KIEL WORKING PAPER

Assessing Asia – Sub-Saharan Africa Global Value Chain Linkages

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Leibniz Association

ABSTRACT

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This paper studies the relationship between Asia's economic engagements in Africa and individual African nations' participation in global value chains (GVC) over the past two decades. We find that while overall exports from Africa to Asia are still highly concentrated in resource-intensive sectors, a few African countries have exploited the emerging opportunities to diversify export portfolios through exporting to Asia. Each African nation has a distinct main trade partner in Asia, in contrast to the common view that China has become the dominant trade partner of most African nations. Using a panel data set for 46 African countries over 16 years from 2000 and 2015, we find that exports to Asia are positively correlated with exports to the rest of the world, suggesting that in contrast to trade diversion, trade with Asia complements exports to other countries. Asian economic engagement in the continent is associated with countries' exports "moving up the value chain", as measured by the upstreamness index proposed by Antras et al. (2012). However, such process was accompanied by a reduction in the length of their production chains, implying that fewer stages and countries are now involved in the production of exported goods.

Keywords: Global Value Chains; Trade; Industrialization; Asia; Africa; Economic Development

JEL classification: F1, L6, O1

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1   Introduction

Since 2000, China and other Asian countries, such as Bangladesh, Cambodia, India, and Vietnam, have become important trade and investment partners with Sub-Saharan African countries. Some of those Asian trading partners have lost their own growth momentum. There have also been concerns that Asian countries' economic engagement may have reduced Sub-Saharan African nations' local industrial capability, causing them to be more dependent on Asian economies. For Sub-Saharan Africa to tap into the trade-and-growth spiral, it needs to diversify—away from some of the traditional advanced economy trading partners, whose growth is slowing, and away from commodity exports, which often exhibit high price volatility. The growing middle class in and increasing demand from Asia along with the shifting structure of global value chains (GVCs) may offer new economic opportunities for Sub-Saharan Africa.

The objective of this paper is to offer an assessment of the value chain linkages between Sub-Saharan Africa and Asia, summarizing the current status and future potential of Sub-Saharan African products in emerging Asia. The paper offers insights on how Sub-Saharan African economies can expand their market potential and advance their industrialization and economic diversification agendas.

A lesson that is drawn from the detailed sector-level analysis on Sub-Saharan African countries' exports to Asia is that each nation in the continent has its own experience of trading with Asia, in terms of structural change, diversification dynamics, and specialization patterns. Although exports from Sub-Saharan Africa to Asia remain highly concentrated in resource-intensive products, such as petroleum, minerals, metals, and primary goods, there are a few exceptions. For instance, Ethiopia and Tanzania have done relatively well in diversifying their export portfolios during the boom of exports to Asia. Nigeria, by contrast, has been highly specialized in natural resources, in particular petroleum and crude oil, before and after the export boom to Asia.

We find that each country has a distinct key trading partner in Asia. In contrast to the prevailing view, we find that China is not always the dominant trading partner for individual African nations, despite its status as the leading trading partner of the entire African continent. For instance, India is emerging as an increasingly important trading partner of Sub-Saharan Africa. Since 2005, India has become the largest export destination in Asia for Nigeria, Tanzania, and Ghana. Pakistan has been the top destination for Kenya's exports.

After documenting some stylized facts, we examine the determinants of successful participation in GVCs and inclusive growth. First, we examine how the sharply increasing engagement of Asian economies in Sub-Saharan Africa has changed the pattern of the region's exports, in the composition of destination countries (for example, between advanced and developing countries), factor intensity (for example,

capital, skill, and raw material intensity), and various value chain measures (for example, length of production, upstreamness, and domestic value added). We show that exports to Asia are positively correlated with exports to the rest of the world, using a panel data set of trade and foreign direct investment for 46 countries in Sub-Saharan Africa from 2000 to 2015. The findings show that increased exports from a Sub-Saharan African country to Asia, proportionally or in absolute value, do not appear to divert exports away from other destination countries. On the contrary, increased exports to Asia tend to raise exports to the rest of the world as well as to other African countries. We discuss reasons why increased exports to a country (or region) would raise exports to other countries. More exports to a country usually come with more imports from the same country or other countries. It has been shown in the literature that imports of foreign intermediate inputs can increase a firm's productivity, which in turn raises its sales and profits. So, the idea of trade diversion based on a zero-sum concept is an exceptional situation. There are many reasons why a country's participation in a GVC with a region that is growing fast can serve as an engine of growth.

In the second part of the paper, we conduct an assessment of how Asian economic engagement changes Sub-Saharan Africa's trade patterns. First, we examine the effects of participating in Asian value chains on the factor content of exports. Using a panel data set of trade for 46 Sub-Saharan African countries over 16 years, from 2000 and 2015, we show that economic engagement with Asian GVCs raised the capital intensity but had no effect on the skill content of Sub-Saharan African exports. Such increase in the capital content, or the so-called capital deepening, of exports was mostly driven by increased exports of capital-intensive goods to Asia, rather than to the rest of the world. By contrast, imports from Asia as a whole do not seem to have played a significant role in changing the factor intensity of exports, although imports from Bangladesh, Cambodia, China, India, and Vietnam (Asia5 hereafter) have done so. There is no evidence that increased exports to Asia led to more specialization in the resource-intensity of exports, debunking the claim that Asian economic engagement in the continent is mainly resource-seeking and can potentially lead to deindustrialization.

We also examine the determinants of the relative successes of some nations in Sub-Saharan Africa in terms of participation in GVCs, through Asia's economic engagement. Using panel data on trade at the country-industry level, we find that Asian economic engagement in the continent is associated with an increase in upstreamness, a measure proposed by Antras et al. (2012) to capture the shares of exports coming from more upstream instead of downstream industries. Such a process was accompanied by a reduction in the length of the production chains, implying that fewer stages and countries are now involved in the production of exported goods from Sub-Saharan Africa. There is no evidence that trade with Asia affects Sub-Saharan African nations' domestic content in exports. The study also sheds light on the policy implications for Sub-Saharan African nations to move up the value chain by participating in Asian GVCs. The results show that proportionally more exports to but not imports from Asia can help Sub-Saharan African nations move up the value chains. The effects are particularly strong among Sub-Saharan African countries that have access to the sea but are relatively poorer than their land-locked peers in the region. Corruption appears to impede not only trade, but also the benefits from GVC participation. These results suggest that export orientation toward Asia as a policy helps reduce poverty, and anti-corruption policies can help enhance economic efficiency. Surprisingly, the general measure of a country's rule of law does not affect the relation between countries' trade with Asia and their GVC outcomes.

