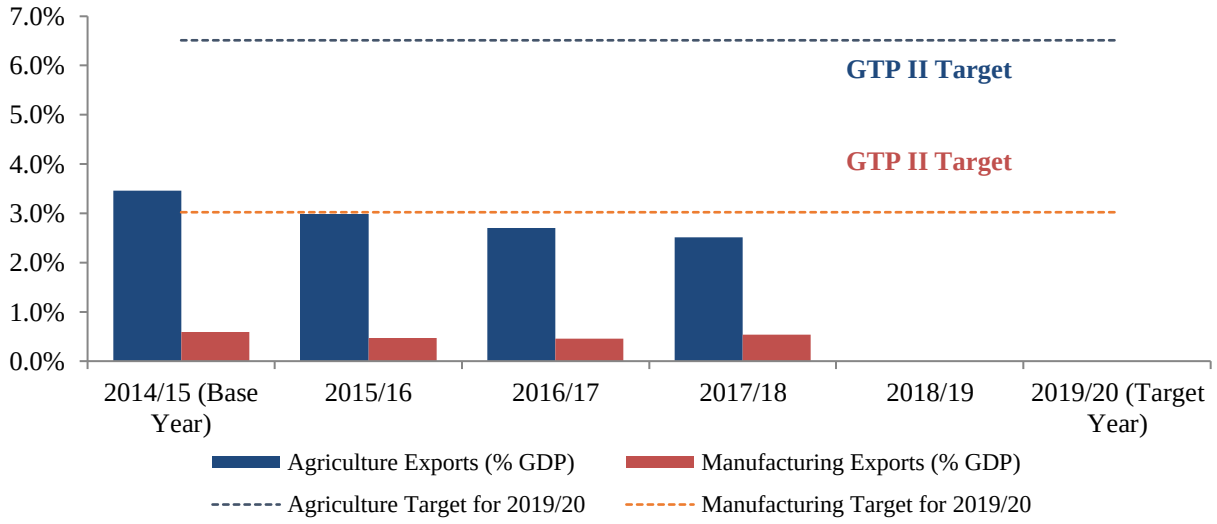
Figure 13. Ethiopia's Export Performance – Non-Oil Gross Exports



Source: Atlas of Economic Complexity

[13] *Appendix 2* explains the inconsistencies between trade reports and provides details on the Atlas of Economic Complexity's data cleaning process.

Figure 14. Growth and Transformation Plan II Export Targets

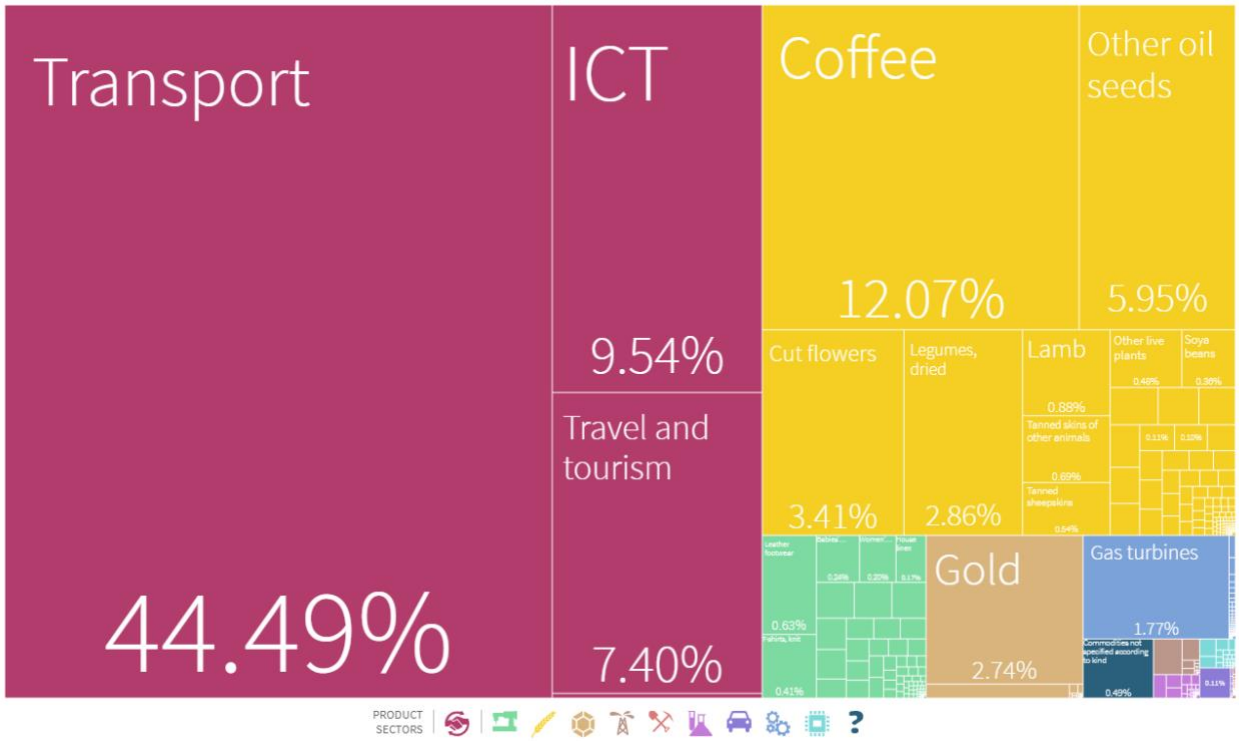


Sources: Growth and Transformation Plan II / National Bank of Ethiopia

The export boom from the early 2000s to 2014 was concentrated in a small variety of goods and services. Ethiopia's export basket is largely described by transportation exports (led by Ethiopian Airlines), followed by other services and a small variety of agricultural goods and minerals (*Figure 15*). As of 2017, a few agriculture goods represent 77% of merchandise exports, while the country's growing textile sector only represents 8% of its merchandise exports and 3% of gross exports. Ethiopia's merchandise export basket is effectively more concentrated than all of its regional and aspirational comparators' export baskets, according to different measures of market concentration (*Figure 16*).[14] It is hence not surprising that both the growth acceleration since the early 2000s and the growth slowdown in 2014 was driven by the few products that represent the majority of the country's exports. Dynamics of Ethiopia's coffee, gold, cut flowers and other animal and vegetable exports largely explain both the rise and fall of the country's export sector (*Figure 17*). All product categories – including manufactured exports (which include garments, metals, pharmaceuticals and chemicals) have shown subpar performance – below 50% in many cases with regards to GTP-II goals for 2018. In the fiscal year 2017/18, coffee exports only reached 50% of targeted exports, with similar results in cut flowers and pulses. Garments, chemicals and leather products reached less than 40% of the yearly target for the same period (*Figure 18*).

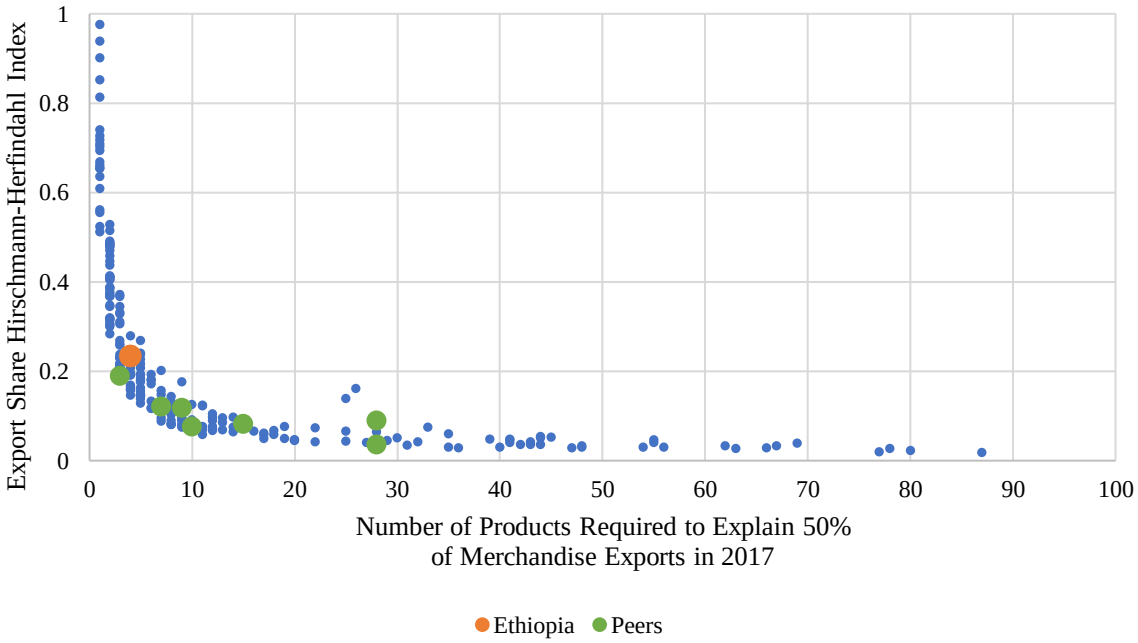
[14] The two measures provided are (1) the number of products that are required to explain 50% of merchandise exports, and (2) the Hirschmann-Herfindahl index (HHI) of export shares. The latter is the sum of the squares of the export shares in an industry and can range from 0 to 1. An increase in the HHI index indicate an increase in the concentration of the export shares.

Figure 15. Exports Composition (HS92 4-Digit, 2017)



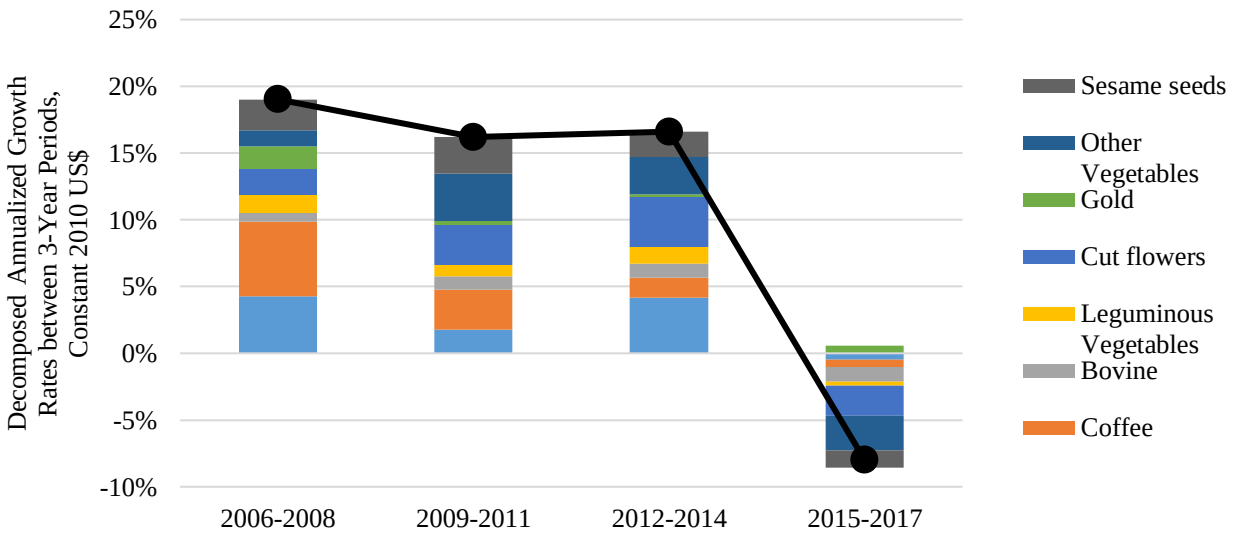
Source: Atlas of Economic Complexity

Figure 16. Export Concentration



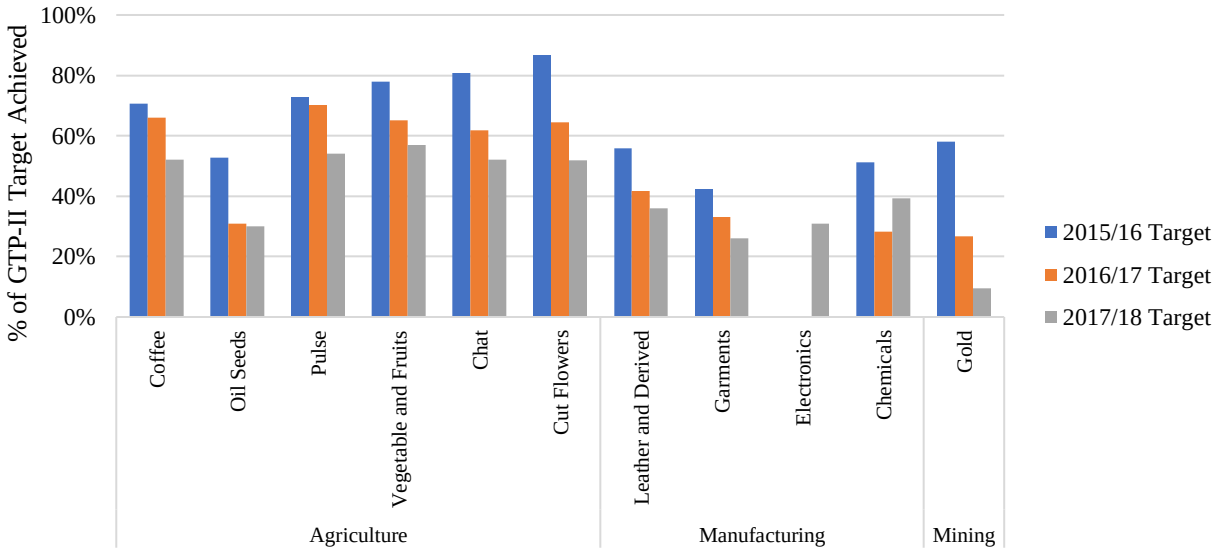
Source: Atlas of Economic Complexity

Figure 17. Ethiopia's Export Performance – Non-Oil Goods



Source: Atlas of Economic Complexity

Figure 18. Growth and Transformation Plan II Export Targets, by Industry

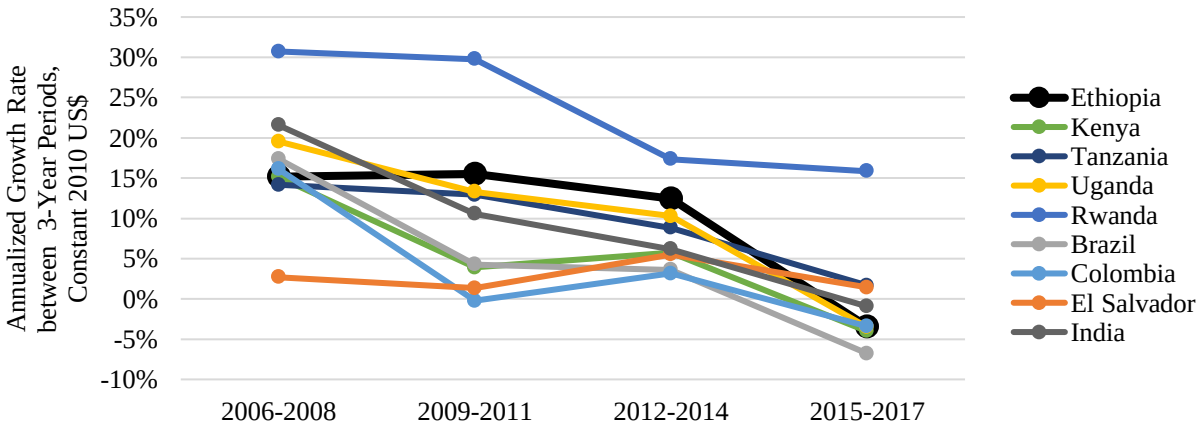


Sources: Growth and Transformation Plan II / National Bank of Ethiopia

Ethiopia's export growth outperformed most regional and aspirational peers in the last decade but have nevertheless failed to converge to their export levels. Ethiopia's export growth throughout the growth acceleration was not unique across emerging markets, but nevertheless outpaced many of its regional and aspirational peers, particularly through the late 2000s and early 2010s (*Figure 19*). Until 2014, this allowed Ethiopia to partially converge in its export per capita levels with its regional peers. The export growth slowdown was not uncommon between Ethiopia's peers, but hit Ethiopia harder than others. As of 2017, Ethiopia still showed the lowest exports per capita (as well as exports as a share of GDP) amongst its regional peers, with levels substantially

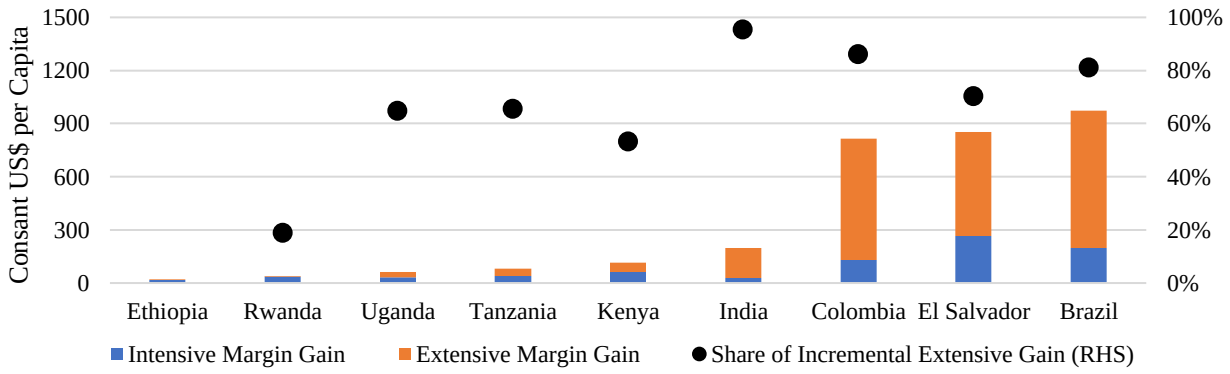
below aspirational benchmarks. The gap between Ethiopia and its peers is not mainly on the intensive margin: Although Ethiopia produces less of the goods in which it is competitive than its peers, more importantly the country produces a lower variety of goods (*Figure 20*).[15] With regards to some of its aspirational peers, the extensive margin can explain more than 80% of the difference in exports per capita, as is the case of Colombia or Brazil.

Figure 19. Ethiopia's Export Growth by 3-Year Period – Non-Oil Goods



Source: Atlas of Economic Complexity

Figure 20. Ethiopia's Export Gap (Goods) – Intensive vs. Extensive Margin



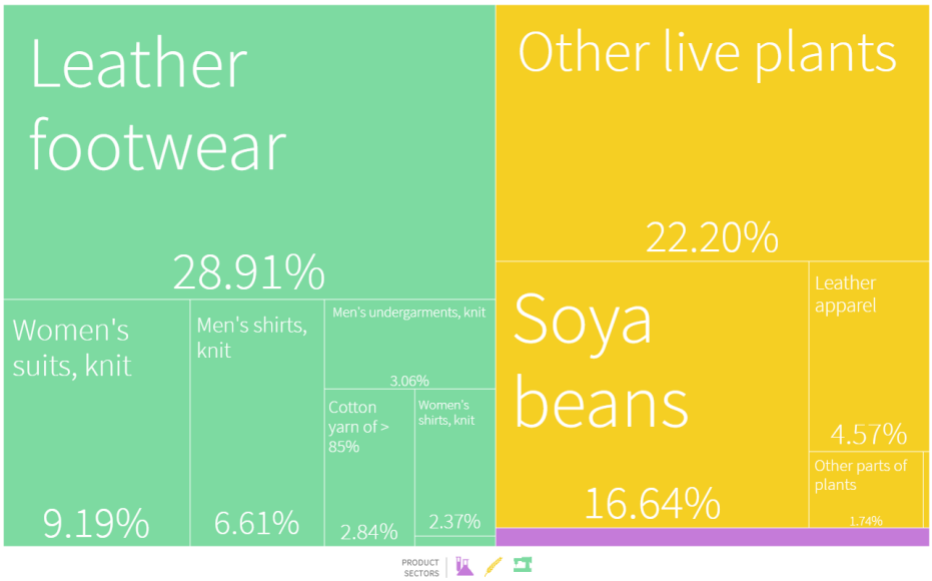
Source: Atlas of Economic Complexity.
The intensive margin is defined as the export gap for products in which Ethiopia has an RCA > 1.

Ethiopia managed to introduce some new products to its export basked in the last two decades, but these have not significantly altered its export composition. Ethiopia's textile industry, comprised of both apparel and footwear manufacturers have surged, especially over the last ten years. Over the same period, Ethiopia was able to consolidate its cut flower export industry

[15] To seize whether the gap in exports per capita between Ethiopia and the country's comparators was due to differences in the intensive or the extensive margin, the former was defined as differences in exports for products in which Ethiopia displays a Revealed Comparative Advantage or an RCA larger than 1. The extensive margin is then defined as the difference between the export per capita gap and the intensive margin.

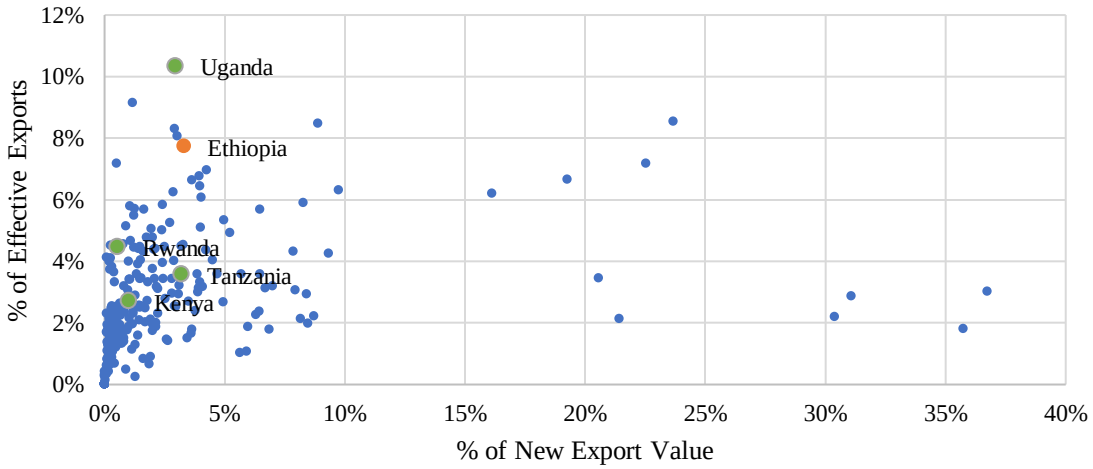
as well as to introduce a handful of new exports in the agriculture sector (*Figure 21*). Altogether, although the new products now represent a significant share of Ethiopia's products with an RCA > 1, their share in Ethiopia's export basket is relatively low, although higher than the equivalent shares for the country's peers in the same period (*Figure 22*). It is notable that Ethiopia pursued through GTP I and II strategic bets for diversification that have not yet materialized as exports, such as with sugar, which required major public investments, and pharmaceuticals, which has depended mostly on private participation. With the exception of products in the textile and apparel and the leather value chains, new manufacturing industries have failed to materialize as exports.

Figure 21. New Products in Ethiopia's Export Basket, 2017 (% of New Exports)



Source: Atlas of Economic Complexity. A product is considered "new" if it was absent in 2002 (RCA<0.5) and has been present for the latest three years before 2017 (RCA>1)

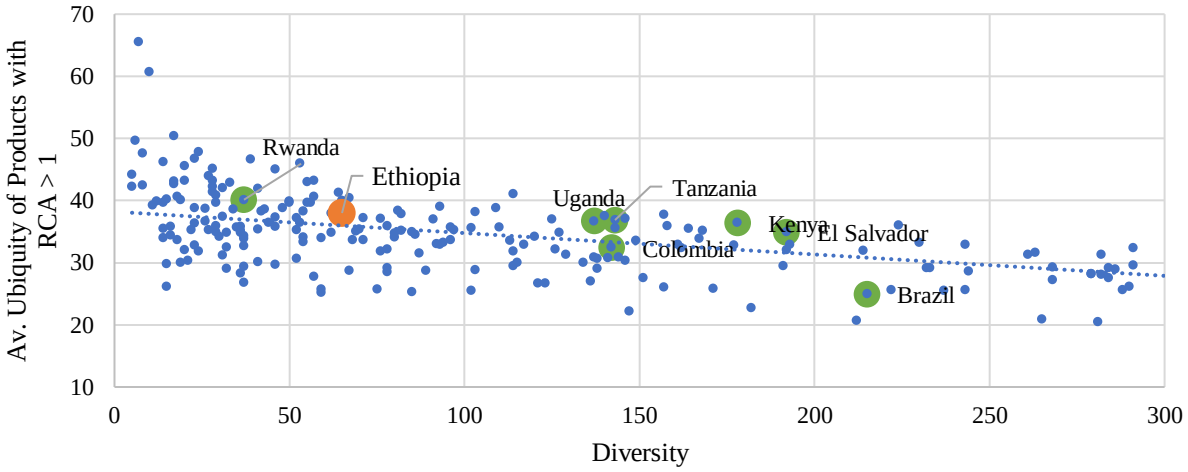
Figure 22. New Products' Impact in Ethiopia's Export Basket, 2017



Source: Atlas of Economic Complexity. A product is considered "new" if it was absent in 2002 (RCA<0.5) and has been present for the latest three years before 2017 (RCA>1)

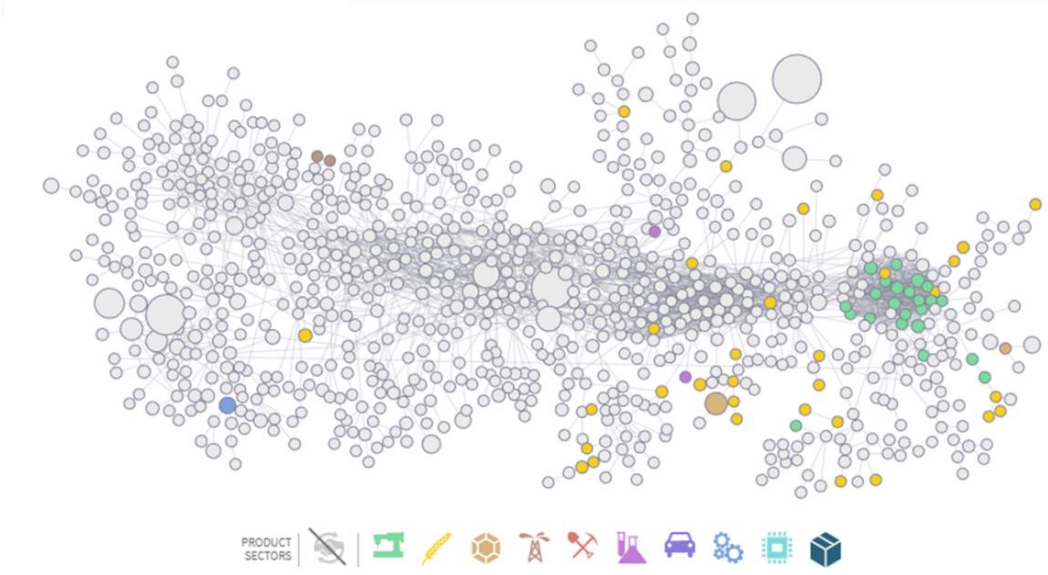
The economy displays signs of low economic complexity, with a sparse positioning in the Product Space that has not significantly improved in time. Ethiopia competitively produces a low diversity of products, compared to most of its peers (*Figure 23*). Moreover, the average ubiquity of the products Ethiopia produces is above what is expected for its level of diversity, which implies that Ethiopia produces mainly products that are produced in other locations. This is reflected in Ethiopia's sparse population of the Product Space, concentrated in largely unrelated agricultural products and a handful of products in the textiles cluster that have appeared over the last decade (*Figure 24*). The vast majority of the Produce Space is unpopulated, given the low diversity of Ethiopia's export base.

Figure 23. Diversity and Ubiquity (HS92 4-Digit, 2017)



Source: Atlas of Economic Complexity

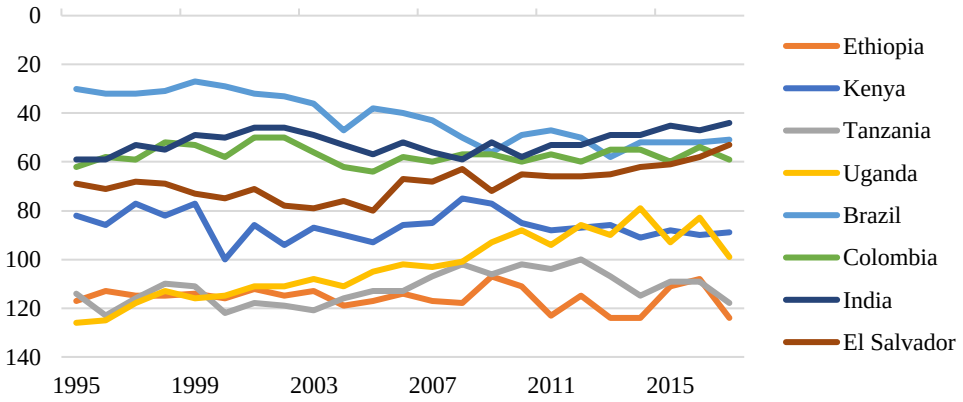
Figure 24. Ethiopia's Position in the Product Space, 2017



Source: Atlas of Economic Complexity. Colored circles represent the industries in which Ethiopia has a comparative advantage (RCA > 1)

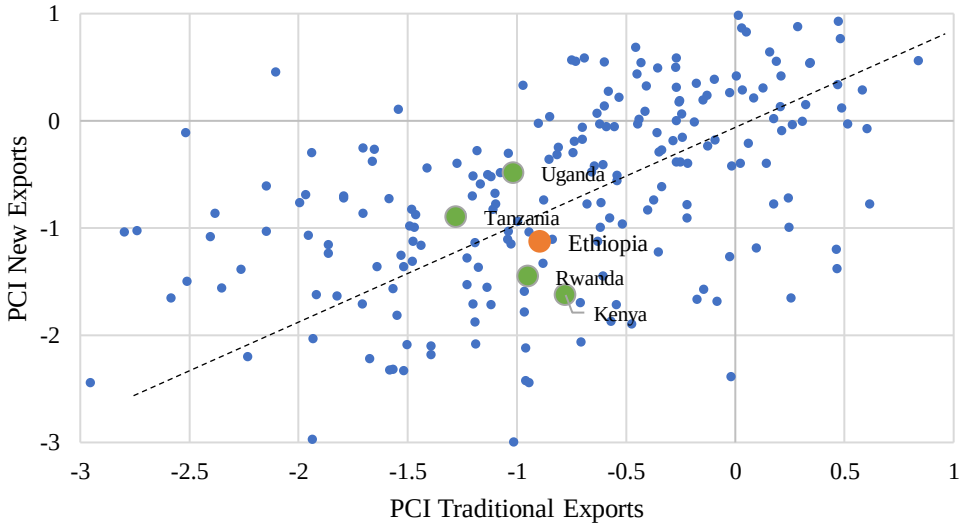
Despite some diversification in recent years, Ethiopia has not yet made gains in its economic complexity. Ethiopia remains ranked below both regional and aspirational peers in the Economic Complexity Index (ECI), as it has for the last two decades, with no overall improvement over time (*Figure 25*). Although Ethiopia managed to incorporate new agriculture and textile products into its export basket, the average product complexity of these goods was similar to Ethiopia's existing (here referred to as "traditional") exports, so overall economic complexity did not increase (*Figure 26*). Both Ethiopia and its regional peers appear to be below their expected income per capita level, given their economic complexity, but with a narrower gap for Ethiopia (*Figure 27*). This implies that Ethiopia has the productive capacities to continue to grow, but *ceteris paribus*, at a lower long-term growth rate than what is expected for Kenya, Tanzania and Uganda, given their larger distances to expected income per capita for their level of economic complexity.

Figure 25. Ethiopia's ECI Ranking, vs. Peers



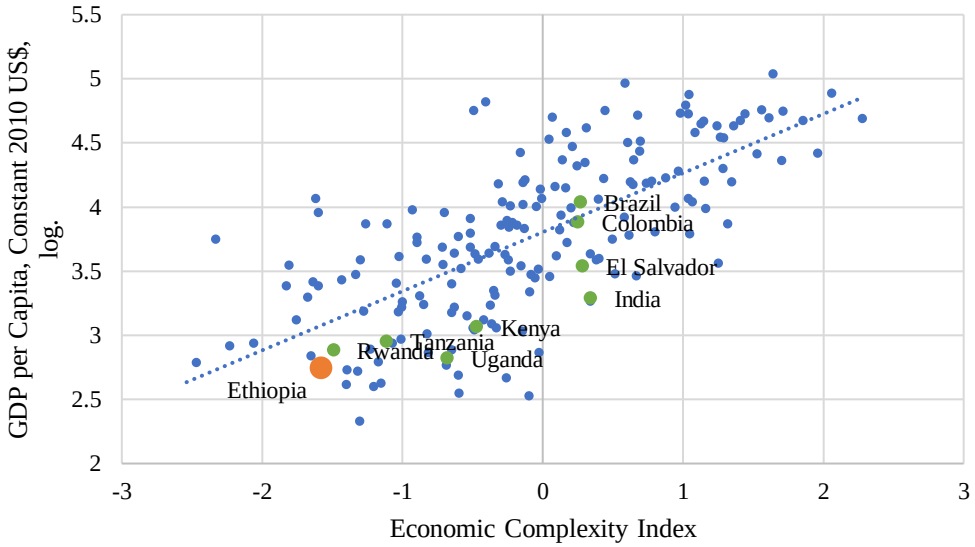
Source: Atlas of Economic Complexity

Figure 26. PCI of Traditional and New Exports



Source: Atlas of Economic Complexity. A product is considered "new" if it was absent in 2002 (RCA<0.5) and has been present for at least three years since 2017 (RCA>1)

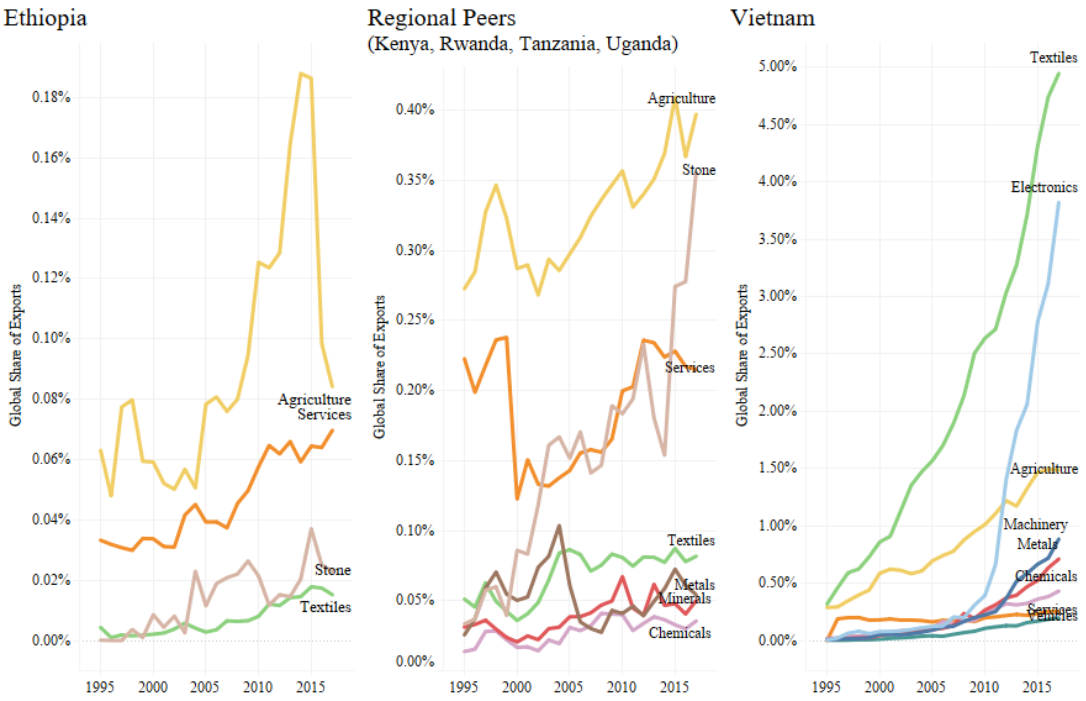
Figure 27. ECI and Income per Capita (2017)



Sources: Atlas of Economic Complexity, World Bank World Development Indicators

The evolution of Ethiopia's global market shares shows that the country has entered the initial stages of structural transformation. The process of structural transformation has been traditionally understood as the reallocation of economic activity and resources in an economy towards more productive sectors. In the context of theory of Economic Complexity, we can reinterpret structural transformation as the gradual development of more and more complex capabilities. Given that countries tend to export products in which they display a comparative edge, the relative position of global market shares of a country's exports can illustrate the evolution of its comparative advantage and its current position in the process of structural transformation. Ethiopia's agriculture sector has traditionally captured a much larger share of the global market than other exports from the country, followed by transportation services (*Figure 28*). Though, it is noteworthy that even these market shares are low in comparison to Ethiopia's share of the world population, which is closer to 1.3%. Nevertheless, the last decade was marked by the gradual increase of textiles' market share, which indicates the beginning of a process of structural transformation. Some of Ethiopia's regional peers have followed similar patterns. Ethiopia is only at the initial stages of this process, as the illustration of the Vietnamese case shows. Whereas Ethiopia's export growth has been led by agriculture and services trade – while only recently incorporating textiles – a country such as Vietnam has grown its textile exports to a much larger size over several decades and has more recently and rapidly expanded into electronics exports, followed by machinery, metals and chemicals.

Figure 28. Global Market Share of Exports



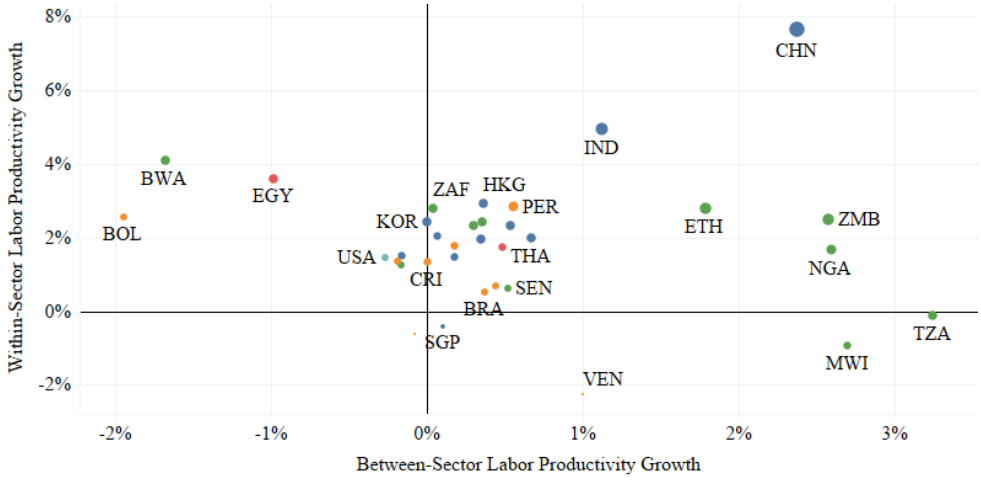
Source: Atlas of Economic Complexity

Analyzing the reallocation of labor across economic activities throughout the growth acceleration leads to a similar conclusion. Throughout the last two decades, labor productivity has increased both from within-sector growth (agriculture, manufacturing or services each becoming more productive) as well as from between-sector growth (labor moving from agriculture towards more productive activities). Compared to other Sub-Saharan African economies, Ethiopia's productivity growth was more dependent on within-sector growth than on between-sector growth, although the economy has seen a decent share of both types of productivity increases (*Figure 29*). Since 1999, Ethiopian labor shares have shifted towards both industrial and service sectors, which have much higher labor productivity than agriculture, although the change in agriculture's employment share was likely not larger than three percentage points (*Figure 30*).[16] The services sector has gradually become one of the driving forces behind Ethiopia's economy, explaining almost half of economic output and more than half of the growth during the acceleration.[17] Within the services sector, commercial services – which includes wholesale and retail work – and public services are the industries that have shown the largest output growth. Commercial services have also shown the largest productivity growth, although their labor productivity is behind that of modern services such as finance. Over the same period, Ethiopia tripled the size and substantially increased the diversity of its manufacturing sector, which is still directed towards domestic consumption (*Figure 31*). However, the increase in manufacturing

[16] Pedro MG Martins, "Structural Change in Ethiopia," *Development Policy Review* 36 (2018): O183–O200.
[17] Lars Christian Moller, "Ethiopia's Great Run: The Growth Acceleration and How to Pace It" (World Bank, 2015).

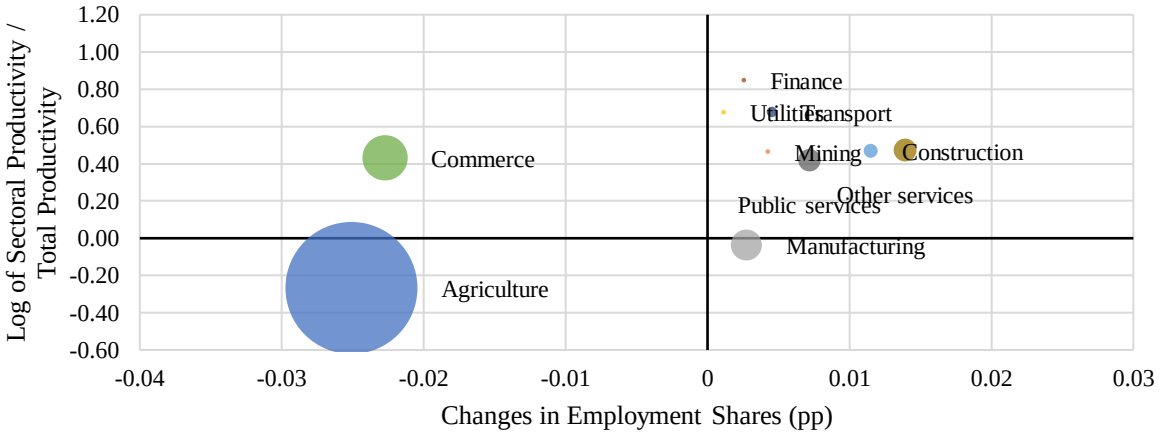
employment was not nearly enough to absorb the excessive supply of labor from the agriculture sector – which has mostly entered the services sector. Moreover, manufacturing's overall low labor productivity leaves further room for worry about the sector's current growth path.[18] In any case, there is no doubt that Ethiopia remains mainly an agriculture-led economy, and that accelerating the process of structural transformation will be necessary to increase the economy's export share and ultimately sustainable growth.

Figure 29. Structural Transformation, Within and Between Sector Variation, 2000-2010



Source: Groningen Growth and Development Centre 10-Sector Database[19]

Figure 30. Structural Transformation, Between-Sector Changes, 1999-2013

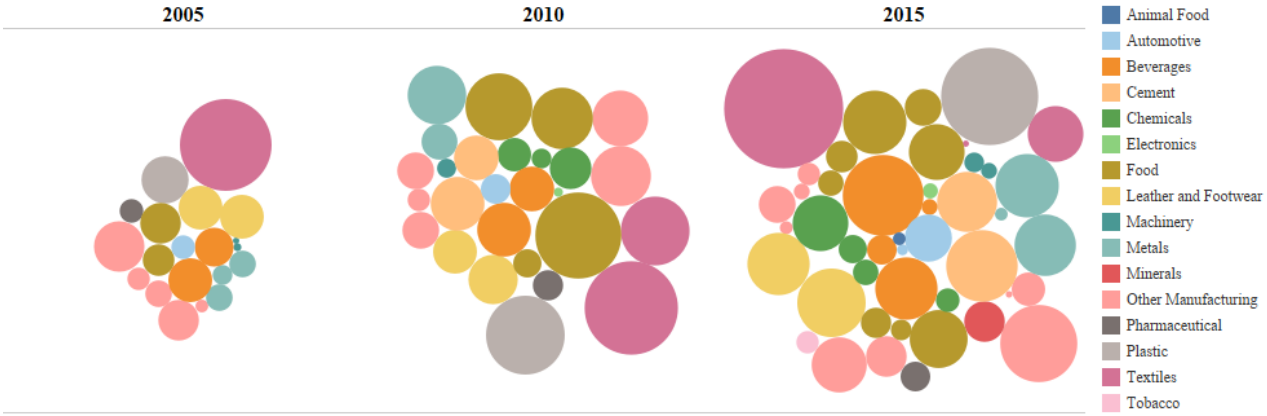


Source: Martins, 2018. Product nodes are sized by sectors' employment shares

[18] Xinshen Diao, Margaret McMillan, and Dani Rodrik, "The Recent Growth Boom in Developing Economies: A Structural-Change Perspective," in *The Palgrave Handbook of Development Economics* (Springer, 2019).

[19] Calculations use McMillan-Rodrik methodology of disaggregating labor productivity growth to within and between sector growth. The following decomposition is used. $\Delta Y_t = \sum_{i=n} \theta_{i,t-k} \Delta y_{i,t} + \sum_{i=n} \theta_{i,t} \Delta \theta_{i,t}$, with Y_t and y_t referring to economy-wide and sector labor productivity, while $\theta_{i,t}$ is the share of employment of sector i at time t. Cf. Margaret McMillan, Dani Rodrik, and Íñigo Verduzco-Gallo, "Globalization, Structural Change, and Productivity Growth, with an Update on Africa," *World Development* 63 (2014): 11–32.

Figure 31. Employees in Large and Medium Manufacturing Firms, by Industry

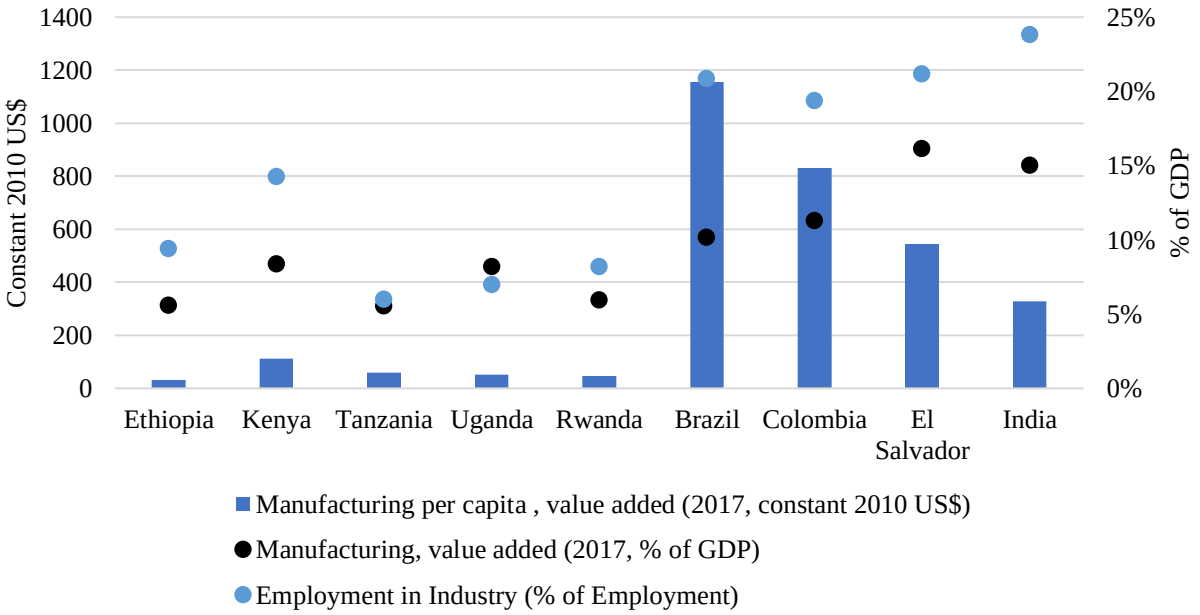


Source: Large and Medium Manufacturing Industries Survey (Central Statistical Agency).
Product nodes represent different industries and are sized by employees

The pace and success of Ethiopia's structural transformation will depend, at least partially, on its ability to diversify its manufacturing sector. Growth in Ethiopia, and generally in Sub-Saharan Africa, has included some degree of structural change – as workers have migrated out of agriculture to other sectors – but this change has been smaller and of a different type compared to East Asian growth episodes such as the cases of South Korea and Vietnam. Whereas in East Asia throughout the late 20th century structural transformation has implied workers leaving agriculture being absorbed by rapidly growing manufacturing industries, the industries that have absorbed these workers in Ethiopia have mainly been low-productivity urban services.[20] Not only are manufacturing exports small in Ethiopia, but so is the manufacturing share of GDP and employment, particularly in relation to aspirational peers (*Figure 32*). Although Ethiopia's success in transportation services, led by the growth of Ethiopian Airlines, provides some ground for the idea of a services-led growth strategy, and recent literature has argued that services could become a new type of growth escalator, it is not clear whether high-skilled services will be able both to drive a sustainable growth path and absorb the relatively low-skilled workers that will ultimately leave agriculture as the sector' productivity increases.[21] Services have not traditionally been regarded as an equivalent ladder towards structural transformation as manufacturing, as the type of services that can serve as a "productivity escalator" are usually high-skill industries, which require broad-based increases in human capital and governance for their success. Moreover, the non-tradability of most services makes a services-led strategy self-limiting, as their ability to expand ultimately depends by the productivity of the rest of the (tradable) economy.[22] Boosting the magnitude and range of services exports are both necessary steps to upgrade Ethiopia's export base, but ultimately it is the manufacturing sector's success that which is likelier to provide a base for high-quality employment and long-term growth in the country.

[20] Dani Rodrik, "An African Growth Miracle?," *Journal of African Economies* 27, no. 1 (2018): 10–27.
[21] Ejaz Ghani and Stephen D. O'Connell, "Can Service Be a Growth Escalator in Low-Income Countries?," World Bank, 2014.
[22] Dani Rodrik, "Premature Deindustrialization," *Journal of Economic Growth* 21, no. 1 (2016): 1–33.

Figure 32. Manufacturing GDP, 2017



Source: World Bank World Development Indicators

Ethiopia will have to accelerate the process of structural transformation for the country to sustain long-term growth at the rate of the last two decades. Although it is evident from the evolution of the country's export basket and labor shares that the country has entered a process of structural transformation, this process has not been nearly rapid enough to keep pace with the overall growth of the economy and has not provided nearly sufficient export growth to keep pace with the growth of imports. This imbalance has contributed to the widening foreign exchange shortfall in the economy, which is currently the binding constraint to growth. Sustaining medium-term growth in the country will require not simply a continuation of the country's recent structural transformation path but an acceleration.