2   Literature Review

The implications of this paper are far-reaching and contribute to four different broad strands of literature, especially the studies on global value chain studies and trade between Africa and Asia.

First, it contributes to the literature on the measurement of GVC and global production fragmentation using IO tables. This literature begins with Hummels, Ishii and Yi (2001), who use industry input-output (IO) tables to calculate the domestic content in gross exports across countries. Recent work includes Antràs, Chor, Fally, and Hillberry (2012), who provide a methodology to measure the position of an industry and thus a country in the GVC. Johnson and Noguera (2012 and 2014) systematically document countries' value added in exports across broad industries but many countries since 1970s. Koopman, Wang and Wei (2012, 2014), De la Cruz, Koopman, Wang and Wei (2013) use IO tables and highlight the importance of taking into account heterogeneity across industries in firms in computing the domestic content in aggregate and sectoral exports.

Second, this paper also contributes to the body of literature on the effects of liberalization of trade and foreign direct investment on innovation and productivity. Goldberg et al. (2008) studies the impact of trade liberalization of India on its export variety. Rodriguez-Clare (1996) and Kee (2015) show that more FDI in an industry will increase the demand for domestic materials, raising their quality and thus productivity of firms in the upstream sectors. Our results confirm existing findings that the reduction in input tariffs and increased presence of FDI in downstream sectors could lead to an expansion of domestic product variety. Using data on products' exports to the US, Amiti and Khandelwal (2013) offer evidence that countries' import tariff liberalization is positively related to the extent of countries' product quality upgrading, especially for products that are closer to the world frontier of quality.

Third, the paper contributes to the literature on international production sharing and global value chains, See Feenstra (1998) for a review of the early literature on foreign outsourcing. More recent work includes, among others, Baldwin (2012) which postulates how participating in a global supply chain should be viewed as a new strategy of industrialization; and Timmer et al. (2014) which summarizes the main findings in the literature on global value chains.

Fourth, recent literature has shown that China's domestic content in exports is increasing (Koopman, Wang, Wei, 2012 and Kee and Tang, 2016). One of the reasons is due to firms' substitution of domestic for imported materials, triggered by country's trade and FDI liberalization. This suggests that China has been moving up the value chains, and thus may have significant implications for world trade and the global economy. It would be important to verify whether China's moved up the value chains at the cost of other countries, in particular those on which it has relied heavily for raw materials.

Finally, the study contributes to a small but growing literature on the economic effects of Asian countries' and in particular Chinese economic engagements in Africa (Brautigam, 2003; Lederman, Mengistae and Xu, 2003; Morris and Einhorn, 2008; Rui, 2010; Rotunno, Vezina, and Wang, 2012; Shen, 2013; Harrison, Lin and Zhu, 2014). A recent paper by Chen, Dollar, and Tang (2016) shows that China's

overall ODI is uncorrelated with rule of law, whereas Western investment favors countries with better governance environments. Thus, Chinese investment in strong and weak governance environments is about the same, but its share of foreign investment is higher in the weak governance states. Their paper complements this literature by showing that China's and possibly other countries' investments in African nations are a function of host countries' factor endowment, institutions, and political stability. Thus, the effects of FDI will naturally vary across countries.

3   Methodology and Data Sources

3.1   Trade Data

We will use product-level trade data and several GVC indices developed by existing researchers to assess the overall GVC trends between Asia and Africa in recent years (up to 10-15 years) and identify the most potential (including the latent) value chain linkages between Asia and Africa. Specifically, we will examine which sectors and countries are the main drivers of Africa's participation in GVC, in terms of exports and imports. Identifying such sectors and countries can potentially help us target policy support.

We use several data sources to construct the variables of interest for our analysis. The bilateral trade flow data between any country pair are obtained from the CEPII's BACI World Trade database. The original data are available at the product level (HS 6). The dataset provides information about the value and quantity (in tons) of trade (in thousands of US dollars). Individual trade flows are identified by the exporting country, importing country, product category at Harmonized System 6-digit (HS6) level every year. When we study the factor intensity and other characteristics of trade patterns at the sector level, we will aggregate the value of trade flows from the HS6 to the HS2 level to match to be consistent with the level of aggregation at which we can construct measures of most sectoral characteristics. Our trade data sample covers 46 African exporting (or importing) countries to (and from) the rest of the world.

3.2   Sector Characteristics

A sector's factor (capital, skilled, and material) intensity measures are constructed based on the NBER-CES Manufacturing Industry Database for the US firms. 94 HS2 sectors (out of 96 possible) have the sector factor intensity measures. Several GVC measures are constructed at the country-sector level as dependent variables. The recent literature in the GVC literature (e.g., Koopman, Wang, and Wei, 2014; Timmer et al., 2014) has proposed various indices to gauge the participation in and characteristics of GVC by different countries and sectors, which include:
   a. Upstreamness: how far a sector is away from final-good consumers;
   b. Domestic value added to gross exports ratio: How much of a country's GDP is generated by the domestic content;
   c. Production length of exports: How many sector-country pairs are involved in the production of exports from a sector.

An industry's (HS2) upstreamness (measure (a)) is constructed using the publicly available data from Antras et al. (2012).[1] The original data are constructed at the US IO level. We first use concordance from the US Bureau of Economic Statistics to match multiple US IO categories to multiple HS2 categories. We then compute the weighted average of upstreamness at the HS2 level, with weights constructed based on the number of underlying HS6 product categories shared between a pair of US IO code and HS2 category. Other weighted averages used in the rest of the paper are constructed in a similar fashion.