4. DIVERSIFICATION DURING THE GROWTH ACCELERATION

During the growth acceleration, Ethiopia developed several niche capabilities. Although the country's export boom was largely led by the expansion of current agriculture and mineral exports, Ethiopia has also incorporated new products into its export basket that indicate the opening of new avenues for diversification. The following section will provide an account of three emblematic cases, one each in the agriculture, manufacturing, and services sectors. Each case study will describe recent trends in the industry, as well as some of its key current challenges. The three cases provide an illustration of what diversification success has looked like in Ethiopia. Cut flowers, textiles and apparel and air transportation all benefited from access to foreign knowhow, and, in all three cases to a different degree, industrial policy was key to address coordination failures and encourage domestic knowhow accumulation. Moreover, all three cases exemplify some of the current difficulties the Ethiopian economy will have to overcome to increase and diversify its export base.

4.1. CUT FLOWERS

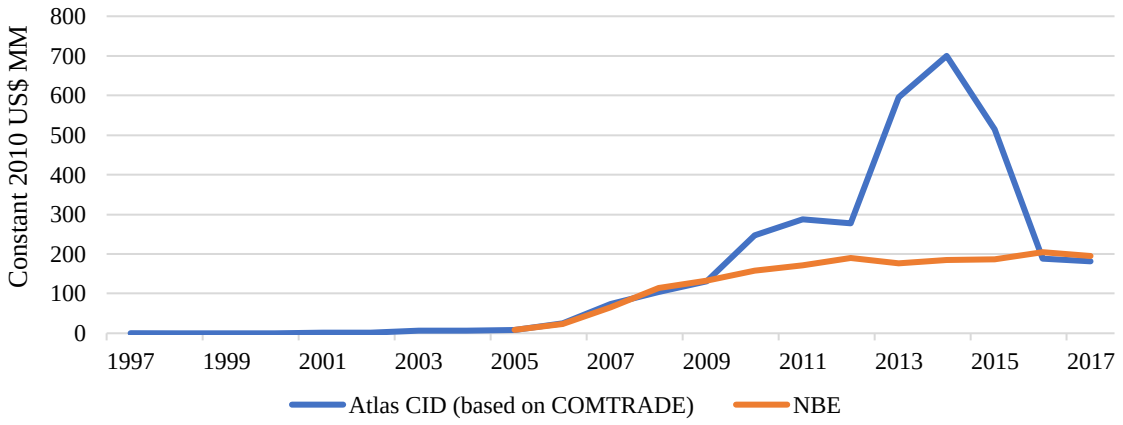
Ethiopia rapidly positioned itself among the top exporters of floriculture in the 2000s. Cut flowers have been a success story for Ethiopia, as the country became a major player in less than two decades. Until 2008, the sector grew rapidly to include over 70 operational firms, and Ethiopia became the 5th largest non-EU exporter to the EU cut-flower market and the 2nd largest African exporter after Kenya. Ethiopia quickly captured over 10% of the Netherlands cut-flowers imports. With average yearly exports over US$ 200 MM, the flower industry quickly rose to represent around 10% of Ethiopia's merchandise exports, becoming the country's largest non-traditional export product. Although some types of floriculture production have existed in Ethiopia since the time of the Derg regime, the industry's current performance kicked off in the mid-1990s when two domestic entrepreneurs experimented with producing summer flowers for exports. After this, a foreign pioneer (Golden Rose) introduced modern technology in the form of steel greenhouses to boost the sector's productivity.[23] Ultimately, the development of the sector was spearheaded by major foreign firms, which included Afriflora and other actors from Netherlands and Israel. The country always had significant agronomic potential, but despite Ethiopia's adequate conditions for a competitive flower industry with regards to land (flat and high altitude), climate, low-cost labor, and airport availability, the industry's surge only took place after the sector became a focus of targeted government action.[24] After 2002, domestic and foreign floriculture investors benefited greatly from targeted industrial policy, including allocation of land, infrastructure investment, cooperation with Ethiopian Airlines for air cargo transportation, tax and tariff breaks, soft loans, and loan rescheduling.[25] Government support was complemented by cooperation from

[23] Mulu Gebreeyesus and Michiko Iizuka, "Discovery of Flower Industry in Ethiopia: Experimentation and Coordination," *Journal of Globalization and Development* 2, no. 2 (2012): 1–27.
[24] Arkebe Oqubay, *Made in Africa: Industrial Policy in Ethiopia* (Oxford University Press, USA, 2015).
[25] Ayelech T. Melese, "Constraints on the Ethiopian Floriculture Industry," in *The Oxford Handbook of the Ethiopian Economy* (Oxford University Press, 2019).

international actors such as the Dutch development agency, and, ultimately, the Ethiopian Horticulture Development Agency was set up to lead public policy in the sector, particularly with regards to investments, capacity building and marketing. The result of both targeted government interventions and foreign investment was the expansion of exports in up to the late 2000s.

There are significant data discrepancies regarding the performance of the sector throughout the 2010s, although all sources indicate a decline in the sector's performance. In studying the recent evolution of the industry, as explained in *Appendix 2*, there is an important divergence between data sources with respect to Ethiopia's export trends; this divergence is particularly stark in the case of cut flowers. Data from COMTRADE, even after corrections by the Atlas of Economic Complexity, shows a significant rise and fall throughout the 2010s that is neither reflected in recent NBE data nor in the Netherlands' import records (*Figure 33*). Whereas COMTRADE data ultimately shows a rise and fall pattern, NBE shows a relative stagnation of exports throughout the 2010s. Nonetheless, all sources show either a fall or a stagnation in Ethiopia's exports and global shares in the sector. COMTRADE data shows a stagnation of global floriculture trade throughout the 2010s, which, combined with increasing international competition, might have acted as a factor limiting the industry's growth. Domestic factors related to shortage of land around Addis Ababa, changes in business regulations and access to finance for working capital might be further limiting the expansion of the sector, although it is not evident to what extent.[26]

Figure 33. Cut Flower Exports, Varying by Data Source



Source: Atlas of Economic Complexity / National Bank of Ethiopia

Ethiopian firms have found it challenging to benefit from the knowledge transfer and compete in the global floriculture sector. The entry of international leaders in the 2000s had been accompanied by the creation of new domestic firms which had little experience in the floriculture business. The last decade not only saw a stagnation in the development of the flower industry but also a replacement of domestic firms by foreign ones. Many of these domestic firms

[26] Florian Schaefer and Girum Abebe, "The Case for Industrial Policy and Its Application in the Ethiopian Cut Flower Sector," Ethiopian Development Research Institute, 2015.

had entered the sector in response to the available investment incentives but failed to thrive without the required knowhow to operate competitively, either in terms of production management or marketing.[27] Domestic firms reported particular difficulties with regards to developing the marketing expertise that is necessary to diversify sales from the Dutch auction that dominates the global market. The development of the sector hence illustrates some of the inherent difficulties in the process of diversification related to the transmission of knowhow. The attraction of foreign investors does not necessarily lead to a spontaneous development of local capabilities, and channels of transmission such as labor turnover are often insufficient to develop specific firm capabilities such as marketing that can be essential for competitive value chains.

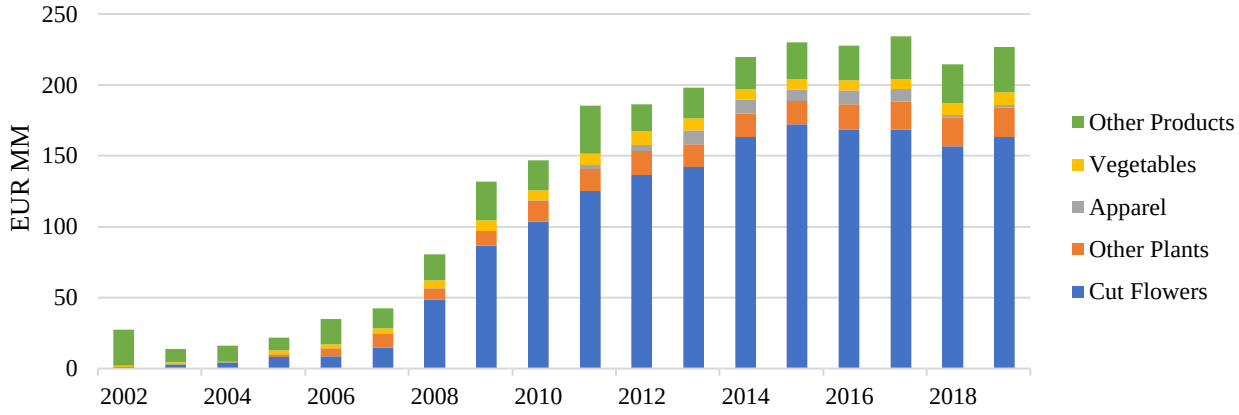
The development of the floriculture sector facilitated the emergence of complementary industries. As the floriculture sector grew, it gave rise to complementary manufacturing and services business activities such as planting materials, chemical fertilizers, packaging, and logistics. The sector gradually saw a shifting of sources of inputs – especially plant materials and fertilizers – from imported to local sources, which led for example to the vast majority of farms to currently use local packaging material.[28] This phenomenon is consistent with literature on the importance of backward spillovers from foreign direct investment.[29] Moreover, the floriculture business has also supported the rise of a domestic air freight industry. Early entrepreneurs depended on belly cargo of passenger flights operated by Ethiopian Airlines and other air carriers. The government facilitated the cooperation between producers and Ethiopian Airlines, which ultimately started to lease cargo planes for flower producers. At present, floriculture exports represent the majority of Ethiopia's exports via air freight carrier, implying indirect positive benefits for service exports through Ethiopian Airlines (*Figure 34*). Although some foreign carriers carry flowers from Ethiopia, Ethiopian Airlines still delivers flowers for the majority of enterprises.[30] Through the growth of a local air freight industry, the sector also promoted the development of inland cold chain functions, with local refrigerated trucking service providers used extensively by exporters.[31]

Significant gains from further expansion of the sector appear to be unlikely. Although the sector has played an important role in the diversification of Ethiopia's agriculture and economy, the sector's complementarities provide only limited opportunities for further diversification gains and are unlikely to promote a significant shift in the economic complexity profile of the country. Cut flowers are a sparsely linked product in the Product Space, with few connections to other industries, which implies limited strategic value for the sector in terms of further diversification opportunities. Even if this is the result of the sector being a "niche" product and some floriculture skills might be transferable to other horticulture production, the sector generally does not appear to provide major avenues for diversification. As for gains in the intensive margin, Ethiopia could

[27] Melese, "Constraints on the Ethiopian Floriculture Industry."
[28] Oqubay, *Made in Africa*.
[29] Beata Smarzynska Javorcik, "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages," *American Economic Review* 94, no. 3 (2004): 605–627.
[30] Gebreeyesus and Iizuka, "Discovery of Flower Industry in Ethiopia."
[31] Milco Rikken, "The Global Competitiveness of the Kenyan Flower Industry," World Bank, 2011.

recover some of its lost market share, but in any case, the global floriculture market has only slowly grown in the last decade and competition for it is increasingly crowded. The country could also explore the possibility of further diversifying away from the Dutch markets, including by following the lead of regional peers such as Kenya that have explored the possibilities of exporting directly to the United States, the Gulf or Russia, although opportunities still appear limited.

Figure 34. Ethiopian Air Freight to Europe (EU-28)



Source: Eurostat. The estimate excludes turbojets and other aircraft machinery related to Ethiopian Airlines operations

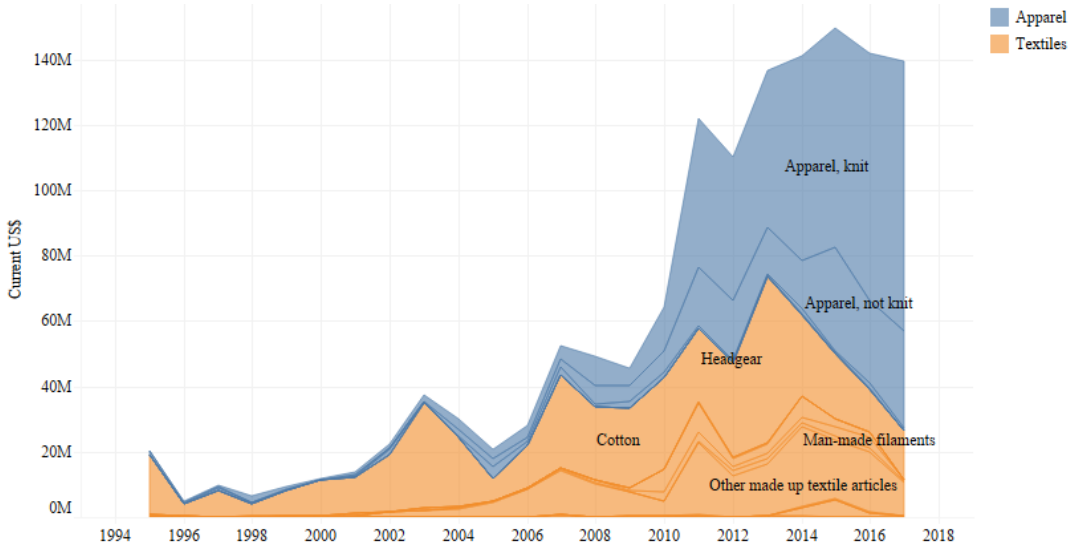
Ethiopia's experience with cut flowers offers insights on the future of diversification within agriculture. Cut flowers offered Ethiopia a quick and successful diversification opportunity into a non-traditional agriculture export product. Floriculture not only reduced Ethiopia's export dependency on traditional, low-value agricultural commodities, but also contributed towards additional foreign exchange earnings, upgraded agricultural production skills, and introduced new employment opportunities in a variety of complementary industries.[32] The evolution of the sector offers lessons with respect to diversification within agriculture. Although foreign investment was vital to spark the development of the sector, it was not enough by itself to ensure the transmission of knowhow to domestic firms, which are yet to close the gap in terms of marketing and commercialization capabilities for them to become internationally competitive. Moreover, it is evident from the sector's history not only that targeted industrial policy was key to attract the initial foreign investors for the development of the sector, but also that continuous government efforts that go beyond investment promotion may be required for the industry to remain internationally competitive. Finally, the fact that the export slowdown can be at least partially attributed to the overall stagnation of the sector should be a reminder of the vulnerabilities of an export strategy centered around agricultural products, even in the case of non-traditional agriculture. Given the importance of agriculture for Ethiopian exports and economy, the lessons learned from the case of floriculture should be incorporated to the formulation of a homegrown diversification strategy.

[32] Wubalem Gobie, "A Seminar Review on Impact of Floriculture Industries in Ethiopia," *International Journal of Agricultural Economics* 4, no. 5 (2019): 216.

4.2. TEXTILES AND APPAREL

The emergence and growth of textiles and apparel industries is Ethiopia's most successful export-led manufacturing development. Ethiopia has for decades been viewed as a potential garment powerhouse, given not only it's low labor, electricity and water costs, but also its prospective capacity to build a national supply chain from cotton to apparel.[33] Nevertheless, although Ethiopia has sought to build a competitive textile and apparel cluster since at least the 1960s, the sector remained modest in size until the mid-2000s, at which point its growth accelerated. The sector's exports took off after continuous waves of foreign investment, starting with a Turkish company which was followed by a group of Asian producers investing within private international industrial parks, and currently growing around public industrial parks.[34] Since the mid-2000s, textiles and apparel exports have surpassed US$ 100 MM, and apparel exports have become larger over time relative to textiles (*Figure 35*). Apparel exports have increasingly gained global market share, which although still low are rapidly catching up with regional and aspirational peers (*Figure 36*). Currently, the largest importers of Ethiopian textile and apparel exports are Germany and the US, followed by Turkey and China. Ethiopia has effectively been able to take advantage of its duty-free and quota-free access to the EU market through the Everything but Arms (EBA) scheme and to the US market through the African Growth and Opportunities Act (AGOA). In any case, the sector's products – together with the leather and footwear value chain – have rapidly become major elements of Ethiopia's export basket.

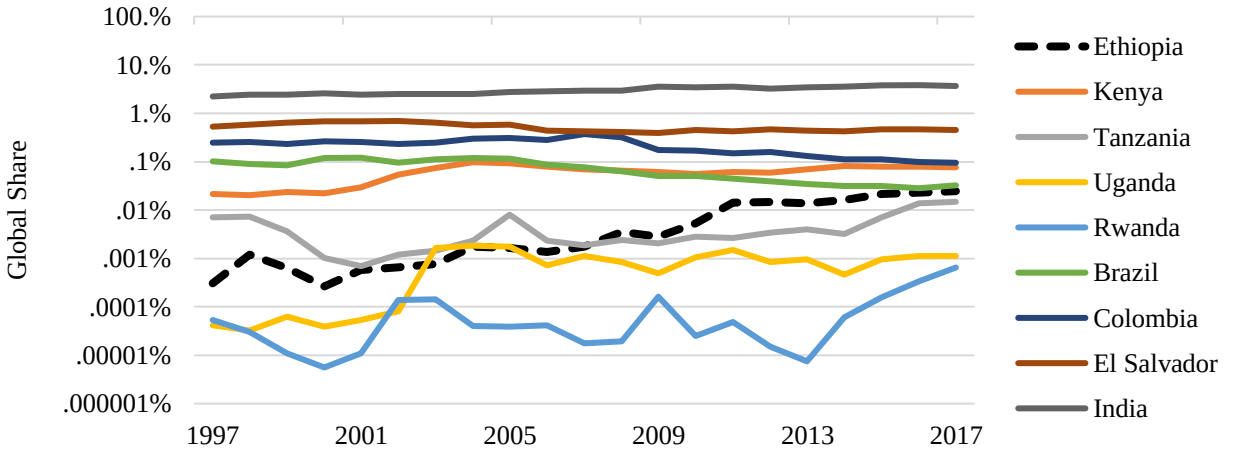
Figure 35. Apparel and Textiles Exports



Source: Atlas of Economic Complexity

[33] Mamo Mihretu and Gabriela Llobet, "Looking Beyond the Horizon: A Case Study of PVH's Commitment in Ethiopia's Hawassa Industrial Park" (World Bank, 2017).
[34] Cornelia Staritz and Lindsay Whitfield, "Light Manufacturing in Ethiopia: The Apparel Export Industry," in *The Oxford Handbook of the Ethiopian Economy* (Oxford University Press, 2019).

Figure 36. Articles of apparel and clothing accessories – Exports (Global Share)



Source: Atlas of Economic Complexity

The success of the textiles and apparel industry is a story both of effective industrial policy and of foreign knowhow introduced into the economy through direct investments. The Government of Ethiopia has been committed to active industrial policy ever since the implementation of the Agricultural Development-Led Industrialization strategy in the 1990s, and more recently through the two Growth and Transformation Plans. GTP I led to the creation of sector-based development institutes and supported programs not only for infrastructure development but also for initiatives such as Technical and Vocational Education and Training (TVET), twinning, benchmarking, skills development and Kaizen programs.[35] Although by the early 1990s there were a dozen of firms already engaged in operations, industrial policy after 2002 helped to establish an export-led sector.[36] The government partially liberalized the textile industry as state-owned firms were sold to both local and foreign investors while land and credit access were provided to new investors. The Ethiopian Textile Industry Development Institute was subsequently set up, with large interventions by International Financial Institutions (IFIs) and other donors to increase capacity building, attract foreign direct investment, and address exporters' constraints. The result of these policies has been Ethiopia becoming one of the largest recipients of garments FDI worldwide in the last decade, surpassing in the last three years in number of projects global powerhouses, including Bangladesh, receive (*Figure 37*). After Ethiopian firms, the majority of firms are Chinese, followed by Indian, Turkish and then South Korean. There are important differences between local and foreign firms as most local firms produce only for the domestic market, less than a third of them export, and represent only a fifth of the cluster's exports.

Foreign direct investment has not only been key for Ethiopia as a source of foreign exchange but also as a source of knowledge. Domestic learning appears to be low, as a recent survey found

[35] Thilmann Altenburg, "Industrial Policy in Ethiopia," *German Development Institute Discussion Paper* 2 (2010); Oqubay, *Made in Africa*.

[36] Mulu Gebreeyesus, "Industrial Policy and Development in Ethiopia," *Manufacturing Transformation* 27 (2016); Cornelia Staritz and Lindsay Whitfield, "Made in Ethiopia: The Emergence and Evolution of the Ethiopian Apparel Export Sector," CAE Working Paper, 2017.

that the largest source of technological innovation in the sector comes from the acquisition of machinery or knowhow from abroad.[37] Foreign direct investment has also been found to increase the productivity of domestic plants by introducing better productive processes, managerial and organizational practices, logistics, and exporting knowhow.[38] Although knowhow transmission has been found to be more likely within firms that are vertically integrated, it has also occurred outside these channels. The interaction between effective industrial policy and knowhow-enhancing foreign investment has allowed Ethiopia to gradually increase the size of its domestic exporting cluster, laying a strong foundation for further homegrown development in the near future.

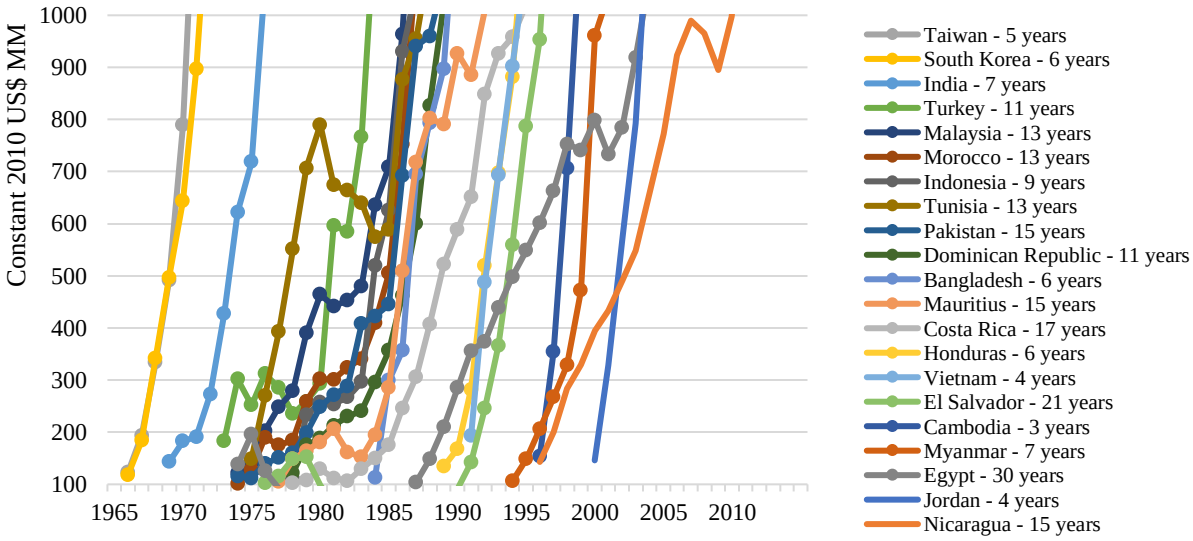
Figure 37. Foreign Direct Investment Projects in Textiles and Apparel, by Country of Destination

Source: FDI Markets. Each nodes represents a firm and is sized by number of projects by firm

[37] Taffere Tesfachew, "Technological Learning and Industrialization in Ethiopia," in *The Oxford Handbook of the Ethiopian Economy* (Oxford University Press, 2019).
[38] Girum Abebe, Margaret S. McMillan, and Michel Serafinelli, "Foreign Direct Investment and Knowledge Diffusion in Poor Locations: Evidence from Ethiopia," NBER, 2018.

Although Ethiopia has managed to increase its global market share in apparel exports, becoming and sustaining a position as a garment powerhouse is not going to be easy. The garments market globally, which is organized in a buyer-driven global value chain coordinated by lead firms that outsource manufacturing, is extremely competitive and will not provide Ethiopia with many opportunities to tap into higher value activities without an upgrading in the competitiveness of the sector. Few countries without an initial competitive cluster have managed to scale up their apparel sector in less than a decade and gain a significant global market share, but successful stories exist (*Figure 38*). In this context, the fact that Ethiopia's yearly exports have struggled to surpass the (constant) US$ 100 MM threshold in the last five years – according to NBE data – might be a cause for concern. For Ethiopia to increase the competitiveness of its cluster, it will have to address the issues that are currently undermining its performance.

Figure 38. Articles of apparel and clothing accessories – From 100 to 1,000 US$ MM



Source: Atlas of Economic Complexity

Ethiopia's foreign exchange constraint has not only complicated the industry's access to finance but also access to inputs. Although Ethiopia has extensive cotton supply, the quality of domestic spinning and ginning is often insufficient for high-quality production and additionally other types of apparel accessories (such as buttons) need also to be imported.[39] The fact that Ethiopia partly needs to import cotton and other raw inputs should not by itself be a problem, as although quality domestic supply could potentially improve the efficiency of the value-chain, no global powerhouse for any manufactured product sources all its inputs domestically, and imports are only as far as the nearest port when producers are actually able to access the necessary inputs. Nevertheless, whilst *current* exporters face looser restrictions on access to foreign exchange than producers that do not currently export, foreign exchange controls present throughout in the

[39] Hinh T. Dinh et al., "Light Manufacturing in Africa: Targeted Policies to Enhance Private Investment and Create Jobs" (World Bank, 2012); Arne Bigsten, Mulu Gebreeyesus, and Maans Söderbom, "Tariffs and Firm Performance in Ethiopia," *The Journal of Development Studies* 52, no. 7 (2016): 986–1001.

economy have introduced inefficiencies in the supply chain, and high tariffs have further undermined the capacity of the sector to secure inexpensive quality inputs. Potential domestic suppliers of inputs based outside of industrial parks face not only infrastructure gaps and severely constrained access to foreign exchange to supply their own inputs for production but are also are at a competitive disadvantage vis a vis foreign suppliers, given that apparel manufacturers in industrial parks can take advantage of tariff exemptions to supply themselves with imported finished inputs.

Manufacturing industries such as textile and apparel face additional constraints that are not equally binding at the moment for the agriculture or services sector. Even if the cost of providing electricity in Ethiopia is low, recurring outages and overall low quality of supply have disempowered electricity-intensive business' ability to thrive and are currently putting a limit on the garment cluster's capacity to expand. The use of backup generators and the design of industrial parks have helped firms bypass this constraint, but not without major costs.[40] Ethiopia's trade logistics impose an additional toll on manufacturing competitiveness, as high handling costs over large physical distances undermine what could be Ethiopia's comparative edge in terms of costs.

Finally, Ethiopian firms presently struggle with issues related to workforce development, particularly the training and retaining of workers. The government has long prioritized skill development initiatives, but mismatches between workers' abilities (both soft and hard skills) and firms' expectations might still be resulting in productivity losses for firms, given the continuous need for firms to provide additional training.[41] Moreover, ethnic clashes between workers and lack of appropriate housing have been challenges for employee retention in the sector and ultimately development of a proper industrial workforce in the country. A recent study found high turnover and little medium-term impact of industrial jobs on national employment or income: employees who accepted industrial jobs (including a garment factory but also in the beverage and footwear industries) ultimately preferred informal entrepreneurial labor to their factory job.[42]

To consolidate the sector's performance, public policy will have to gradually identify, prioritize and address this multiplicity of challenges. The challenges illustrated above are not all equally vital and not all of them require immediate government intervention. The fact that there is high turnover and that wages are not high enough for medium-term worker retention does not imply by itself a market failure and might not need a government response. Other challenges, either related to the macroeconomic context or to the setting of industrial parks, directly concern the provision of public goods and are hence rightfully within the domain of public policy. In any case, it is clear that in an industry as competitive as apparel – but also in related sectors such as footwear

[40] Harvard Growth Lab, "Ethiopia Growth Diagnostics."

[41] Shoko Yamada, Christian S. Otchia, and Kyoko Taniguchi, "Explaining Differing Perceptions of Employees' Skill Needs: The Case of Garment Workers in Ethiopia," *International Journal of Training and Development* 22, no. 1 (2018): 51–68; Paul M. Barrett and Dorothée Baumann-Pauly, "Made in Ethiopia: Challenges in the Garment Industry's New Frontier," Center for Business and Human Rights, NYU-Stern, 2019.

[42] Christopher Blattman and Stefan Dercon, "The Impacts of Industrial and Entrepreneurial Work on Income and Health: Experimental Evidence from Ethiopia," *American Economic Journal: Applied Economics* 10, no. 3 (2018): 1–38.

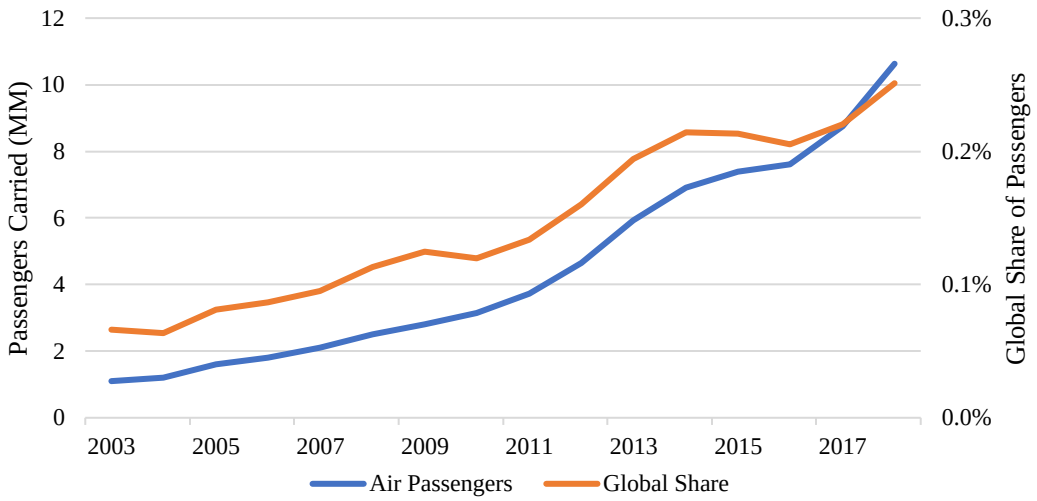
– prioritizing and addressing this array of challenges will be indispensable to secure long-term competitiveness so that exports from this sector can grow at their full potential. As argued in the last section of this report, the Government of Ethiopia will have to strengthen problem-solving institutions through stakeholder coordination to continuously adapt to the dynamic environment which distinguishes this emerging industry. Industrial parks such as Hawassa have successfully managed to coordinate private and public actors to solve problems in the past, but long-term competitiveness will require additional coordination capabilities not only between industrial parks and firms but also between industrial parks and local governments or local government and federal agencies.

The textile and apparel industries have led the way in the process of diversification through the expansion of manufacturing capabilities. Ethiopia's textile and apparel sector has been able to consistently attract investments and increase its exports despite the growth slowdown and the increasing external imbalances that debilitate the economy. Driven by its low labor costs, Ethiopia has become increasingly an attractive destination for low-skill manufacturing. Nevertheless, industrialization is not destiny, and Ethiopia will have to successfully tackle both macroeconomic and sectoral challenges to secure the competitiveness of the sector. Understanding the current challenges of existing exporting firms in the textile and apparel industries, as well as in other export cluster of leather and footwear firms, will be key for policymakers to seize the constraints that future diversification efforts might encounter in the medium term. Strengthening the industries' competitiveness and local capabilities will be vital itself for Ethiopia to be able to diversify into more complex manufacturing industries such as electronics or machinery. At last, the sector's success also illustrates some of the perils of industrial policy strategies designed around industrial parks. Addressing the constraints that prevent a domestic manufacturing sector from thriving outside of the parks will be key for its consolidation, but also to gradually shift the focus of industrial parks to new emerging industries that can help Ethiopia advance in the process of structural transformation.

4.3. Air Transportation and Tourism Services

During the 2000s Ethiopian Airlines (EAL) grew to become Africa's top airline and by far the state's most successful public enterprise. Since the year 2000, transportation exports have increased in real terms by a factor of seven, achieving a value of US$ 2.6 billion by 2017. In total, this has been by far the greatest gross increase by a single export category in this period, making EAL a crucial success story in a notoriously thin-margined industry for an economy that struggles with FX shortages. Although available data do not disaggregate transportation services statistics into component parts, most of this growth should be attributed to the success of Ethiopian Airlines, given the absence of other major logistics clusters. Before 1990, EAL carried around a million passengers per year. In the last two decades, the number of passengers carried has grown by a factor of ten, while the global share of passengers has tripled (*Figure 39*). In the same period, EAL's fleet size increased from less than 30 aircraft in 2000 to over 90 at present, and destinations served almost doubled. The company's revenues, jumped the same period, jumped from less than US$ 500 MM to over US$ 4 billion in the 2019 fiscal year.

Figure 39. Ethiopian Airlines' Global Passenger Share

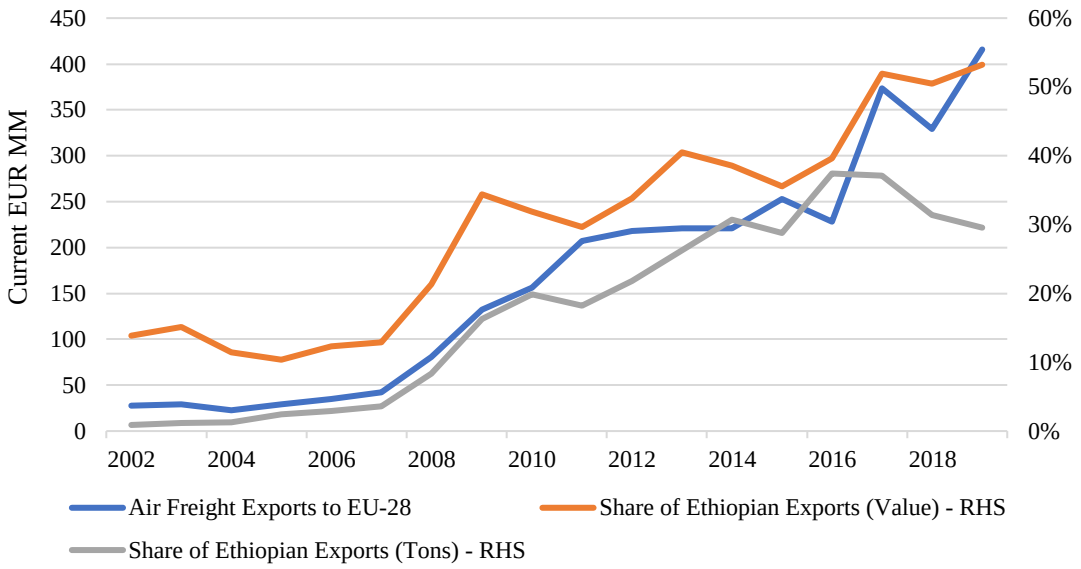


Sources: Ethiopian Airlines, World Bank World Development Indicators

The company's growth can be explained as unique example of institutional commitment and technological learning. Ethiopian Airlines is one of the country's oldest institutions, having started operations in the 1940s with the support of Trans World Airlines (TWA).[43] Established in 1946, the company initially built internal capabilities through a learning-by-doing process facilitated by its international partnership with TWA until 1975 and protected these capabilities through the political and economic instability that followed in the next decades.[44] As early as 1953, government officials had a strategy for the "Ethiopianization" of the airline – that is, the operation of the airlines by Ethiopian personnel – which ultimately facilitated the takeover of the airline by domestic authorities after the end of the partnership. The change of regime in the 1970s initially brought the airline close to bankruptcy, but the country's management ultimately managed to retain the necessary independence to ensure financially sustainable operations. The company was also able to expand its African operations even throughout the 1980s, as economic crisis hit the continent. Liberalization and reconstruction throughout the 1990s facilitated the company's growth, although the company was still affected by economic instability. After the 2000s, a renewed company was re-organized for modernization and market expansion. Ethiopian Airlines became the largest African airline in the 2010s and one of the most profitable. In the last several years, Ethiopian has both expanded its destination network – it now trails only Turkish Airlines, Air France, and British Airways in terms of countries served – and has also acquired equity in other regional airlines such as Guinea Airlines, Chad Airlines, Air Malawi, Zambia Airways, and ASKY.

[43] Carlos Lopes, "Three Sectoral Policies in Ethiopia's Structural Transformation," in *The Oxford Handbook of the Ethiopian Economy* (Oxford University Press, 2019).
[44] Oqubay, *Made in Africa*.

Figure 40. Ethiopia's Air Freight Industry



Source: Eurostat. The estimate excludes turbojets and other aircraft machinery related to Ethiopian Airlines operations

Ethiopian Airlines is both the flagship firm of the country's service sector and has helped enable other exports The growth acceleration coincided with rapid growth of the service economy, both in terms of employment and output, but gains were concentrated in non-tradable sub-sectors such as retail, real estate, health, and education. Ethiopian Airlines, however, has been critical for the tradeable growth that Ethiopia has seen, not only the expansion of services exports through its own operations, but also by supporting other tradable industries. As previously detailed, the cut flower industry would not be economically viable were not for the air freight services provided by Ethiopian Airlines. At present, exports through air freight represent half of all exports to Europe, with reliable, expansive cargo operations contrasting favorably with the challenges Ethiopia faces as a large, landlocked country with high transport costs (*Figure 40*). The country's tourists arrive mainly by air, and Ethiopian's expansive connectivity complements Addis Ababa's concentration of regional and international institutions in the important "Meetings, Incentives, Conferencing & Exhibition" space. Ethiopian Airlines hence not only has the chance to continue expanding its operations throughout Africa but also to promote air freight as an avenue for diversification of the country's exports.

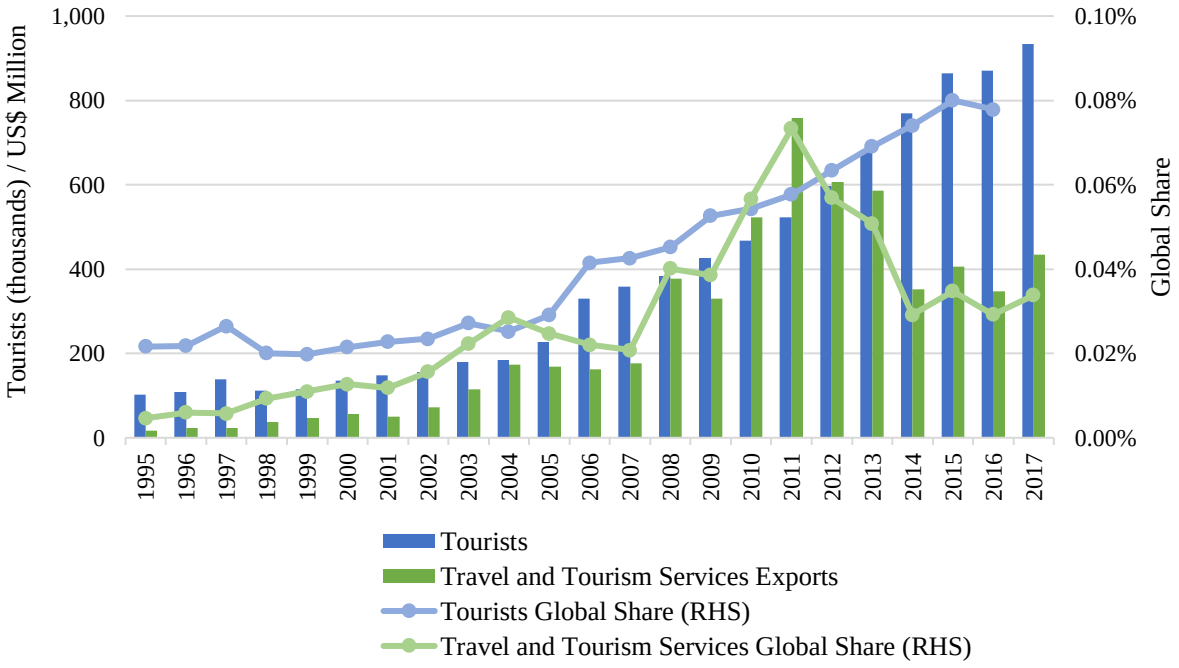
In contrast to Ethiopian Airlines' success and despite the potential value of air connectivity, tourism and other services exports have not yet seen the same level of success. Tourism arrivals have grown nearly continuously from since the late 1990s, contributing to increase the country's global share, but travel and tourism receipts (which include all types of travel) are well below their 2011 peak in terms of both value and global share (*Figure 41*).[45] Generally, Ethiopia remains a

[45] It is not evident at the moment whether this divergence is due to a different identification of travelers and tourists in migratory and balance of payments data or to changes in consumption patterns.

country with a tourism industry below its potential given its current income level, once tourism arrivals are adjusted by country size, despite its natural heritage, renowned culture, and large diaspora (*Figure 42*). Even in absolute numbers, many Sub-Saharan African peers and economies have managed to attract larger numbers of tourists without the advantage of air connectivity that Ethiopian Airlines provides – EAL currently transports more than ten times the number of tourists that arrive to the country yearly. Meanwhile, other modern tradable services, such as ICT, have struggled to thrive and generate exports, largely given the burden of the foreign exchange constraint but also given restrictions on foreign investment.

Competitive tourism clusters depend on the successful delivery of a variety of products and services, which include but are not limited to air transportation. Developing a functional tourism cluster in Ethiopia will require the successful delivery of many complementary inputs such as specialized tourism infrastructure, including accommodations for tourists.[46] A large share of Ethiopia's tourists are transit passengers that rarely leave Addis Ababa, and the development of tourism sites outside of Addis would require not only investments in the sites themselves but also on ground transportation. Marketing efforts will most likely be necessary as well to increase the customer base of domestic tourist sites and counteract the detrimental effect that political instability might have had on the tourism industry over the last few years.

Figure 41. Ethiopia's Tourism Industry

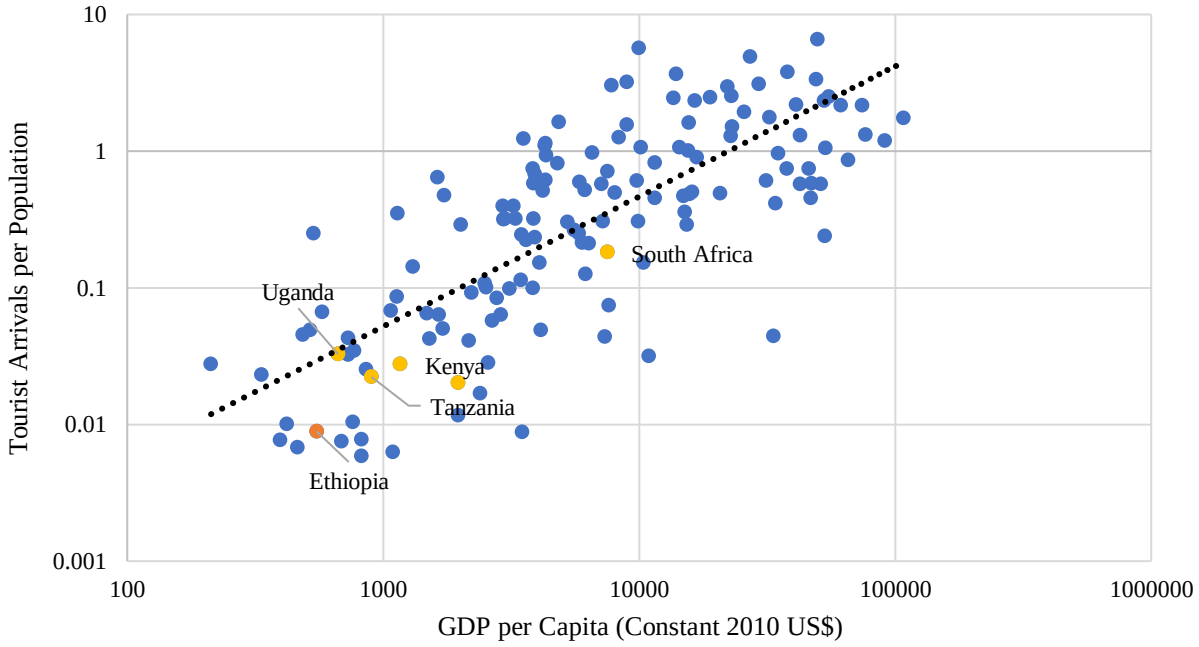


Sources: UNWTO, Atlas of Economic Complexity (based on International Monetary Fund)

[46] Iain Christie et al., "Tourism in Africa: Harnessing Tourism for Growth and Improved Livelihoods" (World Bank, 2013); Landry Signé, "Africa's Tourism Potential. Trends, Drivers, Opportunities and Strategies," Africa Growth Initiative at Brookings Institute, 2018.

The company's experience provides an invaluable example of successful technological learning and industrial policy and provides a platform for future diversification. EAL not only generates a substantial share of Ethiopia's exports and opens the door to future growth in the tourism industry, but it also serves as a unique example for other sectoral policy. Although the conditions that generated the company's success may be hard to replicate, the combination of international knowhow and a professionally-managed, independent state-owned enterprise could serve as a model for future reform efforts.

Figure 42. Ethiopia's Tourism Industry, vs. benchmarks



Sources: UNWTO, World Bank World Development Indicators

5. IDENTIFICATION OF DIVERSIFICATION OPPORTUNITIES

Accelerating structural transformation and the diversification of Ethiopia's economy will require that the government actively supports diversification efforts. Developing economies such as Ethiopia do not always spontaneously diversify over time, as market failures often prevent the investments are required for structural transformation. Private agents often face substantial uncertainties when it comes to producing a new good or service for a first time, even when the good has been produced in other environments many times before. Specifically, entrepreneurs or foreign companies that successfully introduce a new product in the economy have positive externalities on other agents, since others can emulate the incumbent's project; and consequently, entrepreneurs private returns can often lie substantially below their social returns. These knowledge or "self-discovery externalities" imply that economies often under-invest in new products, in comparison to what would be considered optimal.[47] Moreover, "coordination externalities" can also arise when new activities require simultaneous upstream, parallel, or downstream investments which the market cannot easily coordinate to provide. Sometimes the missing investment is a private good, but in other cases a public input such as a specific type of legislation or infrastructure might be missing. In either case, the absence of a proper market generates little information or incentive for private actors or the government to coordinate to provide it.[48] Both self-discovery and coordination externalities can lead an economy to become trapped in a low-income and low-complexity equilibrium, where returns to innovation are low, and disincentivize the innovation that is necessary to sustain long-term growth. When low-complexity is binding, these market failures make public interventions and policies to encourage diversification through self-discovery necessary.

Diversification will require the government to encourage and catalyze investments in activities that are both strategic and viable in the country. The fact that Ethiopia needs to diversify its economy and its exports to sustain rapid growth does not imply an obvious path towards diversification. Entrepreneurs or government officials might have very different ideas of what types of products and services are desirable for Ethiopia. Given that not every potential direction for diversification is equally strategic, and given that government's time and resources are limited, public institutions involved in investment promotion and facilitation need to prioritize their actions within a diversification strategy. Evidently, sector prioritization is a technically complex task, which has had internationally mixed results in practice. The successful case of South Korea transitioning from agriculture to textiles, then to machinery and electronics coexists with failed ventures such as Brazil's informatic program in the 1980s.[49] Although sector prioritization is a risky enterprise, it might still be necessary to concentrate the government and economy's efforts on viable opportunities. Given the country's structural balance of payments shortfalls, it is reasonable for diversification efforts to focus on *tradable* goods, as only these will help relax the

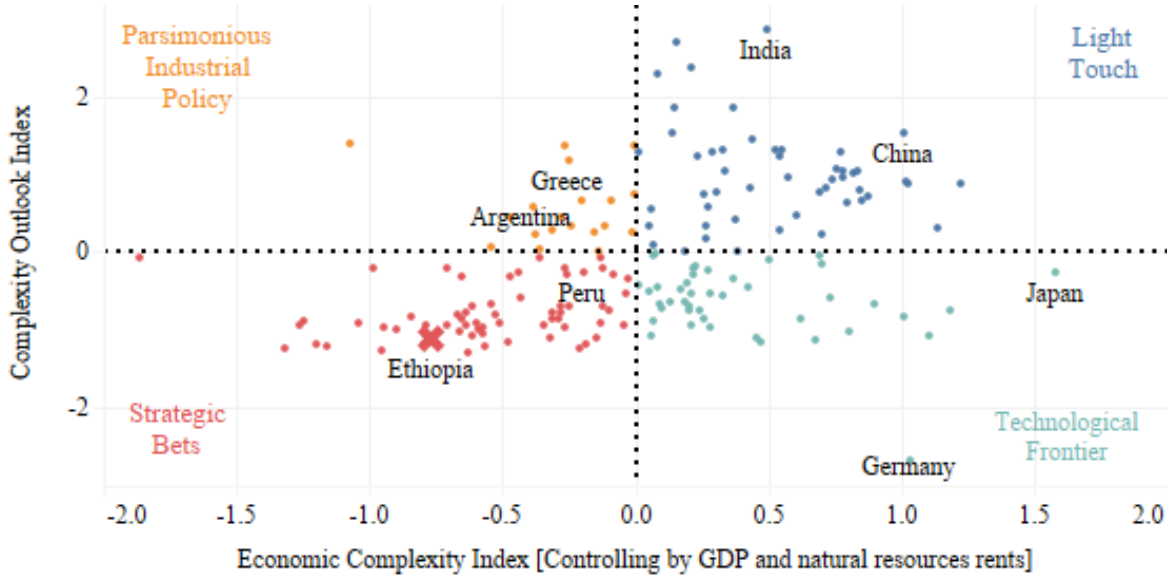
[47] Hausmann and Rodrik, "Economic Development as Self-Discovery."
[48] Ricardo Hausmann, Dani Rodrik, and Charles Sabel, "Reconfiguring Industrial Policy: A Framework with an Application to South Africa," CID Working Papers (HKS Working Paper No. RWP08-031, 2008).
[49] E. Stein and Gustavo Crespi, *Rethinking Productive Development: Sound Policies and Institutions for Economic Transformation* (Springer, 2014).

balance of payments constraint and lead to higher demand in non-tradable industries. Diversification into tradable activities tends to be particularly challenging, as these do not have a captive market and face foreign competition from the beginning. For that reason, it is important for Ethiopia to identify and prioritize those activities that have the highest likelihood of succeeding and present the largest spillovers for the rest of the economy. This section will focus on the identification of diversification opportunities while the next section will elaborate on the "work" of diversification and provide policy recommendations to accelerate diversification.

The theory of Economic Complexity provides a tool to objectively start drawing a diversification strategy for Ethiopia that avoids subjectivity as much as possible. As previously explained, the theory argues that production capabilities not only determine a country's current production but also what a country is most likely to effectively produce in the future. Capabilities evolve gradually, and countries rarely develop comparative advantage in products that require capabilities that are very different than current ones. When countries attempt to develop sectors that are "too distant" from current capabilities, they often fail in the task, which can leave a legacy of stranded assets and fiscal losses. Economic Complexity provides tools to quantify the strategic value of different sectors, which can contribute to focus diversification efforts. The application of the theory using international trade data has its limitations, including that it does not include an analysis of services or non-tradables industries, but this is an ideal first step to build an initial map for diversification efforts.