The measures for (b) to (c) of a sector are constructed using data from the University of International Business and Economics (UIBE) GVC index system. Out of the many indices constructed with different types of global input-output tables (e.g., World Input-output Tables), to maximize the coverage of the number of African countries, we use the indices for production length and domestic value added (DVA) of exports constructed with data from GTAP IO tables. The drawback is that the constructed variables are only available for three years -- 2004, 2007 and 2011. We will therefore run regressions using long-differenced variables (i.e., the change in the variable of interest between 2004 and 2011), instead of at the annual frequency as we do for other variables of interest.

In terms of the independent variables of interest, the authors obtain the foreign direct investment (FDI) data from the FDI Statistics posted online by the United Nations Conference on Trade and Development (UNCTAD).[2] In line with the Balance of Payments Manual – Fifth Edition (International Monetary Fund, 1993), FDI is defined as "investment made to acquire lasting interest in enterprises operating outside of the economy of the investor". We obtain the Chinese Overseas Direct Investment data from the China Statistical Yearbook and the Statistical Bulletin of China's Outward Foreign Direct Investment.

3.3   Country Characteristics

In the regression analysis, several institutional measures of countries are used. Government institutions are defined in line with Douglass North's seminal article: "Institutions are the humanly devised constraints that structure political, economic, and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights)" (1991, p. 97). However, due to the difficulties inherent to measuring humanly devised constraints, institutions are operationalized through four sets of variables: rule of law and corruption controls, political stability and absence of violence, democratic development, and respect of human rights. In order to facilitate the interpretation of the results, each of the variables outlined below is standardized, as (Institutional Score$_{it}$ – Institutional Score$_\mu$)/ Institutional Score$_\sigma$.

Finally, an aggregate institutional indicator is generated using a principal components analysis of these same three institutional indicators constructed by the World Bank Worldwide Governance project:
- Corruption Controls and Rule of Law indices: two distinct indicators that reflect (1) "perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as

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[1] https://scholar.harvard.edu/antras/publications

[2] http://unctad.org/en/Pages/DIAE/FDI%20Statistics/FDI-Statistics.aspx

well as the likelihood of crime and violence" and (2) "perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests" (World Bank, 2016). The resulting variable is converted to a value between 0 and 5, as follows: [(Rule of Law + Control of Corruption)/2] + 2.5;

Political Stability and Absence of Violence index: an indicator that captures the "perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism" (World Bank, 2016) It is then indexed and converted to a scale of 0 to 5, as follows by adding 2.5 to the index.

4   Key Trade Patterns and GVC Linkages between Sub-Saharan Africa and Asia

This section examines the patterns of exports for Sub-Saharan Africa as well as five selected countries in the region (Africa5 for short, namely, Ethiopia, Kenya, Ghana, Nigeria, and Tanzania), for which we have survey data that allow for granular GVC analyses. To this end, we aggregate the BACI trade data from the Harmonized System (HS) 6-digit level to the HS 2-digit level (96 categories), to analyze the top sectors in Sub-Saharan Africa and the Africa5 nations that sell to Asia for 2005 and 2015.

### *Top Products Exported from Sub-Saharan Africa to Asia*

Focusing on the top 10 export sectors to Asia from Sub-Saharan Africa and each of the Africa5 countries, it appears that for 2005 and 2015, the top sector in the value of exports was minerals, fuels, and mining. The entire continent exported about US$16.1 billion worth of goods from that sector to Asia in 2005, which increased to US$54.5 billion in 2015. The next sectors are natural or cultured pearls (valued at US$4.1 billion and US$16.3 billion in 2005 and 2015, respectively) and ores, slag, and ash (valued at US$2.7 billion and US$9 billion in 2005 and 2015, respectively). All the top-10 Sub-Saharan African export sectors to Asia for both years exhibit a clear pattern: exports from Sub-Saharan Africa to Asia were still heavily concentrated in raw materials and primary goods, with mining and fuels always standing at the top.

Figure 4.1 shows the shares of exports from Sub-Saharan Africa to Asia by HS 2-digit sector, for 2005 and 2015. For clarity, only sectors that contributed at least 1 percent of total Sub-Saharan African exports to Asia in each respective year (or either year) are shown. Sixteen sectors (of 96) satisfied this 1 percent rule, that is, each of the 16 sectors accounted for over 1 percent of Sub-Saharan Africa's exports to Asia in either year. The minerals, fuel, and mining sector (HS 27) stands out. It accounted for 41 percent of Sub-Saharan Africa's total exports to Asia in 2005 and increased to 48 percent in 2015. The second most prominent export sector in both years is natural or cultured pearls (HS 71), which also rose in prominence in Sub-Saharan Africa's exports to Asia between 2005 and 2015. In 2005, it accounted for 11 percent, and it increased to 14 percent by 2015. Among the 16 sectors shown, six increased in shares of Sub-Saharan Africa-to-Asia exports. In addition to the top two sectors mentioned, the others include copper and copper articles (HS 74); edible fruits (HS 8); and ore, slag, and ash (HS 26). The other 10 sectors declined in their shares in Sub-Saharan Africa-to-Asia exports. The sector that experienced the largest drop in export share between 2005 and 2015 in percentage terms is iron and steel (HS 72),

which dropped from 7 to 2 percent. Other sectors that experienced a significant drop in export shares include aluminum and articles, electrical machinery, and fish and crustaceans.