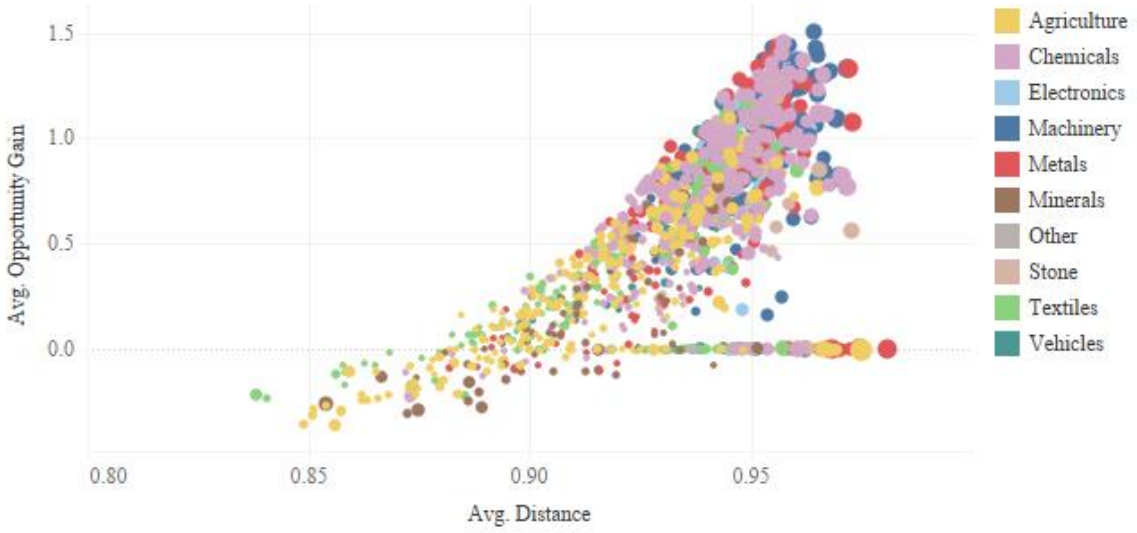
Ethiopia's existing knowhow provides a minimal springboard to new opportunities for diversification, which suggests the country should promote "strategic bets" towards new sectors with future diversification potential. Ethiopia's economic complexity index – relative to its GDP and natural resource wealth – and Ethiopia's complexity outlook index are both below the global average and median across countries, which indicates that the economy might be trapped in a low-complexity equilibrium, where existing knowhow both is insufficient to ignite growth and provides few opportunities to diversify into nearby products (*Figure 43*). This suggests that Ethiopia should focus on a "strategic bets" approach, through which policy should focus on promoting "long jumps" across the Product Space into areas that provide additional potential for future diversification. Such a strategy requires navigating implicit tradeoffs because the most attractive diversification pathways will tend to be "far" from the current base of productive capabilities (i.e. the distance between existing and required knowhow is large). These tradeoffs can be quantified through the indicators of "distance" and "opportunity gain", which capture important dimensions of risk that a new product will not be feasible in Ethiopia and the benefits of adding a new product to the nation's export basket. In Ethiopia's case, a simple visualization shows that agriculture products and textile and apparel products are at a lower "distance" than the rest of the products but offer lower potential for opportunity gains than chemicals or machinery-related products (*Figure 44*). Products at a lower distance tend also to be less complex in terms of PCI than products at a higher distance and with higher opportunity gains. A diversification strategy will have to balance the relative ease of moving towards low-distance products, but also promote the expansion towards products that show larger opportunity gains.

Figure 43. Economic Complexity and Complexity Outlook Index (HS92 4-Digit, 2017)



Sources: Atlas of Economic Complexity, World Development Indicators

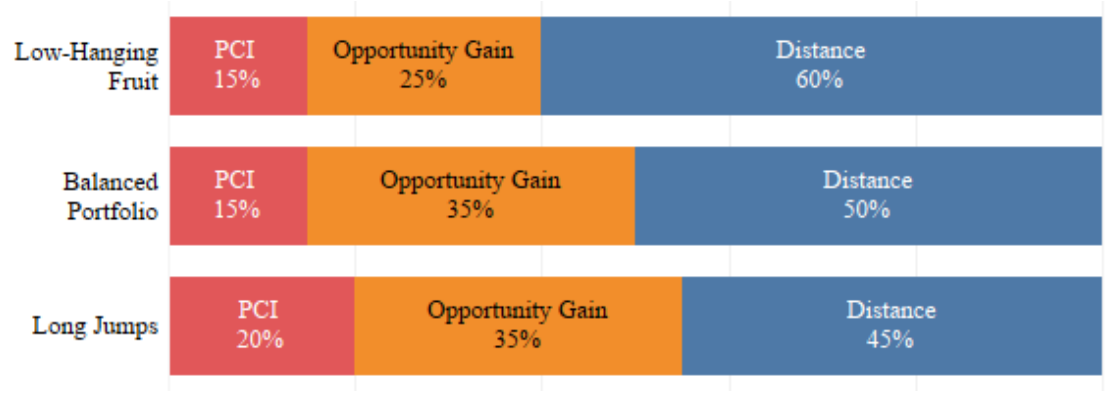
Figure 44. Distance and Opportunity Gain, Ethiopia (HS92 4-Digit, 2015-2017)



Source: Atlas of Economic Complexity. Product nodes are sized by Product Complexity Index (PCI). Only products with RCA < 1 and PCI < 2 are displayed

Strategic new products should balance product complexity, distance, and opportunity gain considerations. Given the tradeoff between feasibility and attractiveness of different diversification paths based on the knowhow embedded in their production, a diversification strategy should aim to balance our different measures of these factors. As the conceptual framework explained, the theory of Economic Complexity has the advantage of synthetizing our understanding of the "distance to existing capabilities" to a single indicator. Similarly, "product complexity" can summarize the sophistication of a certain good and hence its capacity to sustain in the long-term higher wages, and "opportunity gain" captures how incorporating a certain product can bring Ethiopia closer to expanding in the future to more complex industries. Balancing these three measures in different weights will lead to different diversification strategy orientations. *Figure 45* provides three examples of possible portfolios that can be constructed with different weights: (1) a "low-hanging fruit" strategy that places a high weight on products that are the closest to existing capabilities, implying both lower risk and lower reward; (2) a "long jumps" strategy puts relatively high weight on product complexity and opportunity gain, implying both higher risk and reward for the strategy; and (3) a "balanced portfolio" strategy with more even weights to balance risk and reward. Visualizing the trade-off between low-hanging fruit and long-jump portfolios shows that most of the former are agriculture and textile products, while the latter include many machinery, chemicals, electronics and metals products (*Figure 46*).

Figure 45. Product Selection Criteria Weights



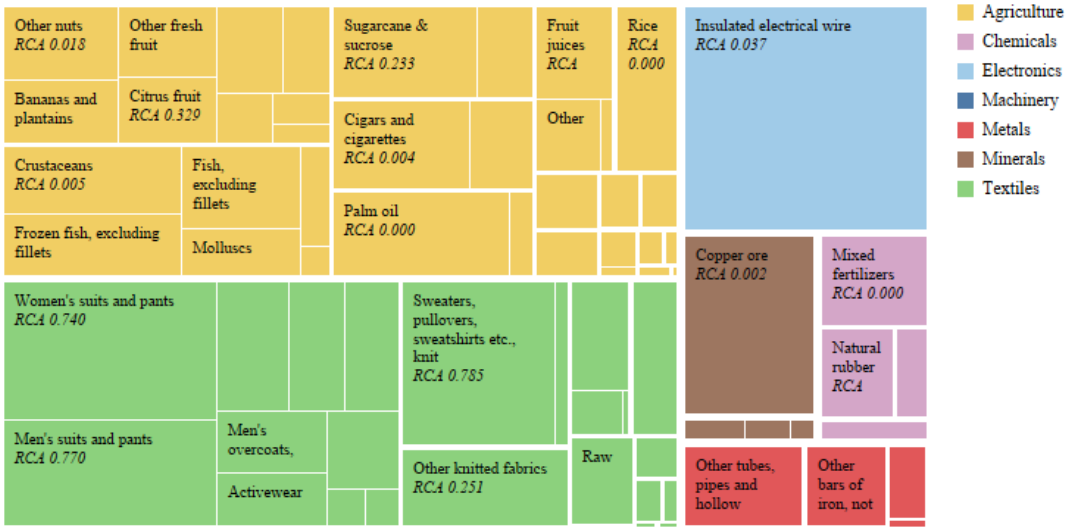
Source: Atlas of Economic Complexity

Figure 46. Product Selection Criteria and Prioritization (HS92 4-Digit, 2015-2017)

Source: Atlas of Economic Complexity Product nodes are sized by global trade flows

Ethiopia's low-hanging fruit portfolio would structure a strategy centered on diversifying the country's agriculture exports and scaling up the development of its textile and apparel sector. Given Ethiopia's reliance on agriculture exports and its recent developments in both the garment and footwear industry, it is no wonder that the prioritized products in this portfolio are largely found within these two sectors (*Figure 47*). Agricultural products prioritized by this strategy include horticultural crops as well as some grains and some processed food products. Evidently, not every product that arises from the algorithm is feasible or even recommendable for Ethiopia. Some products – such as crustaceans and other seafood – might depend on natural resources that Ethiopia is not intensive in, while others – such as sugarcane – might have been strategic bets in the past that have had limited success. What is clear is that Ethiopia not only needs to increase the magnitude of its existing agricultural exports but their diversity. As a matter of fact, when analyzing *only* agricultural products, Ethiopia's diversity is still lower with regards to peer economies, and its average ubiquity is still higher than is expected for its level of diversity. Although Ethiopia is mainly an agricultural economy, even as one Ethiopia is consistently under-diversified and should prioritize the upgrading of the complexity and diversity of its cluster. With regards to textile products, although Ethiopia has substantially improved its production over the last decade and has shown an important increase in global shares, the country has only become an efficient exporter of a handful of products. Complexity estimates indeed show that Ethiopia has much to gain by diversifying into nearby textile and footwear products, hence improving the diversity and quality of its cluster. Finally, other products appear as low hanging fruit, including some electronics (electrical wire) and chemicals (fertilizers), but some of these might depend on natural resource endowments (copper).

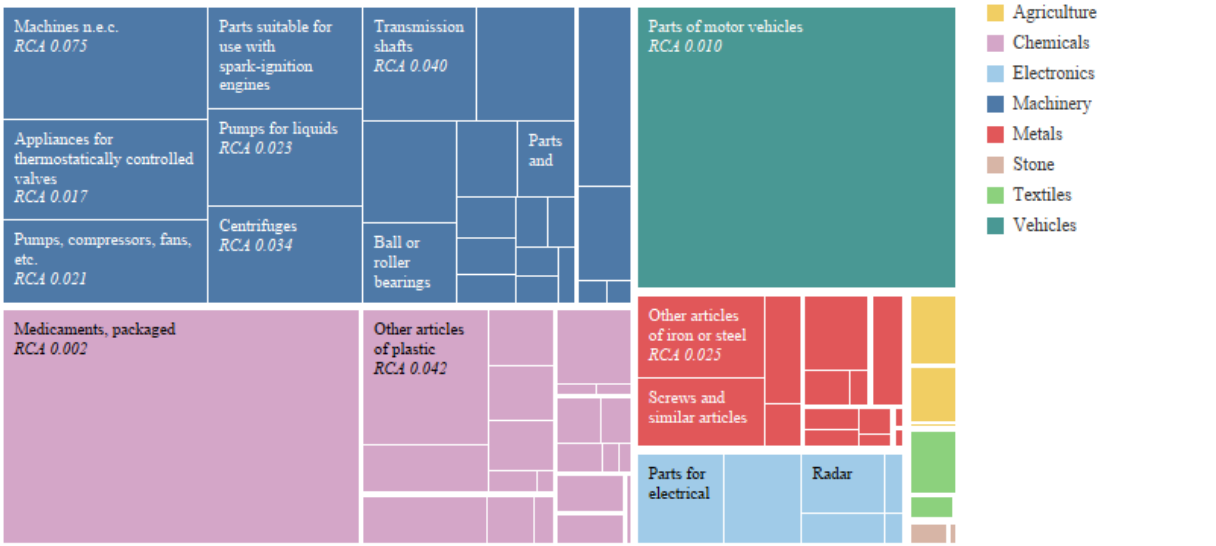
Figure 47. Top Low-Hanging Fruit Products, by Global Market (HS92 4-Digit, 2015-2017)



Source: Atlas of Economic Complexity. Product nodes are sized by global trade flows

To expand its productive capabilities more rapidly, Ethiopia will have to consider prioritizing some *long jumps* into other tradable manufacturing industries, such as machinery, pharmaceuticals and electronics. Success in a low-hanging fruit strategy would definitely increase Ethiopia's economic complexity index and its complexity outlook index, but might not be sufficient to upgrade its exporting sector at the required pace. A "long jump" basket that puts higher weight on complexity outlook and product complexity than distance would include more products in industrial machinery, chemicals, pharmaceuticals, electronics and metal sectors, as well as some scattered products such as autoparts and agroprocessed products (*Figure 48*). It is notable that Ethiopia has managed to build domestic clusters for some of these products (some chemicals and metals), but these have not scaled up as exports as easily or quickly as garments and footwear. Moreover, foreign direct investment in these industries has not risen to textiles and footwear's levels, compared to regional or aspirational peers (*Figure 49*). It will be in Ethiopia's interest to capture some of these products to build the capabilities that are necessary for a deeper and longer-term diversification strategy.

Figure 48. Top Long Jumps Products, by Global Market Size (HS92 4-Digit, 2015-2017)



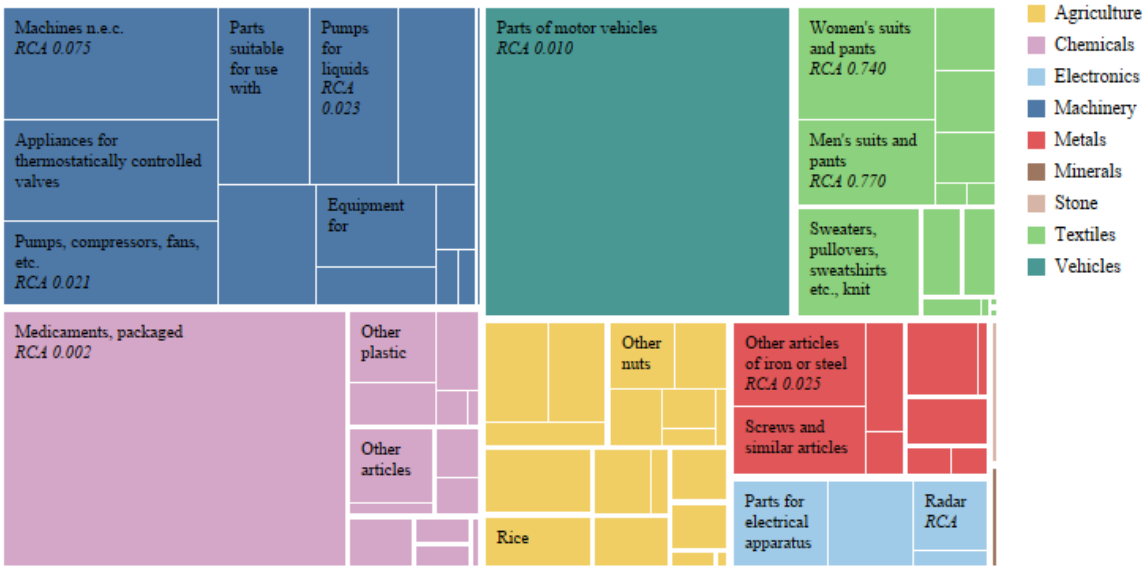
Source: Atlas of Economic Complexity. Product nodes are sized by global trade flows

Figure 49. Foreign Direct Investment Projects, by Country of Origin

Source: FDI Markets. Each nodes represents a firm and is sized by number of projects by firm

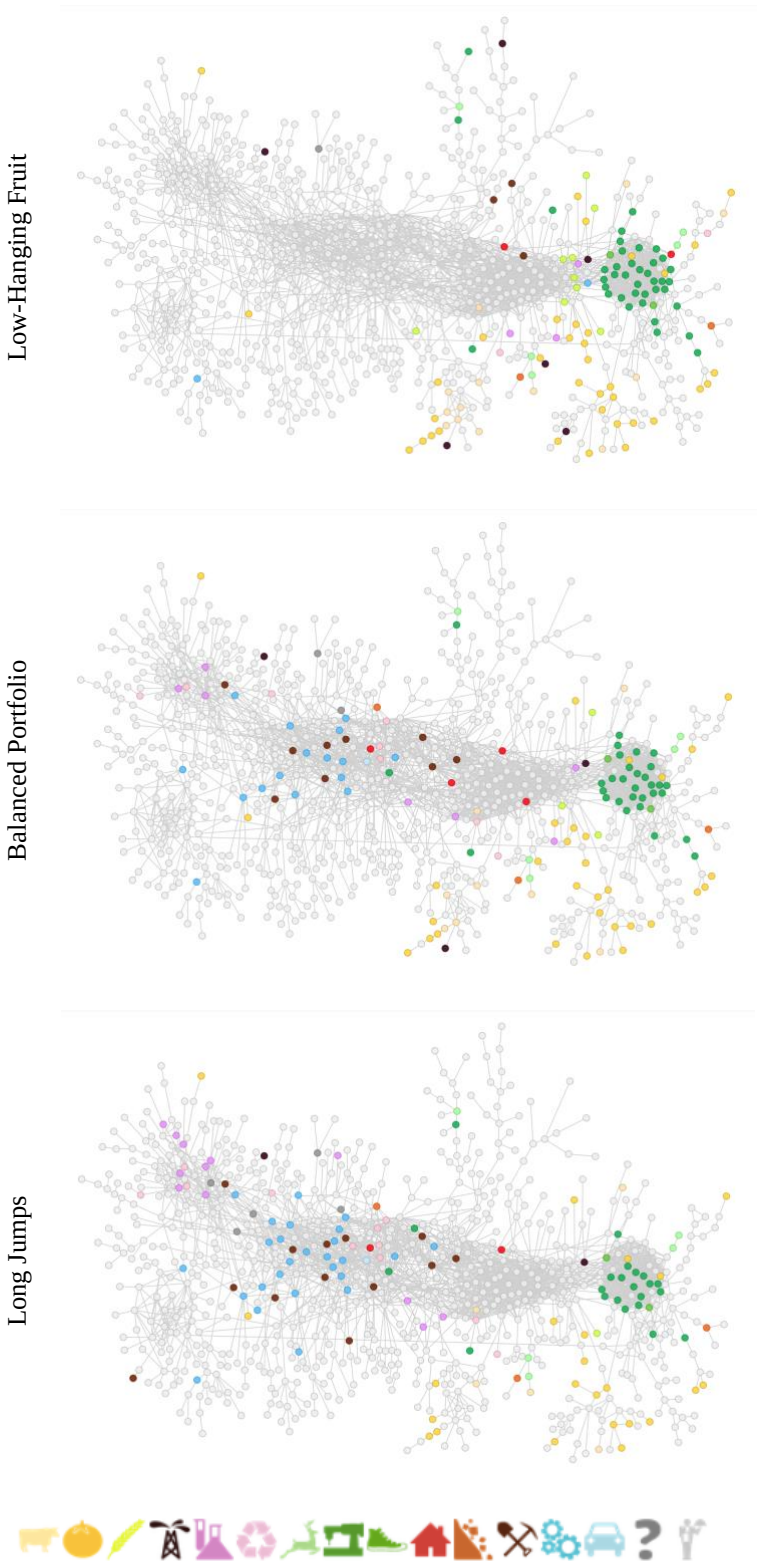
Ultimately, increasing the magnitude and variety of exports will require both diversifying into adjacent and distant products. Low-hanging fruit and long-jump portfolios are not necessarily mutually exclusive strategies for the country. Rather, these may actually be thought of more as short-term and medium-term goals. Given Ethiopia's acute need for foreign exchange, nearby opportunities cannot be disregarded, but these will nevertheless not be sufficient to support a long-term export boom. A "balanced portfolio" strategy – with an intermediate weighting of product complexity, opportunity gain and distance – can provide an outlook of what a middle path could look like (*Figure 50*). Balanced portfolio products include both new agriculture and textiles goods, but also target a starting point in the chemicals, machinery, metals and electronics sectors, as well as automotive parts as an additional product category (related to light machinery). An alternative way of illustrating the tradeoffs between the three strategic approaches is to visualize the impact each strategy would have on Ethiopia's Product Space (*Figure 51*). While a low-hanging fruit approach would increase the population of the Product Space near existing products, amplifying the size of the textile cluster and introducing an array of new agriculture products in the bottom-right of the visualization, a long jumps portfolio would imply populating clusters that are currently vacant in the center of the product space with new industries (electronics machinery, metals). A balanced portfolio strategy again provides a middle way in weighting the strategic value of the newly added industries and the difficulties in developing the necessary capabilities for these.

Figure 50. Top Balanced Portfolio Products, by Global Market Size (HS92 4-Digit, 2015-2017)



Source: Atlas of Economic Complexity. Product nodes are sized by global trade flows

Figure 51. Ethiopia's Product Space under Three Strategies (HS92 4-Digit, 2015-2017)



Source: Atlas of Economic Complexity

An additional product that does not arise for the complexity profile – given methodological limitations to incorporate services data – but that should be considered in Ethiopia's diversification strategy is tourism. The availability of air connectivity and unique natural and cultural destinations provide Ethiopia a competitive advantage to develop a sector that could potentially provide both foreign exchange and job opportunities for low-skilled workers. Although the goods-based Product Space is unable to characterize "distance" for the tourism industry, it is clear from the previous section that successfully diversifying into tourism will not be an easy task, as Ethiopia will have to develop multiple new capabilities to thrive in this new industry. The supply of tourism services not only requires reliable air transportation but also the development of complementary industries such as tour operators, accommodation and travel agencies or attraction management services. As the previous section argued, developing a tourism cluster will demand the successful delivery of many inputs that are only now emerging in the country.

The results of this complexity analysis provide an important quantitative input for updating investment promotion and industrial policy strategies in Ethiopia. A diversification strategy needs to leverage both Ethiopia's comparative advantages and the strategic value of targeted industries, and a analysis like this one provides a chance to accurately quantify these dimensions, which can be easy to miscalibrate in the absence of data. When miscalibrated, strategic bets for diversification tend to fail and foreign investment attracted to the country can turn out to be not particularly beneficial to the economy and Ethiopian workers. The prioritization exercise completed here outlines a possible roadmap for targeting efforts but should not be taken as the sole input for diversification strategy and policymaking. The results of this analysis will not only need to be cross-checked by policymakers through a dynamic process that incorporates the perspectives of government and private sector stakeholders, but also could take into consideration other important constraints and attractiveness factors that are not reflected in the complexity analysis. Some of these are discussed in the next section.

These results also provide some continuity with regards to previous sector identification efforts pursued by the Government of Ethiopia. When comparing the type of products that appear in the three strategies discussed above with the implied prioritization of Growth and Transformation Plan II (deduced from the rates of growth projected for each *new* export) and with the Ethiopian Investment Commission's (EIC) strategic sectors, it is notable that a majority of the suggested sectors have been previously identified by these plans in some way or another (*Figure 52*). Nevertheless, there are three notable differences with previous prioritization. First of all, the Growth Lab methodology allows policymakers to not only identify broad sectors of interest but specify at a granular level which industries should be prioritized in diversification efforts. Within sectors as broad as "agriculture" or "textiles", itemizing particular industries to target investment promotion initiatives is vital for their success. Second, the focus on tradables puts the emphasis on exporting capacity, implying that sectors should not simply be targeted for import-substitution purposes but because Ethiopia has the potential to develop a comparative advantage. Third, this report distinguishes between the short-term expansion of existing capabilities, through the "low-hanging fruit" portfolio, and the need for "long jumps" towards products that are substantially

beyond current knowhow. This differentiation is key to identifying required policy actions and initiatives to promote and incentivize each type of industry, as detailed in the next section.

Figure 52. Product Selection in Comparison to Previous Studies

Sector		GTP II Implied Growth	EIC Strategic Sectors	GL Complexity Report
Agriculture	Fishing	▲		
	Forestry	▲	▵	
	Horticulture	▲	▲	▲▲
	Sugar	▲▲	▵	
	Other Agroprocessing	▲	▲▲	▲
Manufacturing	Chemicals	▲	▵	▲▲
	Electronics	▲▲	▵	▲
	Leather Products	▲▲	▲▲	▲
	Metals and Machinery	▲	▵	▲▲
	Mining	▲▲	▲	
	Pharmaceuticals	▲	▲▲	▲
	Textile and Garments	▲▲	▲▲	▲▲
Services	Tourism	▲	▲	▲▲
	ICT	▲	▲	

Sources: National Planning Commission / Ethiopian Investment Commission.[50]
"▵" indicates that the industry has been mentioned as a part of a broader category.

[50] National Planning Commission, "Growth and Transformation Plan II," 2016, https://ethiopia.un.org/en/15231-growth-and-transformation-plan-ii; Ethiopian Investment Commission, "Strategic Sectors," 2020, http://www.investethiopia.gov.et/.

6. THE WORK OF DIVERSIFICATION

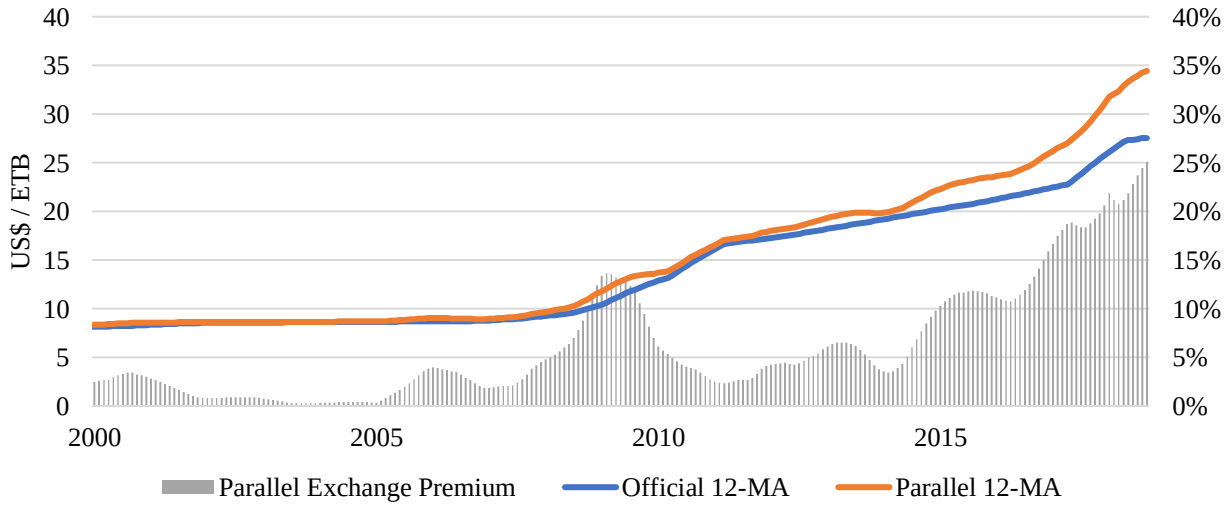
The work of diversification requires that governments actively encourage investments in new activities that are both viable and strategic whilst avoiding undisciplined support of unproductive sectors. Policies and government actions can play major roles in addressing the self-discovery and coordination failures that undermine diversification. By providing public inputs and supporting private entrepreneurs directly, governments can reduce the implicit costs or increase the payoffs of entrepreneurship in new sectors. Interventions are nevertheless not always successful: well-intentioned policies such as directed credit or trade protection can often create new distortions that hinder the productivity of both the intentionally supported sector and the rest of the economy. Moreover, "vertical policies" – which favor specific sectors or firms rather than broad segments of the economy – often involve great amounts of subjective discretion which creates room for rent-seeking. Even when there is no capture, "picking winners" can be dangerous when the process of sector prioritization becomes purely discretionary. Ethiopia has had a successful experience with regards to promoting the textile and apparel cluster, as well as partial success with regards to footwear and other leather products, but other strategic bets such as sugar production have failed to thrive over the last decade. Prioritizing sectors is a technically complex task, and even sound guidelines can lead to bets that fail in practice, after which it is often hard for political reasons to revert course.[51] The theory of Economic Complexity provides a framework to bring additional objectivity to sector prioritization efforts and guide vertical policies, but success is never guaranteed. For these reasons, it has been often concluded that industrial or diversification policy requires not only "carrots" – or positive incentives – but also "sticks" – discipline.[52] Policymakers need not only to encourage entrepreneurship in new modern sectors but also need to be able to change course when projects or investments fail. Piloting or providing incentives only with automatic sunset provisions can be ways to limit a government's exposure to the effects of strategic bets that do not work out in practice. It is impossible to avoid failure at some rate, since it is uncertain *ex ante* which new ventures will be successful, but governments need to be able to recognize which investments have become unproductive and be able to let these go.

A diversification strategy will have to take into consideration that Ethiopia's low economic complexity contributed to its current foreign exchange scarcity, but also that it is not itself the economy's binding constraint. As discussed above, throughout Ethiopia's growth acceleration, export growth has been insufficient to keep the pace of imports, which has aggravated the country's foreign exchange shortage and forced imports to stagnate and growth to slow in recent years. But Ethiopia's low level of economic diversification has been rather constant prior to and during the growth acceleration. If anything, structural transformation through export diversification has actually accelerated over the last decade as growth has slowed. This suggests

[51] Stein and Crespi, *Rethinking Productive Development*.
[52] Dani Rodrik, "Industrial Policy: Don't Ask Why, Ask How," *Middle East Development Journal* 1, no. 1 (2009): 1–29.

that something other than low economic complexity has been binding the growth process. We find that unavailability of foreign exchange itself is the factor that is constraining growth, and to a large extent, constraining more rapid diversification in recent years. Chronic exchange shortages have led to the deepening of Ethiopia's parallel exchange market where firms are forced to pay significant premiums to acquire foreign exchange (*Figure 53*). Many of the firms advancing the process of structural transformation in the country benefit from special regimes to bypass the foreign exchange constraint and access their required imported inputs, mainly through industrial parks. But even these firms with exceptional access to foreign exchange, which comes at the expense of foreign exchange availability for the rest of the private sector, report significant issues. Firms in newly established sectors such as apparel and footwear have struggled obtaining the necessary capital equipment and intermediate inputs to expand production. For incipient activities to thrive and for new sectors to establish themselves in Ethiopia, this constraint will have to be first alleviated before other issues related to coordination failures are addressed.

Figure 53. Ethiopia's Official and Parallel Exchange-Rates – 12-Month Average



Sources: Reinhart and Rogoff (2004; pre 1998), National Bank of Ethiopia (post 1998)[53]

In addition to reducing the foreign exchange constraint, to accelerate export diversification so that exports can grow at pace, Ethiopia will have to both in address sector-specific constraints and target new foreign investments to overcome its currently low economic complexity. Since Ethiopia has only limited opportunities to expand its exports on the intensive margin, the GoE will have to be strategic in order to promote diversification. Two broad types of policies will ultimately be required from the government. With regards to firms currently advancing structural transformation in the country, the government will have to improve its capacity to address the sector-specific constraints that prevent some of these particular activities

[53] Carmen M. Reinhart and Kenneth S. Rogoff, "The Modern History of Exchange Rate Arrangements: A Reinterpretation," *Quarterly Journal of Economics* 119, no. 1 (2004): 1–48.

from thriving. This will not only allow the economy to consolidate gains from more of its new industries but also to help develop capabilities in the "low-hanging fruit" portfolio. Given the country's needs to improve its complexity outlook, the government will also have to actively pursue longer jumps towards products that are farther away from its current capabilities, through targeted investment promotion strategy and investment facilitation efforts. Importantly, these two types of policies are not substitutes but rather complements, since "low-hanging fruit" will also require active investment promotion efforts to consolidate Ethiopia's position and advance knowhow accumulation, while "long jumps" will require addressing on-the-ground constraints for their establishment in the country.

6.1. Targeting Foreign Direct Investment

Foreign direct investment (FDI) has been and will continue to be vital to Ethiopia's structural transformation process. Since at least TWA's foundational support to the growth of Ethiopian Airlines, foreign direct investment has been at the heart of the economy's knowhow accumulation and structural transformation processes. The cases of cut flowers in the agriculture sector and garments in manufacturing also illustrate the importance of foreign investment in the transmission of technology and the development of new domestic capabilities. Globally, FDI has been proven to be a mechanism for transmission of knowhow through a variety of channels, such as labor turnover (workers leaving foreign firms and being rehired by domestic ones), employee spinoffs (new domestic firms founded by previous employees), and linkages with domestic firms.[54] For Ethiopia to introduce new knowhow in the economy and diversify its production, foreign direct investment will be vital, not only by its direct employment creation but also by its spillovers to domestic labor and firms. In particular, Ethiopia will need foreign direct investment to move into "distant" sectors such as light machinery and electronics, since these require capabilities that do not at the moment exist in the domestic economy.

Targeted investment promotion has the potential to accelerate FDI flows into strategic sectors but will require the development of multiple government capabilities. Institutions that address sector-specific constraints – such as industrial parks or sectoral institutes – will most likely not be appropriate to produce the "jumps" in capabilities that Ethiopia will require to enter new distant sectors. These jumps require more than providing public inputs and can hardly be guided simply by taking into consideration existing producers' concerns.[55] Investment promotion is a different type of activity, which requires the government to actively scout for new opportunities and recognize and address the constraints of firms that are not actually present in the country. In practice, investment promotion efforts encompass activities as diverse as national image building, lead generation, investor services, and policy advocacy with regards to investment climate. These

[54] Jennifer P. Poole, "Knowledge Transfers from Multinational to Domestic Firms: Evidence from Worker Mobility," *Review of Economics and Statistics* 95, no. 2 (2013): 393–406; Marc-Andreas Muendler, James E. Rauch, and Oana Tocoian, "Employee Spinoffs and Other Entrants: Stylized Facts from Brazil," *International Journal of Industrial Organization* 30, no. 5 (2012): 447–458; Smarzynska Javorcik, "Does Foreign Direct Investment Increase the Productivity of Domestic Firms?"

[55] Hausmann, Rodrik, and Sabel, "Reconfiguring Industrial Policy."

activities seek to alter potential investors investment location decisions by creating incentives and reduce information asymmetries. Investment promotion activities tend to have some type of sectoral or geographical targeting, that is a "vertical" dimension, even when investor services and assistance are granted to all foreign firms.[56] Targeted investment promotion efforts have effectively been proven to facilitate foreign direct investment inflows, in particular in developing economies in which information asymmetries or bureaucratic "red tape" are issues of concern.[57]

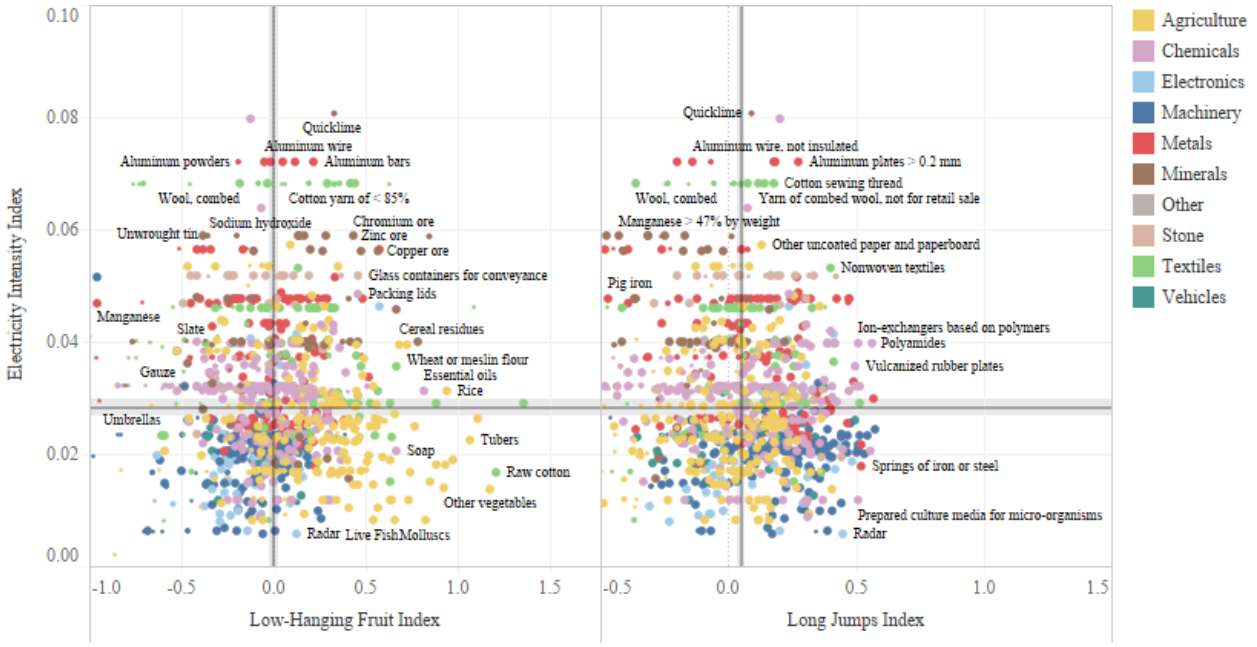
Ethiopia's prioritization of investment promotion has been a step forward in the upgrading of government capabilities that is required to encourage diversification. Ethiopia's investment promotion efforts started as early as 1993, when the Ethiopian Investment Agency was created, later to be renamed Ethiopian Investment Authority. In 2014, the context of the first Growth and Transformation Plan, Ethiopia took steps to prioritize investment promotion by strengthening the autonomy and capacity of the Ethiopian Investment Commission (EIC), with a proclamation by the parliament that established the agency as accountable to the Prime Minister and to the Ethiopian Investment Board of government representatives.[58] Under its current organizational structure, EIC has as the main duties of management of investment operations, the regulation of industrial parks, and the strengthening of the country's policy and investment climate. As part of their investment operations, the agency currently dedicates a one-stop service to foreign investors that facilitates their establishment in the country. Ethiopia has taken the necessary steps to establish an investment attraction ecosystem in the service of diversification. Strengthening Ethiopia's targeted investment promotion in new sectors will be vital for the country to accelerate its structural transformation process.

An investment promotion targeting strategy will have to prioritize industries by leveraging both the country' comparative advantages and targeted industries' strategic value. The prioritization that arises from Ethiopia's complexity analysis offers a starting point to construct a diversification strategy that should ultimately be reflected in Ethiopia's active investment promotion policies. Most likely, there are both "viability" and "attractiveness" factors that may not be explicitly captured by Economic Complexity indicators and that will have to be taken into consideration in an investment promotion roadmap.[59] The lack of a necessary natural resource is a disqualifier for any industry that is based on its extraction, as is the case of mining of missing minerals or some particular agriculture products. Moreover, Ethiopia's current struggle to provide quality of electricity supply could be understood as a call to promote in the short-term sectors that are not electricity-intensive, although many of both the low-hanging fruit and long-jumps portfolios identified by the complexity analysis will require reliable electricity supply (*Figure 54*). On the other hand, the availability of quality air freight through Ethiopian Airlines is a major asset of the country and could lead to prioritized industries that tend to have their products regularly

[56] Stein and Crespi, *Rethinking Productive Development*.
[57] Torfinn Harding and Beata S. Javorcik, "Roll out the Red Carpet and They Will Come: Investment Promotion and FDI Inflows," *The Economic Journal* 121, no. 557 (2011): 1445–1476.
[58] John Sutton, "Institution Building for Industrialization: The Case of the Ethiopian Investment Commission," in *The Oxford Handbook of the Ethiopian Economy* (Oxford University Press, 2019).
[59] Hausmann et al., "A Roadmap for Investment Promotion and Export Diversification."

shipped through this mode of transport (*Figure 55*). Policymakers should ultimately consider which are the factors make for "viability" and "attractiveness" in the economy to filter out, expand, or reprioritize the industries that were selected through the economic complexity calculations. Ethiopia has learned much in the past twenty years on its comparative advantages from its most and least successful diversification endeavors. Just as currently capabilities are the base for knowhow accumulation, institutional learning should be the base for future government efforts on economic diversification. Prioritizing investment promotion efforts will be key to better allocate administrative and political efforts to accelerate structural transformation in the country.

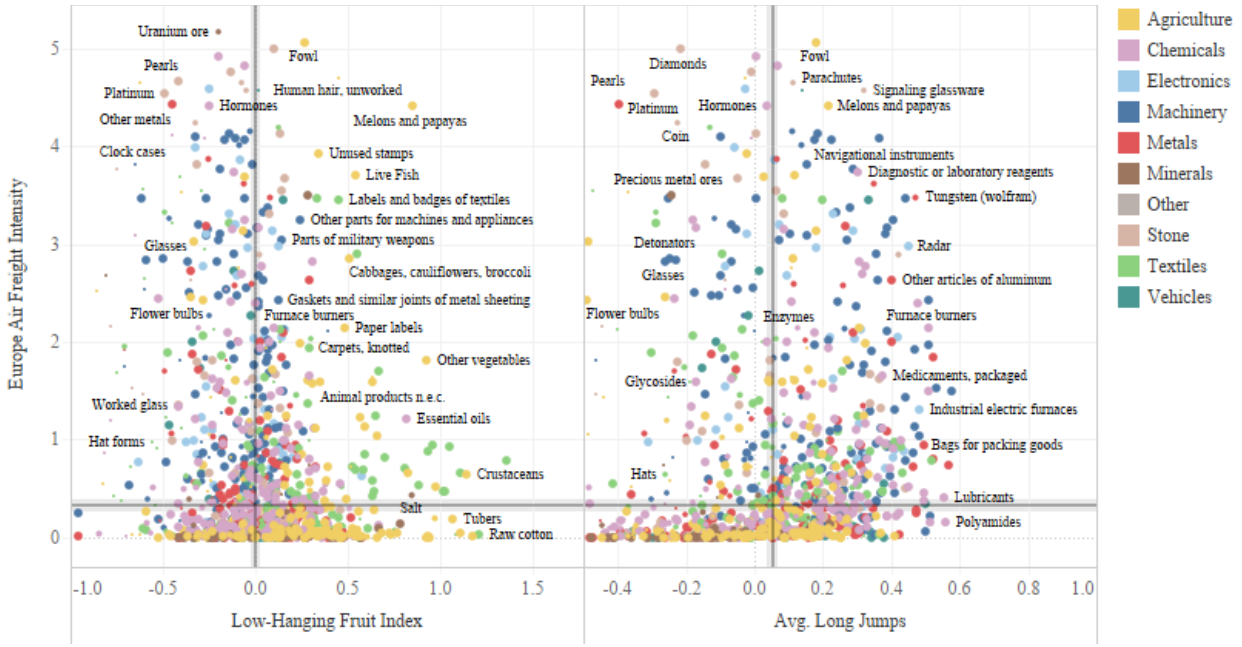
Figure 54. Product Selection Criteria and Electricity Intensity (HS92 4-Digit, 2015-2017)



Sources: Atlas of Economic Complexity / U.S. Bureau of Economic Analysis (BEA).
Product nodes are sized by global trade flows[60]

[60] The electricity intensity index for products is calculated by estimating the value contribution of electricity as an input for each economic sector using the 2017 U.S. Bureau of Economic Analysis input-output tables, after which BEA sectors are mapped into 4-digit HS codes.

Figure 55. Product Selection Criteria and Air Freight Intensity (HS92 4-Digit, 2015-2017)



Sources: Atlas of Economic Complexity / Eurostat.
Product nodes are sized by global trade flows[61]

6.2. Addressing Sector-Specific Constraints

Consolidating the performance of Ethiopia's new emerging industries and attracting adjacent sectors will require the government to establish stronger processes to identify and address sector-specific constraints. In developing countries, self-discovery and coordination market failures often distort and weaken the process of structural transformation. Nevertheless, neither government officials nor technocrats can easily know where these distortions are and how these are structured. Although some distortions affect the economy as a whole – such as foreign exchange shortages in the case of Ethiopia – most distortions affect various industries in different ways. For instance, the lack of a specific type of infrastructure or input or a particular regulation may be a big problem for a one industry but matter very little for others. Firms in Ethiopia's manufacturing sector have different perceptions of the issues affecting their operations and these perceptions tend to vary by region as well, as some requirements for production are sometimes only available locally (*Figure 56*). An important part of the diversification policy process is hence to identify the constraints to structural transformation within different industries and within different geographical clusters. Even more importantly, success requires enabling processes that

[61] The air freight intensity index is calculated by estimating the relative share of European air imports for a given product, with regards to total imports of the same product, using the same methodology as for export RCAs. The calculation is precisely: Air $RCA_{cp} = \frac{M_{cp,\,Air}/\Sigma_p M_{cp,\,Air}}{M_{cp,\,Total}/\Sigma_p M_{cp,\,Total}}$, where $M_{cp,\,Air}$ are the imports of country *c* of product *p* by airfreight.

allow policymakers to continuously address and monitor the evolution of these constraints. Consequently, the government of Ethiopia faces the challenge of increasing the number of channels for communication with the private sector so that the informational environment in which the policy process take place can be enriched, and in that way gradually widening its policy bandwidth to deal with a growing variety of issues.[62]

Figure 56. Major Problems Preventing Operations, by Industry (2013-2015)

	Beverages	Cement	Chemicals	Electronics	Food	Leather and Footwear	Machinery	Metals	Minerals	Plastic	Textiles
Newly estabilshed	19% (12)	7% (40)	10% (12)		11% (81)	5% (8)	10% (2)	11% (25)	8% (42)	11% (21)	21% (22)
Getting market or customers	7% (4)	24% (117)	9% (8)		10% (58)	20% (30)		12% (20)	12% (52)	10% (15)	18% (18)
Government rules and regulations		3% (14)	1% (1)		1% (8)	1% (2)	9% (1)	3% (4)	4% (17)	2% (3)	1% (1)
Lack of working capital		7% (32)	2% (2)		3% (18)	8% (12)	8% (1)	4% (6)	2% (8)	3% (5)	7% (6)
Repeated breakage of machinery	7% (3)	4% (18)	1% (1)		4% (24)	3% (4)		2% (4)	19% (91)	4% (6)	1% (1)
Shortage of electric and water supply	20% (9)	21% (101)	17% (15)		15% (86)	20% (28)	30% (4)	17% (28)	9% (40)	23% (37)	12% (11)
Shortage of foreign exchange	4% (2)	1% (3)	10% (9)		1% (6)	6% (9)	26% (3)	8% (15)	0% (2)	6% (9)	7% (6)
Shortage of raw materials	28% (13)	20% (94)	33% (31)	100% (3)	43% (236)	29% (42)	8% (1)	33% (56)	23% (101)	33% (47)	22% (21)
Shortage of spare parts	7% (3)	2% (11)	2% (2)		2% (9)	2% (3)	5% (1)		6% (24)	3% (4)	3% (3)
Others	8% (5)	12% (63)	15% (16)		9% (64)	6% (10)	5% (1)	10% (22)	18% (87)	4% (8)	8% (8)

Source: Large and Medium Manufacturing Industries Survey (Central Statistical Agency).
The first, second and third major issues reported are consolidated in an index with weights 5/9, 3/9 and 1/9.
Numbers within parenthesis represent sampled firms in three-year period, including repetitions.

In some cases, different agencies within the Government of Ethiopia have been successful in promoting these types of discussions, especially recently, but there is need for more public-private coordination and problem solving. As one successful example of institutional innovation, the Agricultural Transformation Agency (ATA), established in 2010, has prioritized interventions to address bottlenecks in specific geographies and commodity value chains.[63] The ATA's mandated responsibilities to coordinate across multiple levels of government and with private sector and non-governmental actors has allowed it to facilitate a highly integrated, multi-stakeholder approach. The agency's cluster initiative is also an example of targeted and

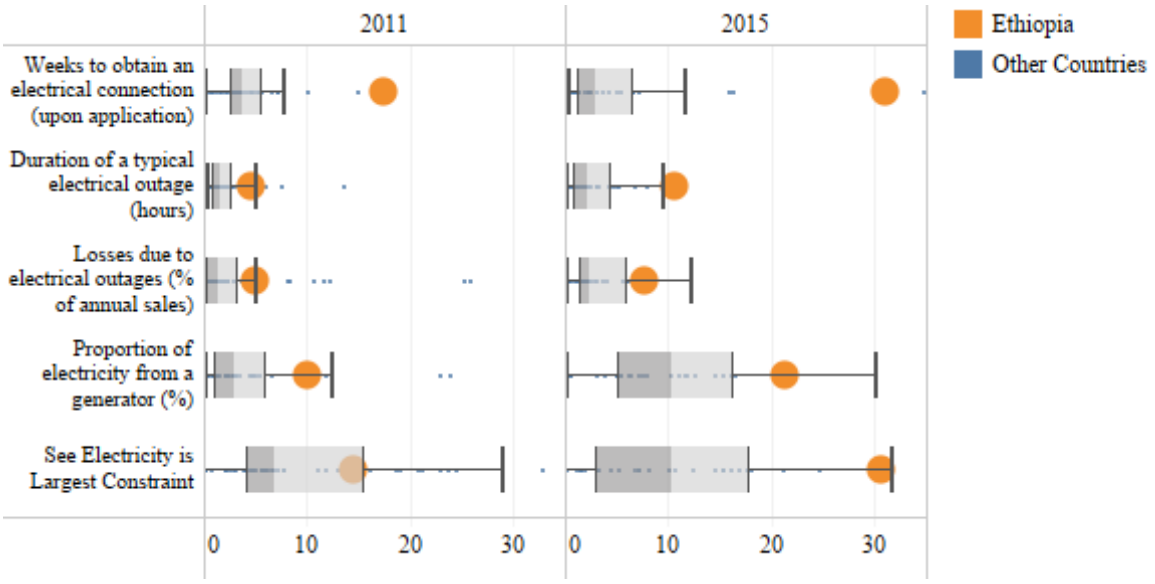
[62] Ricardo Hausmann, "The Other Hand: High Bandwidth Development Policy," CID Working Papers (HKS Working Paper No. RWP08-060, 2008).
[63] Getachew Diriba and Christian Man, "Building a Big Tent for Agricultural Transformation in Ethiopia" (Center for Strategic & International Studies, 2019); Kingsley Y. Amoako, "Growing with Depth: What African Countries Can Learn from the Ethiopian Experience," in *The Oxford Handbook of the Ethiopian Economy* (Oxford University Press, 2019).

decentralized action to identify and address sector-specific constraints. In the case of manufacturing, the Ethiopian Textile Industry Development Institute (ETIDI) and the Leather Industry Development Institute have contributed to help guide the private sector in capacity building exercises and provided technical support. Strengthening existing agencies and facilitating the emergence of additional problem-driven public institutions that can result in iterative problem solving capabilities that will be vital to increase the competitiveness of new industries and consolidate and accelerate the process of structural transformation.