Figure 4.1: Sectoral Composition of Sub-Saharan Africa's Exports to Asia, 2005 and 2015 (share)
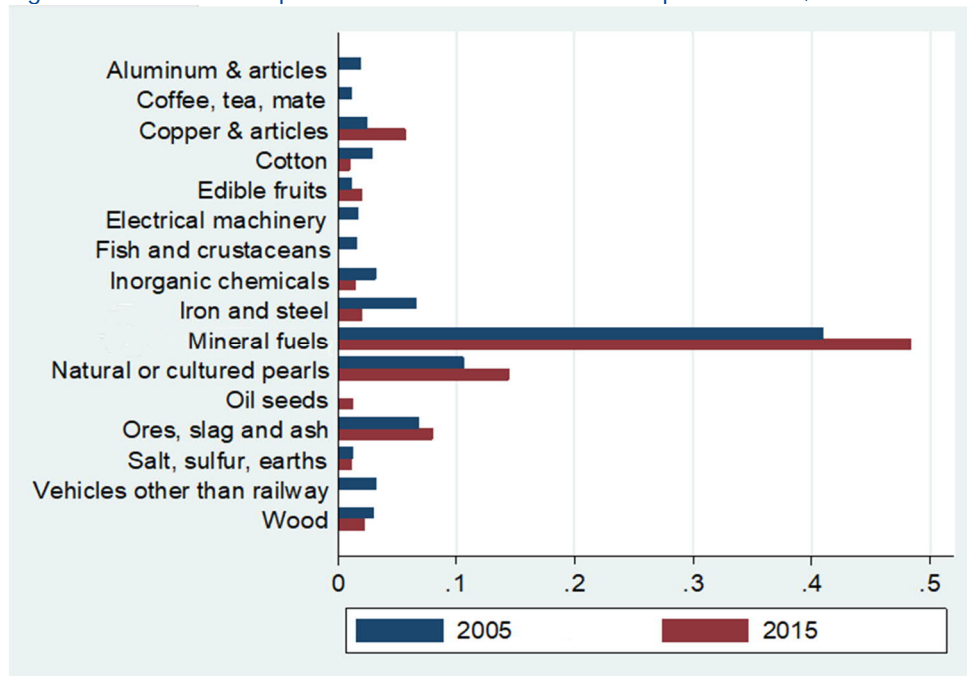
Source: Staff calculations using data from CEPII's BACI World Trade database.

Figure 4.2 shows the shares of exports from Ethiopia to Asia by HS 2-digit sector. Similar to figure 4.1, only sectors that had at least 1 percent of Ethiopia's aggregate exports to Asia in each respective year (or either year) are shown. Ten sectors (of 96) satisfy this 1 percent rule in either year. As is clearly shown, two sectors stand out from the rest: coffee, tea, and mate (HS 9) and oil seeds (HS 12). The coffee sector accounted for 47 percent of Ethiopia's total exports to Asia in 2005, but it decreased to only 18 percent in 2015. The oil seed sector instead increased its share in Ethiopia's exports to Asia, from 28 to 48 percent. Three sectors, namely, footwear and gaiters; natural or cultured pearls; and railway/tramway locomotives contributed less than 1 percent to Ethiopia's exports to Asia in 2005, but by 2015 they had become some of the prominent sectors in the country's exports to Asia. By contrast, three sectors, namely, cotton; ore, slag, and ash; and iron and steel contributed more than 1 percent to Ethiopia exports to Asia in 2005 but declined to less than 1 percent by 2015. Overall, from the export volumes described in figure 4.2, the changes in export patterns for Ethiopia are encouraging news. Ethiopia seems to be one of the few countries in Sub-Saharan Africa that have shown significant improvement in industrialization, at least as revealed in its movement along the GVCs with Asia.

Figure 4.2: Sectoral Composition of Ethiopia's Exports to Asia, 2005 and 2015 (share)
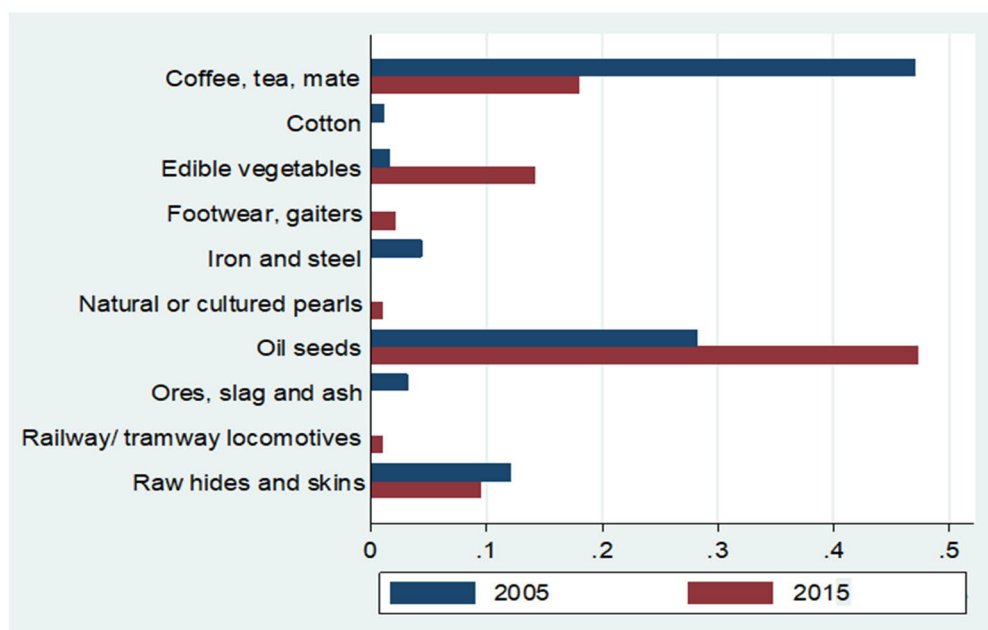
Source: Staff calculations using data from CEPII's BACI World Trade database.

To analyze Ghana's specialization pattern, figure 4.3 shows the shares of exports from Ghana to Asia by HS 2-digit sector. Again, only sectors that contributed at least 1 percent to Ghana's total exports to Asia in each respective year (or either year) are shown. Ten sectors (of 96) satisfied this 1 percent rule in either year. Two sectors that clearly stand out are cocoa and cocoa prep (HS 18), for 2005, and natural or cultured pearls (HS 71), for 2015. In 2005, exports from the cocoa sector accounted for over half of Ghana's exports to Asia; the share declined to only 12 percent by 2015. By contrast, the natural pearls sector has emerged rapidly. In 2005, it accounted for only a mere 3 percent of Ghana's exports to Asia, but it increased tremendously to 60 percent in 2015. The growth of the natural pearl sector was so substantial that it crowded out essentially all other sectors, causing each of them to decline in their share of Ghana's exports to Asia. Although the dominance of a single sector in a country's export basket appears to be quite common across Sub-Saharan African nations, the substantial switching of the top sector in a matter of 10 years is unique to Ghana.
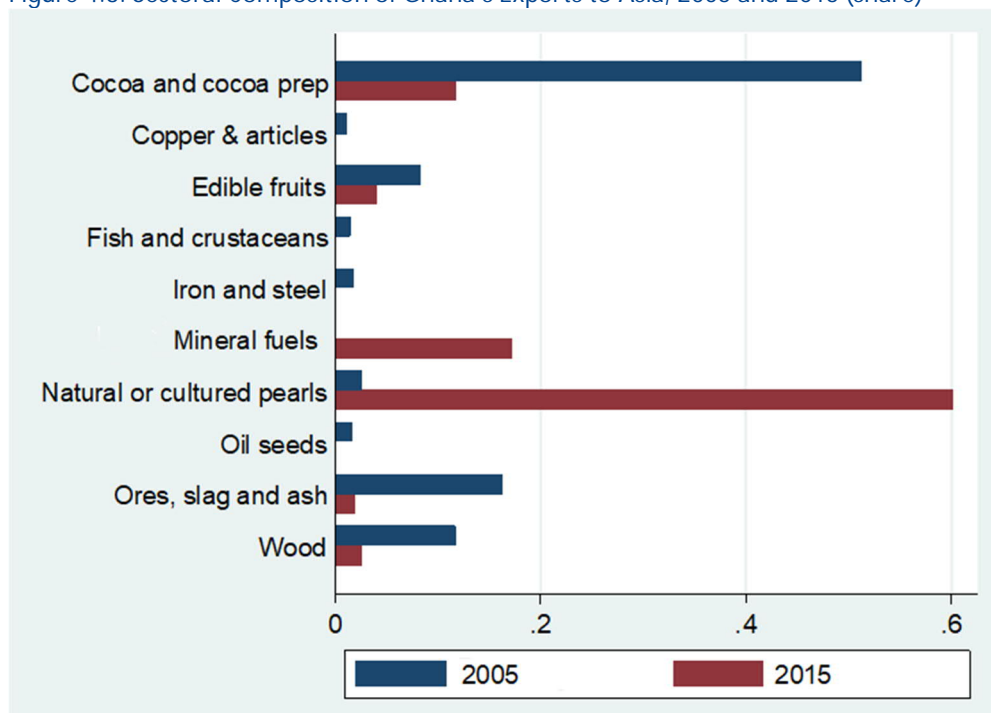
Figure 4.3: Sectoral Composition of Ghana's Exports to Asia, 2005 and 2015 (share)

Source: Staff calculations using data from CEPII's BACI World Trade database.

To describe Kenya's changing specialization pattern more systemically, figure 4.4 shows the shares of exports from Kenya to Asia by HS 2-digit sector. Again, only sectors that contributed at least 1 percent of Kenya's total exports to Asia in 2005 or 2015 are shown. Fifteen sectors (of 96) satisfied this 1 percent rule in either year, suggesting that Kenya's exports (to Asia) have been more diversified than those of Ghana and Ethiopia. Despite the country's more diversified export basket, the top sector—coffee, tea, and mate (HS 9), which already accounted for over half of Kenya's exports to Asia in 2005—continued to grow in absolute value and in share, contributing about 61 percent of the country's exports. All the other sectors appear to be much less important than the coffee, tea, and mate sector in Kenya's exports. Inorganic chemicals (HS 28), which used to be the second largest export sector to Asia from Kenya, declined from 19 to 8 percent in 10 years. The dominance of a single sector in a country's export basket, which is a common feature in many Sub-Saharan African nations' exports, is particularly strong for Kenya.

Figure 4.4: Sectoral Composition of Kenya's Exports to Asia, 2005 and 2015 (share)
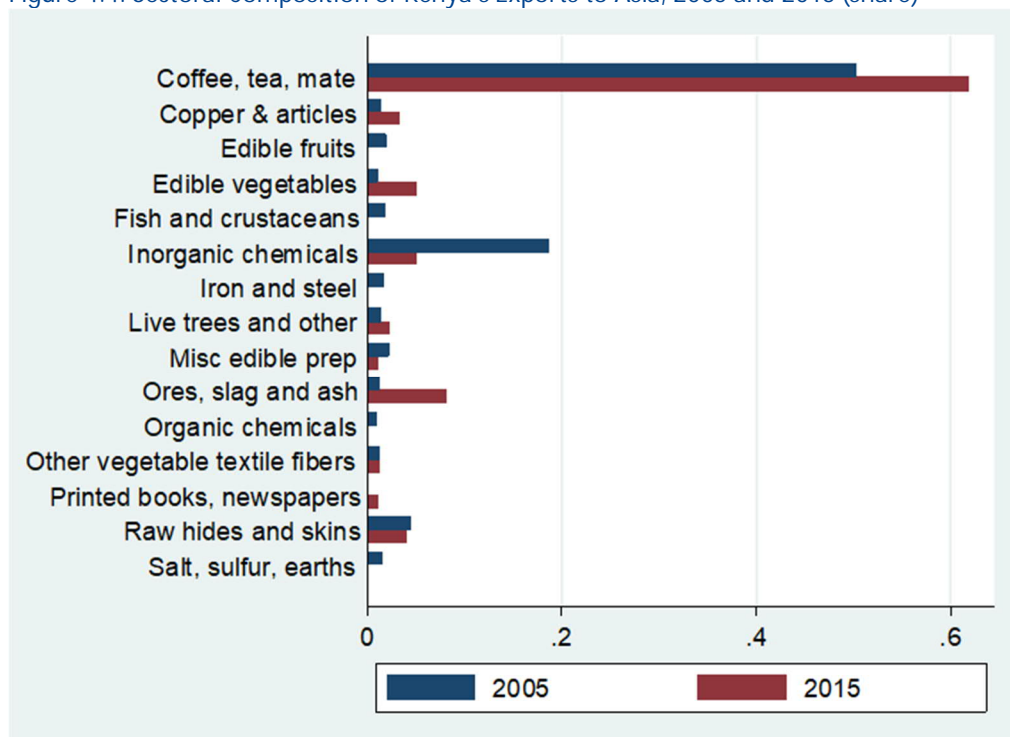
Source: Staff calculations using data from CEPII's BACI World Trade database.