Addressing electricity and logistics bottlenecks will be key to ensure the competitiveness of the emerging manufacturing sector. Ethiopia currently has relatively low labor costs in comparison to middle-income countries that could in theory allow it to become a light manufacturing powerhouse parallel to the cases of China and Bangladesh in the 1980s.[64] Nevertheless, for Ethiopia to become globally competitive in industries such as textiles and apparel, the country will have to address some of the sector-specific bottlenecks. The provision of electricity is a major concern of manufacturing firms, mapping to several aspects of low quality of electricity supply (*Figure 57*). Although the direct cost of electricity for firms is low, increasingly high connection fees and outages have made the cost of access and losses a high burden for Ethiopian firms, which represents a constraint in the development of the manufacturing sector. Ethiopia's abundant energy resources have the potential to power its manufacturing sector in the future, but this will require not only the completion of existing generation projects (Grand Ethiopian Renaissance and Gibe IV dams) but also a major expansion of transmission and distribution infrastructure. Moreover, the country's high logistics costs – derived partially from the fact that that Ethiopia is landlocked but also from high handling costs – may ultimately also contribute to undermining some of light's manufacturing competitive edge (*Figure 58*).[65] Transportation and logistics inefficiencies not only constrain manufacturing's competitiveness by increasing the cost of exporting, but also slow down the process of acquiring production inputs, further difficulted by significant import taxes and the inefficiencies that arise from the country's foreign exchange constraint.[66] The cases of electricity and transportation provide examples of sector-specific distortions that may be present nation-wide, but may require local solutions, as access to highways or to the electricity grid are problems that need to be solved at the local level, in coordination with federal authorities.

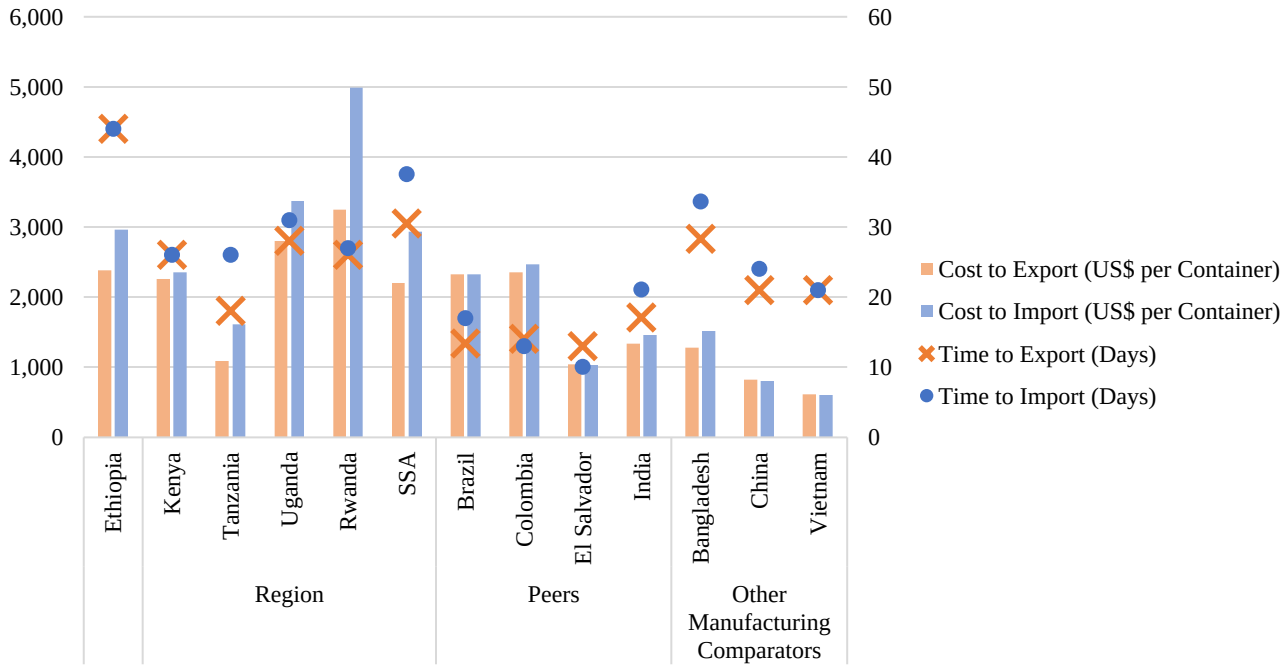
[64] Alan Gelb et al., "Can Africa Be a Manufacturing Destination? Labor Costs in Comparative Perspective," *Center for Global Development Working Paper*, no. 466 (2017).
[65] Dinh et al., "Light Manufacturing in Africa."
[66] Mesfin Girma Bezawagaw et al., "The Inescapable Manufacturing Services Nexus: Exploring the Potential of Distribution Services" (World Bank, 2018).

Figure 57. Electricity as a Constraint for Manufacturing Sector



Source: Enterprise Surveys. Boxplot includes the 10th percentile, first quartile, median, third quartile and 90th percentile of observations. Each year includes observations from previous and following year to increase comparator sample.

Figure 58. Export Logistics as a Constraint for Manufacturing Sector

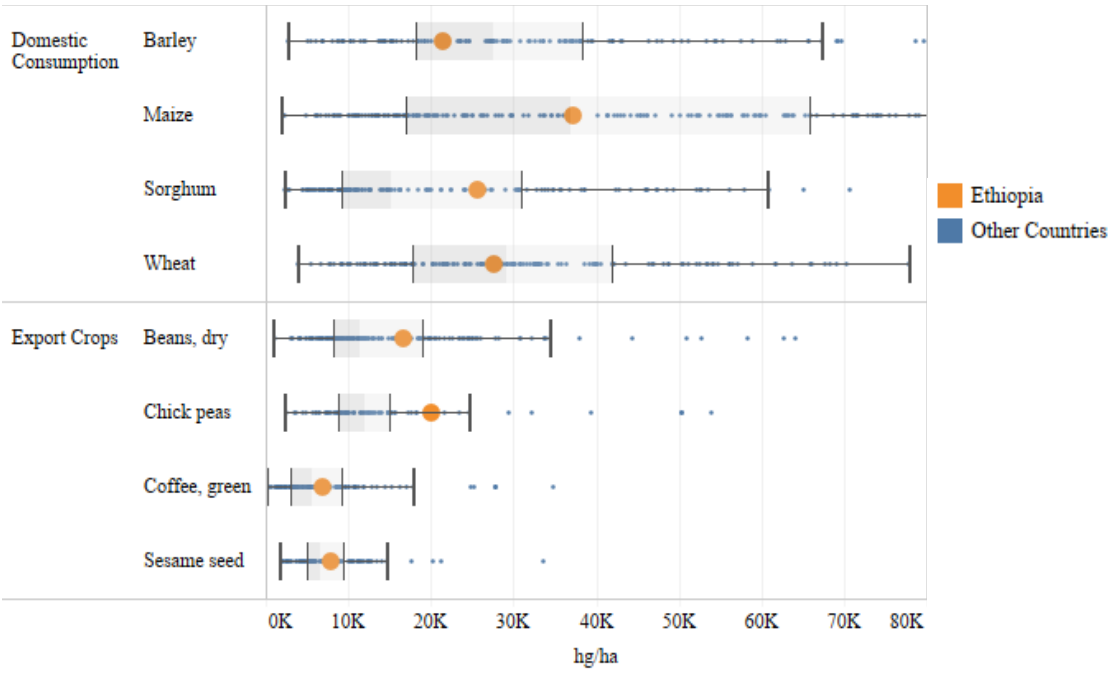


Source: Doing Business 2015

In the case of agricultural development, targeted efforts will most likely be required to address value chain-specific constraints. The last two decades saw a strong expansion of Ethiopia's agriculture production, not only in terms of harvested area but also in terms of production yields. The rise in agricultural productivity came through a variety of sources, including increased use of improved seed varieties, more widespread use of fertilizers and pesticides, improvement and expansion of key infrastructure (road transportation, irrigation and electricity), and development of extension services.[67] Nevertheless, despite general trends, agriculture development comprises many heterogenous stories. While some cereals, such as wheat or sorghum, have seen their yields double over since the beginning of the 2000s, coffee yields have altogether remained stagnant, and sugar yields plummeted. At present, different crops show not only different production and export growth patterns, but also very dissimilar yield performance when compared to international benchmarks (*Figure 59*). This heterogenous performance ultimately reveals very different growth challenges within the sector. While some crops possibly face issues of access to inputs (seeds, fertilizers), market imperfections and issues with regards to land holdings may constrain others. Ultimately, despite the existence of generalized areas of improvement in the sector, targeted efforts will be required both to increase production on the intensive margin, as well as to allow for the diversification of the sector itself by making it easier for farmers and farm service providers to discover new land uses and innovate value chain structures. As previously mentioned, the Agricultural Transformation Agency has played a strategic role in the last decade toward increasing agricultural productivity and improving the market orientation of the sector. Moreover, regional governments together with stakeholders have prioritized specific commodities for specific districts (or *woredas*) through the Agricultural Commercialization Clusters, based on both market and geographical conditions. Within each cluster, ATA has coordinated interventions related to research and development, marketing, access to inputs, and managements skills. Moreover, the development of four Integrated Agro-Industrial Parks (in Tigray, Amhara, Oromia and SNNP) is currently programmed to boost commercialization of agricultural products. Although the experience has been overall positive, ATA's efforts remain to be scaled to mobilize transformation across the country.

[67] Alemayehu Seyoum Taffesse, "The Transformation of Smallholder Crop Production in Ethiopia, 1994–2016," in *The Oxford Handbook of the Ethiopian Economy* (Oxford University Press, 2019); Fantu N. Bachewe et al., "Agricultural Transformation in Africa? Assessing the Evidence in Ethiopia," *World Development* 105 (2018): 286–298; David J. Spielman, Dawit Kelemwork, and Dawit Alemu, "Seed, Fertilizer, and Agricultural Extension in Ethiopia," *Food and Agriculture in Ethiopia: Progress and Policy Challenges*, 2012, 84–122; Stefan Dercon et al., "The Impact of Agricultural Extension and Roads on Poverty and Consumption Growth in Fifteen Ethiopian Villages," *American Journal of Agricultural Economics* 91, no. 4 (2009): 1007–1021.

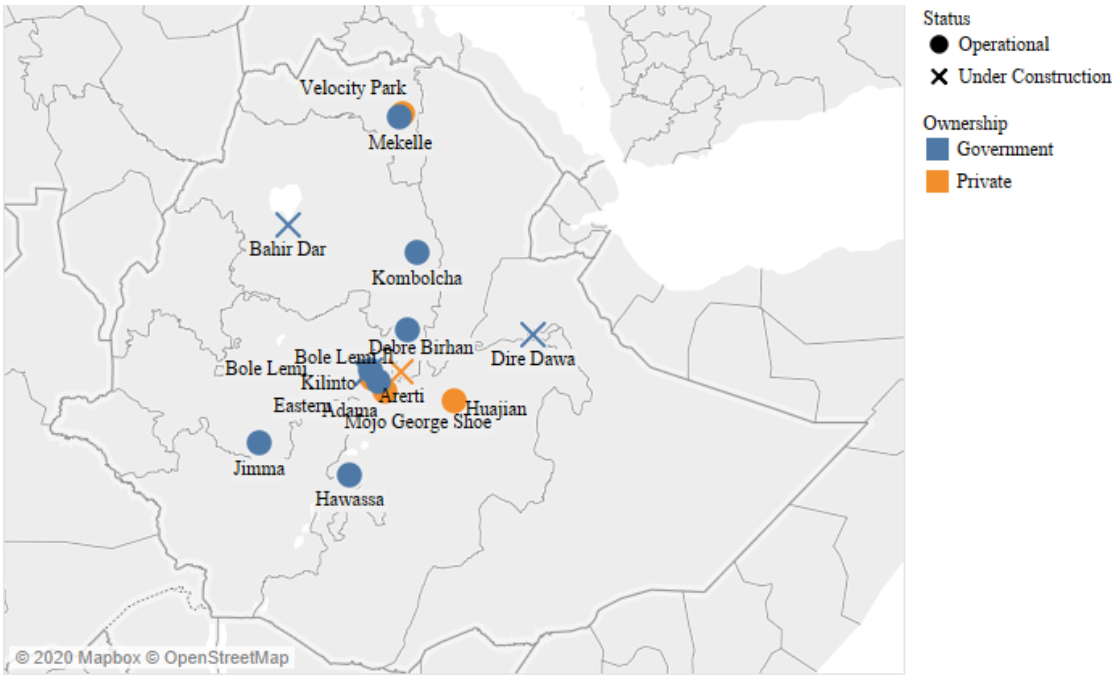
Figure 59. Agriculture Yields, 2015-2017 Average



Sources: FAO. Boxplot includes the 10th percentile, first quartile, median, third quartile and 90th percentile of observations.

Industrial parks have been designed to accelerate Ethiopia's industrialization by allowing firms to bypass the economy's constraints. The Growth and Transformation Plan II has included as one of its key new initiatives the assertive expansion of industrial parks. Despite an overall mixed experience with special economic zones in Africa, compared to successful cases in South Korea or Vietnam, Ethiopia focused its manufacturing development strategy on developing and strengthening industrial parks as a key initiative to expand the country's export base and accelerate its industrialization. Industrial parks are currently in operations or being constructed throughout the entire country (*Figure 60*). Although the majority of these are government-owned and managed by the Industrial Park Development Corporation (IPDC), some new parks are managed by private developers. Industrial parks – regulated by the Ethiopian Investment Commission – were overall designed to work around the economy's constraints. The parks are largely filled by foreign investors, which bring much of their own foreign exchange and hence do not depend heavily on scarce foreign exchange mediated by the domestic banking system. Parks are theoretically equipped with their own back-up electricity generation capacity, ensuring a constant supply throughout blackouts. Moreover, transportation logistics in major zones were meant to be eventually connect to the new rail line to Djibouti's port. In practice, infrastructure provision remains partially unrealized as rail connectivity has not been established and many parks remain unconnected to the electricity grid. Major delays in the opening of some parks has lengthened the timeframes for returns on investments, while exports have overall underperformed. It is important for the country to continue, through IPDC, to address firms' concerns, not only for existing parks to expand their output but also to capture lessons from the experience to inform future expansion.

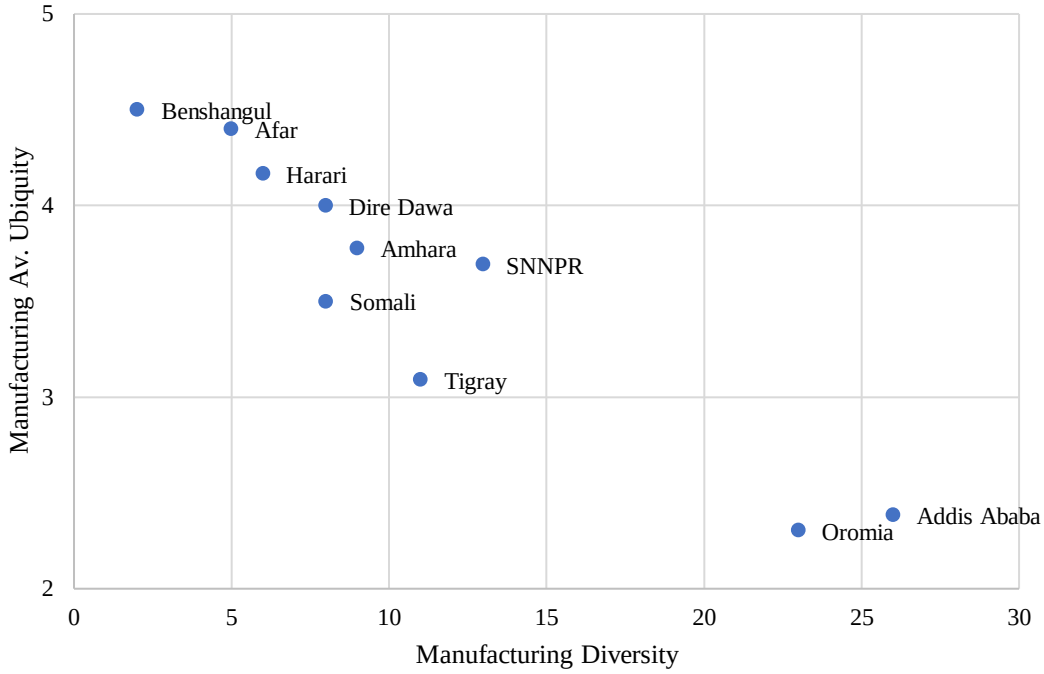
Figure 60. Industrial Parks in Ethiopia



Sources: Ethiopian Investment Commission, Cepheus

Strengthening the value proposition of the newly constructed industrial parks can help Ethiopia to avoid an excessive regional agglomeration of economic activity. Industrial parks in Ethiopia represent an invaluable tool to avoid a concentration of production in main agglomerations and to enter a more geographically-balanced development path. Although the development of the manufacturing sector in Ethiopia has been overall a recent phenomenon, it might already be reflecting some of the pre-existing economic regional disparities. When applying Economic Complexity analysis to manufacturing employment data, it is evident that Addis and Oromia present, on the whole, more diverse and less ubiquitous manufacturing ecosystems with respect to other regions in the country (*Figure 61*). Ethiopia must ensure that regional differences do not become persistent through time through an even development of industrial parks that is not limited to the largest urban centers. Nevertheless, industrial parks imply substantial investments, and the government needs also to guide these by rational investment decisions based on where parks will be able to deliver social returns. Simply developing industrial parks in peripheral areas might not be sufficient to address regional disparities, as the international experience shows that parks located outside of metropolitan areas often fail. Securing access to imported inputs, businesses services, labor and transport for manufacturing is essential for industrial parks' success, and solely locating a park in a lagging region without proper a feasibility assessments and a strategy for business development does not guarantee that the park is effectively able to attract investments. For industrial parks to effectively become a tool for regional development, these will have to be accompanied by proper regional development strategies that address each region's constraints and take advantage of their comparative advantages.

Figure 61. Manufacturing Diversity and Ubiquity, Based on Domestic Employment (2014/15)



Source: Large and Medium Manufacturing Industries Survey (Central Statistical Agency)

Ethiopia must avoid parks becoming isolated enclaves that are separated from the domestic economy, including its supply chains and labor markets. Beyond few successful cases, achieving linkages between foreign direct investment and domestic firms has been generally difficult in industrial zones in Africa, as these easily become isles where the lack of interaction between foreign and domestic firms does not facilitate spillovers, in particular when zones are specialized in low-skill sectors such as garments.[68] Industrial parks in Ethiopia may have partially become part of a tiered system of this sort, in that they confer physical infrastructural as well foreign exchange access and other advantages to foreign investors but do not facilitate interaction with domestic firms (through backward linkages and other business-to-business interactions). There is some optimistic evidence with regards to FDI productivity spillovers on domestic plants related not only to learning by observation but also to labor turnover, technology licensing and supplier relationships, but these spillovers tend to be highly localized and it is not clear whether they will be sufficient for knowhow to persistently diffuse within the domestic private sector. [69] Fostering stronger links between domestic and foreign firms will be key to accomplishing the industrial parks' goal of creating a domestic export base in the country.

[68] Thomas Farole, "Special Economic Zones in Africa: Comparing Performance and Learning from Global Experiences" (World Bank, 2011).
[69] Girum Abebe, Margaret S. McMillan, and Michel Serafinelli, "Foreign Direct Investment and Knowledge Diffusion in Poor Locations: Evidence from Ethiopia," NBER, 2018.

7. CONCLUSION

Applying the theory of Economic Complexity, this report analyzed the challenge of productive diversification in Ethiopia's economy. The report included an analysis of Ethiopia's productive capabilities and the country' recent export performance. Putting an emphasis on the country's ongoing structural transformation process, the report also provided an illustration of what diversification has looked like in the recent past through the cases of cut flowers, textiles and garments and air transportation. Furthermore, the theory of Economic Complexity was used to assess potential diversification strategies and identify specific opportunities for diversification.

Accelerating the process of structural transformation will be vital to achieve a sustainable growth path in the medium-term. The Government of Ethiopia is currently implementing major political and economic reforms to address the country's macroeconomic imbalances. Beyond the current circumstances, the country's medium-term growth prospects will be contingent on the growth of its exports. As we have tried to show, given limited opportunities to expand in the intensive margin, Ethiopia will have to increase the variety of products and services it currently exports to create the export base it needs for sustainable growth. Policy can play a significant role in promoting self-discovery and pave the way for a more robust process of structural transformation. By identifying strategic opportunities and providing an initial discussion on policy strategy, this report seeks to provide part of the groundwork for future diversification work.

The results from this analysis are intended to be improved through further collaboration between the Growth Lab and the Government of Ethiopia. The application of the theory of Economic Complexity is a first step to build an initial map for diversification efforts. Nevertheless, not only are there factors that are not captured by Economic Complexity indicators that should be taken into consideration in an investment promotion roadmap, but generally the work of diversification will require the government to acquire itself new capabilities beyond industry prioritization. For Ethiopia to seize new opportunities and increase its economic complexity, new forms of problem-solving institutions and policies will have to be developed and strengthened. The analysis provided in this report will be complemented by further research to understand these constraints and provide further assistance to diversification efforts.

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APPENDIX

A1. ECONOMIC COMPLEXITY INDICATORS – TECHNICAL BREAKOUT

The following appendix details the mathematical methodology utilized to calculate the Economic Complexity Index as well as the other relevant complexity indicators.[70] Although the economic complexity methodology can be used with a variety of types of data, only international trade examples are used in this explanatory note for simplicity.

Revealed Comparative Advantage (RCA) is a measure of whether a country is competitively the exporter of a product, based on the relative advantage or disadvantage it has exporting it.[71] A country can be thought of as an "effective exporter" of a product if it exports more than what is considered its "fair share", or a share that is larger than the share of world trade the product represents. If X_{CP} represents the exports of country c of product p, then the RCA for that particular country on that specific product is:

$$\mathrm{RCA_{cp}} = \frac{\mathrm{X_{cp}}/\Sigma_c \mathrm{X_{cp}}}{\Sigma_p \mathrm{X_{cp}}/\Sigma_c \Sigma_p \mathrm{X_{cp}}}$$

The M_{cp} matrix is a matrix that connects countries to products effectively exported by these. Entries in the matrix are such that a cell is equal to 1 if the country c exports the product p with an RCA greater than 1 and 0 otherwise. The matrix is used to construct the estimates of economic complexity as well as the Product Space:

$$M_{cp} = \begin{cases} 1 & if \;\; RCA_{cp} \geq 1 \\ 0 & otherwise \end{cases}$$

Diversity is a measure of how many types of products a country is able to make. It is calculated using the M_{cp} matrix: Diversity is the number of products that a country *effectively* exports or the sum of elements in a row of the matrix M_{cp}:

$$Diversity = k_{c,0} = \sum_p M_{cp}$$

Ubiquity is a measure of how many countries are able to *effectively* make a product. It is the sum of units in a column of the M_{cp} matrix:

$$Ubiquity = k_{p,0} = \sum_c M_{cp}$$

[70] Hidalgo and Hausmann, "The Building Blocks of Economic Complexity"; Hausmann et al., *The Atlas of Economic Complexity*; Harvard Growth Lab, "The Atlas of Economic Complexity."
[71] Balassa, "Trade Liberalisation and 'Revealed' Comparative Advantage."

The Economic Complexity Index and Product Complexity Index correct diversity and ubiquity by one another to obtain a more accurate measure of the capabilities available in a country or embedded in a product. This requires either calculating the average ubiquity of products effectively exported, or the average diversity of countries that make a product:

$$k_{c,n} = \frac{1}{k_{c,0}} \sum_{p} M_{cp} \cdot k_{p,n-1}$$

$$k_{p,n} = \frac{1}{k_{p,0}} \sum_{c} M_{cp} \cdot k_{c,n-1}$$

To calculate a complexity index, one would have to insert the second equation into the first one and iteratively repeat the correction. An equivalent method of recursively correcting diversity and ubiquity by each other is taking the eigenvalues and eigenvectors of the $\widetilde{M}^{C}$ matrix, a matrix whose (c, c') element is:

$$\widetilde{M}^{C}_{c,c'} = \sum_{p} \frac{M_{cp} M_{c'p}}{k_{c,0} k_{p,0}}$$

The Economic Complexity Index (ECI) is defined by taking the eigenvector $\vec{K}$ of $\widetilde{M}^{C}$ associated with the second largest eigenvalue.