Figure 4.5 shows the shares of exports from Nigeria to Asia by HS 2-digit sector. Only sectors that contributed at least 1 percent to Nigeria's total exports to Asia in 2005 or 2015 are shown. Only six sectors (of 96) satisfied this 1 percent rule in either year, suggesting that Nigeria's exports (to Asia) were a lot more concentrated in a few sectors compared with those of the four other Africa5 countries. The top sector, minerals, fuel, and mining (HS 27), accounted for over 90 percent of Nigeria's exports to Asia in 2005. All the other sectors appear to be much less important for Nigeria's exports, by definition. The hyper-specialization of Nigeria's exports in petroleum and oil must be related to its rich endowment of oil. In 2015, only three sectors in Nigeria accounted for more than 1 percent of the country's exports to Asia. Aside from petroleum, they were edible fruits and wood. The cotton; oil seeds; and ores, slag, and ash sectors dropped off the list, as they fell below the 1 percent cutoff.

Figure 4.5: Sectoral Composition of Nigeria's Exports to Asia, 2005 and 2015 (share)
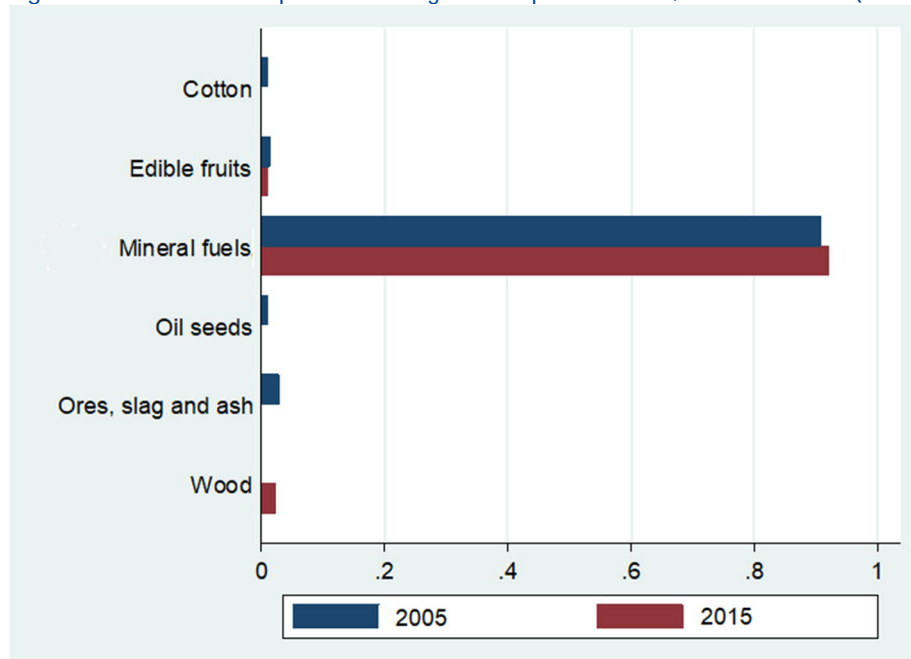
Source: Staff calculations using data from CEPII's BACI World Trade database.

To illustrate more systemically Tanzania's changing specialization pattern, figure 4.6 shows the shares of exports from Tanzania to Asia by HS 2-digit sector. Again, only sectors that contributed at least 1 percent to Tanzania's total exports to Asia in 2005 or 2015 are shown. Fourteen sectors (of 96) satisfied this 1 percent rule in either year, suggesting that Tanzania's exports (to Asia) have been more diversified than Nigeria's and comparable to those of Ghana and Ethiopia. The more diversified export basket is illustrated not only by the number of "above 1 percent" sectors, but also by the more even distribution of export values across sectors. The top export sector in 2005—ores, slag, and ash (HS 26)—accounted for 35 percent of Tanzania's exports to Asia in 2005, but the top sector in 2015—natural or cultured pearls—only contributed about 17 percent to the country's exports to Asia. There has been quite an active process of dynamic reallocation of resources between sectors, contributing to the diversification of Tanzania's export portfolio between 2005 and 2015. The shares of the raw material sectors, such as ores, slag, and ash, declined substantially, while some light manufacturing, such as edible fruits, edible vegetables, and tobacco, became more prevalent sectors in Tanzania's exports to Asia.
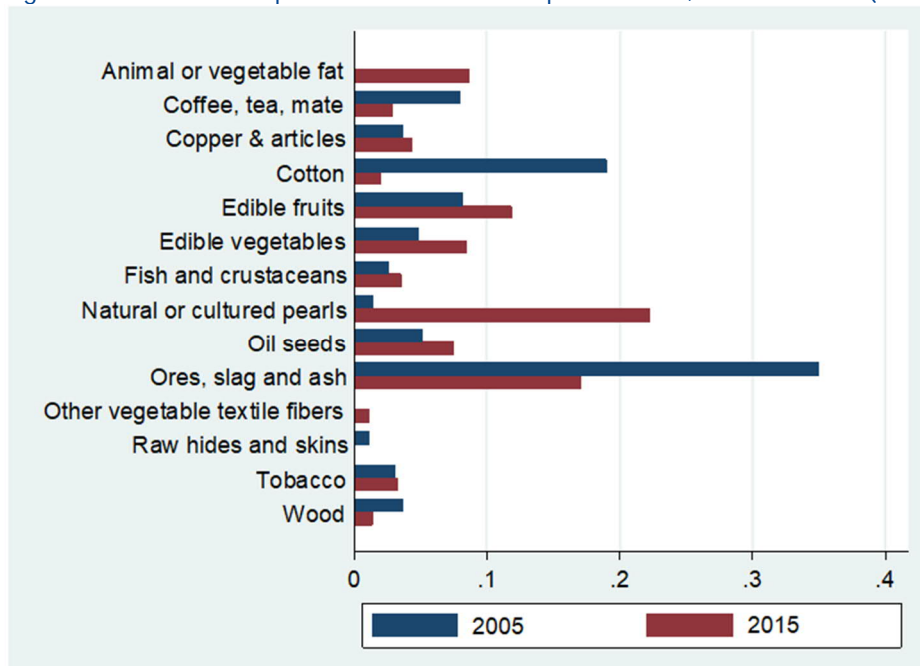
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Figure 4.6: Sectoral Composition of Tanzania's Exports to Asia, 2005 and 2015 (share)

Source: Staff calculations using data from CEPII's BACI World Trade database.

In sum, the experience of exporting to Asia appeared be to quite heterogeneous for the Africa5 countries. Although overall Sub-Saharan Africa's exports to Asia have been concentrated in resource-intensive sectors, there were a few exceptions in the continent. Ethiopia and Tanzania seemed to do relatively better in diversifying their export portfolios during the export boom (to Asia). Nigeria seemed to remain very specialized in natural resource exports, in particular petroleum and crude oil. In the econometric assessment section, we conduct regression analyses to identify the relevant policies or economic fundamentals that contributed to the encouraging experiences.

Primary versus Non-Primary Exports from Africa5 to Asia

This subsection briefly summarizes the discussion on the sectoral patterns of Sub-Saharan African exports to Asia, by analyzing the exports of primary (extractive) and non-primary (non-extractive) exports to Asia from the entire Sub-Saharan African continent as well as the individual Africa5 nations. We classify sectors as primary versus non-primary based on the classification by the United Nations Broad Economic Categories fifth revision.

As table 4.1 shows, the aggregate value of the region's primary exports to Asia was US$22 billion in 2005, accounting for 56 percent of Sub-Saharan African exports to Asia that year. The share was larger than that of primary exports from Sub-Saharan Africa to non-Asian countries, which was 52 percent. Ten years later, in 2015, the share of primary exports from Sub-Saharan Africa to Asia remained around 55 percent, but the value tripled, to US$63 billion. Among the region's exports to non-Asian countries, primary goods only accounted for 35 percent in 2015, a substantially smaller share than that to Asian destinations.

Table 4.1, panel B, shows the same set of statistics for Ethiopia's exports to Asian and non-Asian countries. The share of primary exports in the country's total exports to Asia is significantly smaller than the continent's average. The share of primary exports from Ethiopia to Asia was only 16 percent in 2005, amounting to US$44.9 million worth of goods. The share declined to 5 percent in 2015. In Ethiopia's

exports to non-Asian countries, the share of primary goods in total exports is also much smaller compared with the share of other Sub-Saharan African nations. The share of primary exports from Ethiopia to the rest of the world was only 15 percent in 2005, and it dropped to a mere 2 percent in 2015. In sum, Ethiopia has not been a resource-dependent exporter.

Table 4.1, panel C, reports the same set of statistics for Ghana's exports to Asian and non-Asian countries. The share of primary exports in its total exports to Asia is comparable to the continent's average. The share of primary exports from Ghana to Asia was only 32 percent in 2005, amounting to US$113 million worth of goods. The share declined to 23 percent in 2015. In Ghana's exports to non-Asian countries, the share of primary goods in total exports was much smaller than those for exports to Asia and the counterparts in other Sub-Saharan African nations. The share of primary exports from Ghana to the rest of the world was only 8 percent in 2005; it increased to 23 percent in 2015. In sum, Ghana's pattern of trade in extractive industries is very different from that of Ethiopia. Although Ghana's share of primary exports to Asian markets was larger in 2005, it has since declined. On the contrary, the share of extractive sectors was small for exports to the rest of the world in 2005, but it has since increased substantially. In general, compared with Ethiopia, Ghana was much more dependent on primary exports.

Table 4.1: Primary versus Non-Primary Exports from Africa, Ethiopia, and Ghana to Asian and Non-Asian Destinations

	2005		2015	
	Exp Value (US$, millions)	Exp Share	Exp Value (US$, millions)	Exp Share
A. Africa				
Primary Exports to Asia	22,100.00	0.56	62,600.00	0.55
Non-primary Exports to Asia	17,100.00	0.44	50,200.00	0.45
Primary Exports to Non-Asia	139,000.00	0.52	105,000.00	0.35
Non-primary Exports to Non-Asia	128,000.00	0.48	193,000.00	0.65
B. Ethiopia				
Primary Exports to Asia	44.87	0.16	36.04	0.05
Non-primary Exports to Asia	227.44	0.84	689.02	0.95
Primary Exports to Non-Asia	155.49	0.15	79.89	0.02
Non-primary Exports to Non-Asia	866.91	0.85	4,643.30	0.98
C. Ghana				
Primary Exports to Asia	112.86	0.32	1,133.80	0.23
Non-primary Exports to Asia	235.63	0.68	3,874.70	0.77
Primary Exports to Non-Asia	293.15	0.08	1,025.84	0.19
Non-primary Exports to Non-Asia	3,245.80	0.92	4,500.94	0.81

Source: BACI and staff calculations.
Note: Primary products are defined based on the calculation of the United Nations' Broad Economic Categories.

Table 4.2 reports the statistics for the remaining three countries in Africa5. Panel A shows the same set of statistics for Kenya's exports to Asian and non-Asian destinations. The share of primary exports in its total exports to Asia is significantly smaller than the continent's average. The share of primary exports from Kenya to Asia was only 11 percent in 2005, amounting to US$51 million worth of goods. The share increased to only 16 percent by the end of 2015. In Kenya's exports to non-Asian countries, the share of primary goods in total exports was also much smaller than the share of other Sub-Saharan African nations, as well as the country's shares of primary exports to Asia. The share of primary exports from Kenya to the rest of the world was only 5 percent in 2005 and hovered around 6 percent in 2015. In sum, Kenya has not been dependent on resource exports, even less so compared with Ethiopia.

Table 4.2: Primary versus Non-Primary Exports from Kenya, Nigeria, and Tanzania to Asian and Non-Asian Destinations

	2005		2015	
	Exp Value (US$, millions)	Exp Share	Exp Value (US$, millions)	Exp Share
A. Kenya				
Primary Exports to Asia	50.72	0.11	127.93	0.16
Non-primary Exports to Asia	399.06	0.89	665.36	0.84
Primary Exports to Non-Asia	157.58	0.05	263.98	0.06
Non-primary Exports to Non-Asia	3,048.19	0.95	4,183.62	0.94
B. Nigeria				
Primary Exports to Asia	2,682.23	0.95	9,357.30	0.66
Non-primary Exports to Asia	139.30	0.05	4,918.96	0.34
Primary Exports to Non-Asia	35,200.00	0.89	28,700.00	0.85
Non-primary Exports to Non-Asia	4,271.35	0.11	5,128.28	0.15
C. Tanzania				
Primary Exports to Asia	329.48	0.60	632.11	0.25
Non-primary Exports to Asia	216.07	0.40	1,895.78	0.75
Primary Exports to Non-Asia	249.65	0.14	689.50	0.17
Non-primary Exports to Non-Asia	1,494.52	0.86	3,403.65	0.83

Source: BACI and staff calculations.
Note: Primary products are defined based on the calculation of the United Nations' Broad Economic Categories.