Alternatively, one can define the Product Complexity Index as the eigenvector associated with the second largest eigenvalue of an $\widetilde{M}^{P}$ matrix, where the (p, p') element is:

$$\widetilde{M}^{P}_{p,p'} = \sum_{c} \frac{M_{cp} M_{cp'}}{k_{c,0} k_{p,0}}$$

Distance is a measure of an economy's ability to start producing a specific product, that is the extent of a location's capabilities to make a product based on its current production basket. Distance is calculated between any two products by first calculating a matrix of proximities $\phi_{p,p'}$ which measures the probability that an economy exports a given product given that another economy exports it. The matrix of proximities measures the easiness of moving from one product to another:

$$\phi_{p,p'} = \frac{\sum_c M_{cp} M_{c'p}}{\max(k_{p,0}, k_{p',0})}$$

Distance is then estimated as the weighted proportion of products connected to a product p that the country c is not currently effectively exporting. The index is calculated by summing the proximities connecting a good p to all the products country c is an effective exporter of. The distance indicator is then normalized by dividing it by a sum of all the proximities between all the products and the product p:

$$d_{cp} = \frac{\sum_{p'}(1 - M_{cp'})\phi_{pp'}}{\sum_{p'} \phi_{pp'}}$$

Opportunity gain is an index that measures the benefits in terms of complexity improvement that a specific location can obtain by diversifying into a particular product. The index quantifies how a new product can "open" paths to more and more complex products. It is calculated by using the proximity matrix, the M_{cp} matrix and the PCI index:

$$OG_{cp} = \left[\sum_{p'} \frac{\phi_{p,p'}}{\sum_{p''} \phi_{p'',p'}} (1 - M_{cp'}) PCI_{p'} \right]$$

Economic Complexity Outlook Index (COI) is a measure of how many complex products are near a country's set of current capabilities. The COI captures the "ease" of diversification for a country, or the abundance of complex products at a relatively low distance. Calculating the COI requires calculating the distance towards every product that is not currently produced and weighting these by their complexity or PCI:

$$COI_c = \sum_p (1 - d_{cp})(1 - M_{cp}) PCI_p$$

A2. Atlas of Economic Complexity – Data Cleaning Process

The Atlas of Economic Complexity comprises trade data for more 5000 products and 200 countries and territories. Data is provided both in the Harmonized System (HS, 1992) and the Standard International Trade Classification (SITC, rev. 2) formats. The trade data analyzed throughout this report, and utilized to calculate the complexity indicators, is 4-digit HS 1992 trade data, for which there are more than 1200 products available. The raw trade data on goods is derived from countries' reporting to the United Nations Statistical Division (COMTRADE), while additional data on services trade is provided by the International Monetary Fund's (IMF) Direction of Trade Statistics database.

International trade statistics – imports and exports – as reported by countries present a variety of inconsistencies which complicate the estimation of trade flows between countries. Exports from country X to country Y often do not match reports of imports of country Y from X for the same goods. These inconsistencies can be due to delayed reporting, exchange rate discrepancies and freight and insurance cost-accounting. Moreover, over-invoicing and smuggling activities can in some cases further bias the reporting of trade flows. Since product-specific trade data is utilized not only to analyze trade flows themselves but to calculate countries' complexity profiles, it is vital to resolve inconsistencies between reports to base estimates on a dataset as reliable as possible.

The Atlas of Economic Complexity has developed a methodology to systematically check for these inconsistencies and account for them accordingly. The data cleaning process – the Bustos-Yildrim method – takes advantage of the fact that trade flows are recorded both as exports and imports to cross-reference reports between countries and produce reliable estimations. The algorithm generates estimates of trade flows through three steps:

1. Import values are corrected for them to be properly compared to export flows (as imports include the cost of freight and insurance – CIF – and exports are reported free on board – FOB);
2. A reliability index is estimated for countries based on the consistency of trade reported by all exporter and importer combinations over time;
3. Trade values are re-calculated using the data reported by both importers and exporters, taking account the estimated reliability of the reporters.

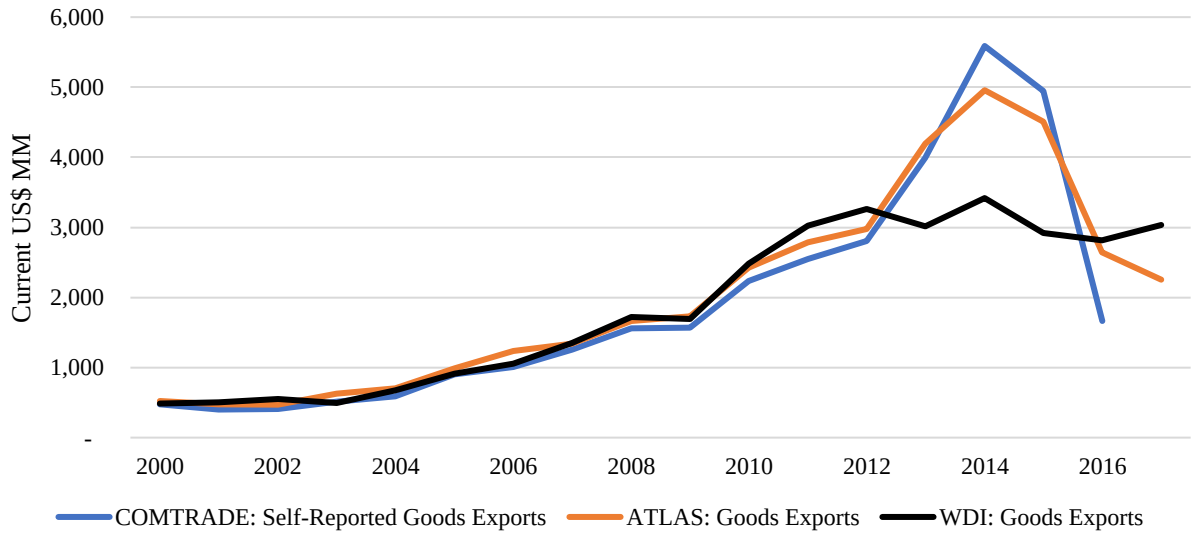
Trade data, even after applying the algorithm might include some degree of error. The cleaning algorithm accounts for some inconsistencies, but ultimately data only reflects best estimates.

Trade data inconsistencies are particularly important in the case of Ethiopia. Although aggregate figures reported by different sources approximately match before 2013, there is a discrepancy starting in that year between the trade data reported by Ethiopia to COMTRADE and official sources such as the IMF or the World Bank (*Figure A2.1*). Specifically, merchandise exports accounted by COMTRADE grow at a substantially larger rate throughout the 2013-2014 years,

only to fall steeply below the IMF reporting around 2015. The trends reported by the IMF match preliminary estimates obtained from the National Bank of Ethiopia (NBE), which also show a stagnation of merchandise exports after 2012 (instead of a rise and fall pattern). The Atlas of Economic Complexity corrects the inconsistencies in COMTRADE data by generating its own estimates of trade flows, based on relative reliability of countries' reporting. In the case of Ethiopia, Atlas aggregate flows are "in between" official estimates and COMTRADE estimates. The Atlas' estimates have a clear advantage for cross-country comparisons and complexity calculations, as they provide more consistent bilateral trade flows that countries' unilateral reporting.

The analysis of the evolution of Ethiopia's trade flows is not severely affected by differences in trade reporting. Although some specific products show particularly diverging trends – floriculture exports stagnate and do not sharply decrease in the latest period in NBE data – the overall picture for most exports is similar. In general terms, the corrected Atlas data shows for most agricultural and mineral exports a more attenuated rise and fall pattern than the COMTRADE data, which is still starker than the stagnation reported by NBE for most products. Complexity indicators appear to be satisfactorily robust to changes in the base-year for the calculations. This is not surprising, given that export shares between products have remained consistently similar throughout the last decade, with the exception of the rise of garments and leather-derived manufacturing products. Generally, although some estimates would change were a definitive trade database available to analyze Ethiopia's trade flows, the analysis presented is overall robust to the measurement error and inconsistencies caused by the data.

Figure A2.1. Ethiopia Goods Exports (in current US$ MM)



Sources: UN COMTRADE, Atlas of Economic Complexity, World Bank World Development Indicators

A3. Complexity Analysis – Potential Growth Opportunities

The top 75 products for each combination of the product complexity, opportunity gain and distance indexes are provided below. The three normalized indexes are three-year averages (2015/2017) and are calculated using trade data from the *Atlas of Economic Complexity*.

A3.1. Low-Hanging Fruit

Sector	Product (HS2)	Product (HS92 4-Digit)	Opportunity Gain	Distance	PCI	Global Trade (2015/17 Avg.)
Agriculture	Animal or vegetable fats, oils or waxes	Other vegetable fats and oils	-1.00	1.49	-1.27	$4.18B
		Palm oil	-1.66	2.06	-2.42	$31.20B
	Animal products	Coral and shells	-1.32	2.05	-1.77	$0.17B
	Beverages	Ethyl alcohol > 80%	-0.95	1.48	-1.25	$7.62B
	Cereals	Rice	-1.75	2.77	-1.92	$21.93B
	Fish	Crustaceans	-2.08	3.28	-2.08	$25.03B
		Fish, excluding fillets	-1.52	2.10	-1.48	$20.47B
		Frozen fish, excluding fillets	-1.80	2.70	-1.68	$22.87B
		Live Fish	-1.10	1.67	-1.26	$1.78B
		Molluscs	-1.79	2.60	-1.90	$11.90B
		Preserved fish	-1.59	2.01	-1.77	$6.02B
	Flours, starches and malts	Wheat or meslin flour	-1.68	2.25	-1.37	$4.73B
	Food residues and animal feed	Cereal residues	-1.67	2.33	-2.03	$2.01B
	Fruits and nuts	Avocados, pineapples, mangos, etc.	-1.94	2.95	-2.10	$12.03B
		Bananas and plantains	-1.74	2.26	-1.97	$15.03B
		Cashew nuts & coconuts	-2.08	2.99	-2.63	$8.62B
		Citrus fruit	-1.60	2.29	-1.65	$13.67B
		Fruits, dried	-0.85	1.48	-1.00	$2.38B
		Melons and papayas	-1.75	2.53	-1.57	$3.69B
		Other fresh fruit	-1.50	2.10	-1.69	$14.47B
		Other nuts	-1.81	2.76	-1.83	$17.70B
		Peaches & cherries	-1.33	2.03	-1.66	$5.93B
	Lac and other vegetable extracts	Vegetable saps and extracts	-1.04	1.72	-1.26	$6.09B
	Other vegetable materials	Vegetable products n.e.c.	-1.91	2.95	-2.11	$0.78B
	Paper and paperboard	Notebooks	-1.01	1.56	-0.85	$4.41B
	Preparations of vegetables, fruit, or nuts	Fruit juices	-1.37	1.93	-1.09	$15.23B
		Other vegetables, prepared or preserved	-0.99	1.59	-0.96	$10.01B
		Pickled fruits and vegetables	-1.15	1.66	-0.93	$1.92B
	Sugar and candy	Confectionery sugar	-1.00	1.50	-0.70	$10.83B
		Sugarcane & sucrose	-1.87	3.08	-1.82	$27.70B
	Tobacco	Cigars and cigarettes	-1.14	1.62	-0.83	$25.83B
		Unmanufactured tobacco	-1.89	3.20	-1.84	$12.10B
	Vegetables	Tubers	-1.97	3.20	-2.42	$2.95B
		Vegetables, provisionally preserved	-1.38	1.90	-1.28	$0.66B
	Wood	Wood charcoal	-1.59	2.04	-1.91	$1.12B
Chemicals	Essential oils	Essential oils	-1.50	2.35	-1.50	$5.08B
	Fertilisers	Mixed fertilizers	-1.17	1.49	-0.98	$21.23B
	Rubber	Natural rubber	-1.76	2.31	-2.78	$14.37B
	Soaps, waxes, and paints	Soap	-1.30	1.93	-1.13	$6.48B

Electronics	Electrical machinery and equipment	Insulated electrical wire	-0.93	1.46	-0.46	$114.00B
Machinery	Miscellaneous manufactured articles	Worked animal carving material	-1.11	1.44	-1.29	$0.15B
Metals	Articles of iron or steel	Barbed wire of iron or steel	-1.22	1.58	-1.08	$0.20B
		Other tubes, pipes and hollow profiles of iron or steel	-0.66	1.22	-0.34	$21.03B
	Iron and steel	Other bars of iron, not further worked than forged	-1.44	1.72	-1.28	$14.23B
	Lead	Lead refined unwrought	-1.46	1.96	-1.59	$6.49B
	Zinc	Zinc waste and scrap	-0.81	1.46	-1.01	$0.56B
Minerals	Ores, slag and ash	Copper ore	-1.96	2.35	-2.39	$50.00B
		Tin ore	-1.84	3.07	-3.63	$0.80B
	Salt, sulphur, lime, cement, etc.	Gypsum	-1.29	1.99	-1.41	$1.20B
		Marble	-1.23	1.65	-1.50	$2.29B
		Salt	-1.56	2.27	-1.26	$3.05B
Textiles	Apparel, knit	Activewear, knit	-1.06	1.68	-1.01	$4.73B
		Sweaters, pullovers, sweatshirts etc., knit	-1.63	2.91	-1.54	$52.57B
	Apparel, not knit	Activewear	-1.47	2.51	-1.39	$12.03B
		Babies' garments	-1.50	2.41	-1.28	$2.60B
		Brassieres	-1.28	2.00	-1.17	$11.80B
		Men's overcoats, not knit	-1.34	2.22	-1.27	$14.37B
		Men's shirts	-1.60	2.74	-1.49	$14.93B
		Men's suits and pants	-1.58	2.73	-1.50	$46.83B
		Other clothing accessories	-0.76	1.56	-0.68	$2.80B
		Women's shirts	-1.33	2.50	-1.38	$14.63B
		Women's suits and pants	-1.49	2.71	-1.35	$60.83B
		Women’s overcoats, not knit	-1.08	1.66	-1.20	$19.10B
	Cotton	Cotton sewing thread	-1.09	1.78	-1.15	$0.17B
		Raw cotton	-1.97	3.47	-2.52	$11.77B
	Footwear	Waterproof footwear	-1.19	1.75	-1.00	$1.48B
	Furniture	Mattresses and bedding	-0.53	1.12	-0.53	$15.33B
	Knitted fabrics	Other knitted fabrics	-0.80	1.25	-0.49	$27.43B
	Man-made staple fibres	Waste of man-made fibers	-0.45	1.22	-0.36	$0.22B
	Other made up textile articles	Bags for packing goods	-2.02	3.59	-1.95	$4.90B
		Other made up articles	-1.20	1.86	-1.18	$13.67B
		Used or new rags textile scraps	-1.09	1.93	-0.92	$0.68B
	Other vegetable textile fibres	Woven fabrics of jute or of other textile bast fibers	-1.51	2.98	-2.18	$0.21B
	Wadding, felt and nonwovens	Twine and ropes of baste fibers	-1.01	1.54	-0.95	$2.49B
	Wool	Wool	-1.59	2.09	-1.96	$3.85B

A3.2. LONG JUMPS

Sector	Product (HS2)	Product (HS92 4-Digit)	Opportunity Gain	Distance	PCI	Global Trade (2015/17 Avg.)
Agriculture	Animal or vegetable fats, oils or waxes	Pig and poultry fat, rendered	1.28	-0.59	0.89	$0.48B
	Paper and paperboard	Cellulose wadding, coated	0.73	0.04	0.42	$15.20B
	Tobacco	Unmanufactured tobacco	-1.89	3.20	-1.84	$12.10B
Chemicals	Albuminoidals; modified starches; glues; enzymes	Glues and adhesives	1.41	-0.59	0.98	$10.77B
	Dyes, paints, inks, etc.	Pigments, nonaqueous	1.18	-0.40	0.66	$2.18B
	Miscellaneous chemical products	Diagnostic or laboratory reagents	1.75	-1.24	1.23	$23.57B
		Pickling preparations for metal surfaces	1.93	-1.26	1.84	$1.53B
		Prepared culture media for micro-organisms	1.88	-0.98	1.44	$1.81B
	Organic chemicals	Aldehydes	1.56	-0.70	0.88	$2.05B
		Amine-function compounds	1.55	-0.97	1.36	$8.85B
		Esters of other inorganic acids of nonmetals	1.91	-1.17	1.79	$1.47B
		Ketones and quinones	1.62	-0.88	1.40	$5.94B
		Phenols, phenol-alcohols	1.79	-0.99	1.67	$5.76B
	Pharmaceutical products	Medicaments, packaged	0.68	0.08	0.51	$337.67B
	Plastics	Acrylic polymers	1.79	-1.13	1.49	$14.20B
		Amino-resins	1.53	-0.77	1.16	$14.80B
		Ion-exchangers based on polymers	1.76	-0.86	1.41	$1.42B
		Other articles of plastic	1.12	-0.39	0.79	$70.43B
		Other plastic plates, sheets etc.	0.61	0.14	0.61	$24.57B
		Polyamides	2.00	-1.07	1.71	$13.30B
		Polymers of vinyl acetate	1.14	-0.38	0.80	$4.46B
	Rubber	Other articles of vulcanized rubber	1.13	-0.36	0.87	$25.40B
		Vulcanized rubber plates	1.51	-0.53	1.03	$3.94B
		Vulcanized rubber tubes	1.18	-0.42	0.76	$9.63B
	Soaps, waxes, and paints	Lubricants	2.11	-1.09	1.54	$8.88B
Electronics	Electrical machinery and equipment	Electric soldering machines	1.94	-1.21	1.50	$11.13B
		Electrical insulators of any material	1.47	-0.64	0.93	$2.36B
		Electrical lighting equipment used for motor vehicles	1.37	-0.70	1.09	$29.60B
		Industrial electric furnaces	2.00	-1.11	1.42	$4.69B
		Parts for electrical apparatus	1.45	-0.59	0.89	$33.33B
		Radar	1.51	-0.74	1.25	$21.43B
Machinery	Apparatuses (optical, medical, etc.)	Instruments for measuring properties of liquids or gases	1.97	-1.39	1.46	$20.87B
		Instruments for physical or chemical analysis	2.05	-1.39	1.74	$39.73B
		Machines for testing the mechanical properties of materials	1.71	-0.99	1.17	$2.33B
		Other parts for machines and appliances	0.93	-0.19	0.84	$2.83B
	Industrial Machinery	Appliances for thermostatically controlled valves	2.05	-0.98	1.50	$83.30B
		Auxiliary machinery for use with knitting and textile machines	1.60	-0.83	1.14	$4.62B
		Ball or roller bearings	1.67	-0.96	1.19	$30.60B
		Centrifuges	1.31	-0.58	0.88	$60.33B
		Compression-ignition internal combustion piston engines	1.97	-1.08	1.56	$45.37B

		Equipment for temperature change of materials	1.63	-0.75	1.18	$38.40B
		Gaskets and similar joints of metal sheeting	1.94	-0.90	1.16	$3.77B
		Industrial furnaces	1.20	-0.41	0.86	$4.77B
		Lathes for removing metal	1.91	-1.21	1.87	$6.85B
		Machinery parts, not containing electrical features, n.e.c.	2.00	-1.06	1.60	$9.94B
		Machines n.e.c.	2.24	-1.36	1.80	$92.40B
		Other machinery for making paper	1.41	-0.87	1.03	$6.25B
		Parts and accessories for metal working machines	1.96	-1.02	1.41	$17.77B
		Parts suitable for use with spark-ignition engines	1.38	-0.57	1.08	$62.47B
		Pumps for liquids	1.87	-1.01	1.21	$60.40B
		Pumps, compressors, fans, etc.	1.88	-1.01	1.30	$68.77B
		Sprays and powder dispersers	1.74	-0.98	1.11	$18.27B
		Steam turbines	1.50	-0.80	1.08	$5.74B
		Tools for hand working, pneumatic, hydraulic motors	1.81	-1.14	1.37	$8.54B
		Transmission shafts	2.08	-1.14	1.32	$52.40B
Metals	Aluminum	Other articles of aluminum	0.80	-0.01	0.63	$15.83B
	Articles of iron or steel	Other articles of iron or steel	0.98	-0.06	0.74	$44.30B
		Screws and similar articles of iron or steel	2.07	-1.03	1.52	$36.27B
		Springs of iron or steel	1.55	-0.57	1.19	$6.48B
		Tube or pipe fittings of iron or steel	1.72	-0.69	1.02	$16.60B
	Copper	Screws and similar articles of copper	1.60	-0.78	0.90	$1.02B
	Iron and steel	Bars of stainless steel, hot-rolled	1.51	-1.08	1.91	$1.77B
		Flat-rolled iron, width < 600mm, clad	1.10	-0.35	0.49	$3.86B
		Flat-rolled products of stainless steel of a width < 600 mm	1.75	-1.01	1.57	$4.38B
		Other bars and rods of stainless steel	1.66	-0.77	1.18	$5.13B
	Metal tools and tableware	Hand tools n.e.c.	1.73	-1.02	0.83	$6.92B
		Interchangeable tools for hand tools	1.85	-0.86	1.32	$21.23B
		Knives and blades for machines	1.75	-0.99	1.17	$2.82B
	Other base metals	Tungsten (wolfram)	1.95	-0.95	1.08	$0.94B
Stone	Articles of stone, plaster, cement, etc.	Natural or artificial abrasive powder	1.70	-0.92	1.29	$4.24B
	Glass and glassware	Laboratory, hygienic or pharmaceutical glassware	1.69	-1.04	1.48	$0.98B
Textiles	Impregnated, coated or laminated textile fabrics	Textile articles for technical use	1.45	-0.74	1.19	$4.87B
	Other vegetable textile fibres	Woven fabrics of jute or of other textile bast fibers	-1.51	2.98	-2.18	$0.21B
	Wadding, felt and nonwovens	Nonwoven textiles	1.31	-0.58	1.01	$14.00B
Vehicles	Vehicles	Parts of motor vehicles	1.46	-0.52	1.11	$364.00B

A3.3. BALANCED PORTFOLIO

Sector	Product (HS2)	Product (HS92 4-Digit)	Opportunity Gain	Distance	PCI	Global Trade (2015/17 Avg.)
Agriculture	Cereals	Rice	-1.75	2.77	-1.92	$21.93B
	Fish	Crustaceans	-2.08	3.28	-2.08	$25.03B
		Frozen fish, excluding fillets	-1.80	2.70	-1.68	$22.87B
		Molluscs	-1.79	2.60	-1.90	$11.90B
	Fruits and nuts	Avocados, pineapples, mangos, etc.	-1.94	2.95	-2.10	$12.03B
		Cashew nuts & coconuts	-2.08	2.99	-2.63	$8.62B
		Citrus fruit	-1.60	2.29	-1.65	$13.67B
		Fruits, dried	-0.85	1.48	-1.00	$2.38B
		Melons and papayas	-1.75	2.53	-1.57	$3.69B
		Other nuts	-1.81	2.76	-1.83	$17.70B
	Other vegetable materials	Vegetable products n.e.c.	-1.91	2.95	-2.11	$0.78B
	Paper and paperboard	Cellulose wadding, coated	0.73	0.04	0.42	$15.20B
		Paper labels	-0.29	0.96	-0.12	$4.69B
	Preparations of vegetables, fruit, or nuts	Fruit juices	-1.37	1.93	-1.09	$15.23B
	Products of the printing industry	Other printed matter	0.62	0.01	0.52	$10.87B
	Sugar and candy	Sugarcane & sucrose	-1.87	3.08	-1.82	$27.70B
	Tobacco	Unmanufactured tobacco	-1.89	3.20	-1.84	$12.10B
	Vegetables	Tubers	-1.97	3.20	-2.42	$2.95B
Chemicals	Dyes, paints, inks, etc.	Paints and varnishes, nonaqueous	0.55	0.18	0.28	$12.90B
	Essential oils	Essential oils	-1.50	2.35	-1.50	$5.08B
	Miscellaneous chemical products	Prepared culture media for micro-organisms	1.88	-0.98	1.44	$1.81B
	Organic chemicals	Ketones and quinones	1.62	-0.88	1.40	$5.94B
	Pharmaceutical products	Medicaments, packaged	0.68	0.08	0.51	$337.67B
	Plastics	Amino-resins	1.53	-0.77	1.16	$14.80B
		Ion-exchangers based on polymers	1.76	-0.86	1.41	$1.42B
		Other plastic plates, sheets etc.	0.61	0.14	0.61	$24.57B
		Polyamides	2.00	-1.07	1.71	$13.30B
		Polymers of vinyl acetate	1.14	-0.38	0.80	$4.46B
	Rubber	Other articles of vulcanized rubber	1.13	-0.36	0.87	$25.40B
		Vulcanized rubber plates	1.51	-0.53	1.03	$3.94B
	Soaps, waxes, and paints	Lubricants	2.11	-1.09	1.54	$8.88B
		Soap	-1.30	1.93	-1.13	$6.48B
Electronics	Electrical machinery and equipment	Electrical lighting equipment used for motor vehicles	1.37	-0.7	1.09	$29.60B
		Industrial electric furnaces	2.00	-1.11	1.42	$4.69B
		Parts for electrical apparatus	1.45	-0.59	0.89	$33.33B
		Radar	1.51	-0.74	1.25	$21.43B
Machinery	Apparatuses (optical, medical, etc.)	Other parts for machines and appliances	0.93	-0.19	0.84	$2.83B
	Industrial Machinery	Appliances for thermostatically controlled valves	2.05	-0.98	1.50	$83.30B
		Compression-ignition internal combustion piston engines	1.97	-1.08	1.56	$45.37B
		Equipment for temperature change of materials	1.63	-0.75	1.18	$38.40B
		Gaskets and similar joints of metal sheeting	1.94	-0.90	1.16	$3.77B
		Industrial furnaces	1.20	-0.41	0.86	$4.77B