Table 4.2, panel B, reports the same set of statistics for Nigeria's exports to Asian and non-Asian destinations. The share of primary exports in Nigeria's total exports to Asia is much larger compared with the continent's average and the three countries we have analyzed so far. The share of primary exports in Nigeria's exports to Asia was 95 percent in 2005, amounting to US$2.7 billion worth of goods. Nigeria has been successful in diversifying away from hyper-specialization in natural resources. In 2015, the share of primary exports declined to 66 percent. In Nigeria's exports to non-Asian countries, the share of primary goods in total exports is still much higher compared with other Sub-Saharan African

nations. The share of primary exports from Nigeria to the rest of the world was 89 percent in 2005, and it decreased slightly to 85 percent in 2015. In sum, Nigeria's pattern of trade in extractive industries is very different compared with those of the other countries in Africa5. Nigeria has been more dependent on primary exports, although there are signs of diversification in its portfolio of exports to Asia.

Finally, in table 4.2, panel C, we show the same set of statistics for Tanzania's exports to Asian and non-Asian destinations. The share of primary exports from Tanzania to Asia was 60 percent in 2005, which was very close to the continent's average. The total value of Tanzania's primary exports amounted to US$329 million. The share declined significantly, to 25 percent in 2015, suggesting successful diversification from primary goods in its exports to Asia. In Tanzania's exports to non-Asian countries, the share of primary goods in total exports is much smaller compared with those for exports to Asia and the counterparts in other Sub-Saharan African nations. The share of primary exports from Tanzania to the rest of the world was only 14 percent in 2005, and it increased slightly to 17 percent in 2015.

In sum, there is significant variation in the patterns of extractive exports across Sub-Saharan African nations. There is no systematic direction of the trend in concentration of natural resources in exports. Some countries, like Nigeria and Tanzania, reduced the share of primary goods in their exports to Asia, while other countries, like Kenya, became more dependent on primary exports.

High-Skill versus Low-Skill Intensive Exports from Africa5 to Asia

This subsection summarizes our sector-level analysis along the lines of skill intensity. We categorize sectors into high-skill and low-skill and show their shares in each Africa5 country's total exports to Asia. We first measure a product's (HS 6-digit) skill intensity, using the share of workers with high school completion or above, in Chinese 4-digit manufacturing sectors 2002–04. The descriptions of the micro data and the concordances involved in matching the Chinese 4-digit manufacturing sector to multiple HS 6-digit sectors are discussed in Ma, Tang, and Zhang (2014). Based on this product-level skill intensity measure, we aggregate exports from the entire Sub-Saharan African continent across all HS 6-digit sectors that have a skill intensity measure above the median in the sample of more than 5,000 HS 6-digit categories. Because we only have data for manufacturing firms in China, the analysis of the skill intensity of Sub-Saharan African exports to Asia is restricted to those from the manufacturing sector only.

Table 4.3 reports that the aggregate value of high-skill exports to Asia was around US$10.7 billion in 2005, accounting for 55 percent of Sub-Saharan Africa's exports to Asia that year. For the continent's exports to non-Asian destinations, the share of high-skill exports was lower (46 percent), amounting to US$58.5 billion. Ten years later, in 2015, the share of high-skill exports to Asia from the continent had declined to 46 percent, although the export value doubled. Exports of low-skill intensive exports to Asia increased, from US$8.7 billion in 2005 to more than triple, at US$28.1 billion in 2015, driving the share from 46 to 54 percent of total manufacturing exports to Asia that year.

Turning to the first country in the Africa5 group, table 4.3, panel B, shows that Ethiopia's share of high-skill exports in its total exports to Asia is about the same as the continent's average. The share of high-skill exports from Kenya to Asia was only 56 percent in 2005, amounting to US$150 million worth of goods; the share increased to 59 percent by the end of 2015. In Ethiopia's exports to non-Asian countries, the share of high-skill goods in total exports was smaller compared with the shares of other Sub-Saharan African nations or Kenya's exports to Asia. The share of high-skill exports from Ethiopia to the rest of the world was 41 percent in 2005; it declined further to 38 percent in 2015. In sum, Ethiopia's exports to Asia have become more skill-intensive over time, and its exports to non-Asian countries have

become less skill-intensive. These developments were accompanied by the country's decreasing dependence on primary exports, as documented in table 4.1.

Table 5.3, panel C, shows the same set of statistics for Ghana's exports to Asian and non-Asian countries. The share of high-skill exports from Ghana to Asia was 65 percent in 2005, which was higher than the continent's average. The total value of Ghana's high-skill manufacturing exports amounted to US$78.3 million. However, the share declined to 42 percent in 2015, suggesting that exports to Asia were not related to skill upgrading in the country's manufacturing sector. By contrast, Ghana's exports to the rest of the world started with lower skill content in 2005, as only 38 percent of its manufacturing exports were above the median level of skill intensity. But by 2015, the share of high-skill products in the country's manufacturing exports to the rest of the world reached 61 percent.

Table 4.3: High-Skill versus Low-Skill Exports from Africa, Ethiopia, and Ghana to Asian and Non-Asian Destinations

	2005		2015	
	Exp Value (US$, millions)	Exp Share	Exp Value (US$, millions)	Exp Share
A. Africa				
Skilled Exports to Asia	10,700.00	0.55	24,200.00	0.46
Unskilled Exports to Asia	8,690.29	0.45	28,100.00	0.54
Skilled Exports to Non-Asia	58,500.00	0.46	97,300.00	0.54
Unskilled Exports to Non-Asia	68,300.00	0.54	83,100.00	0.46
B. Ethiopia				
Skilled Exports to Asia	150.8672	0.56	423.9233	0.59
Unskilled Exports to Asia	118.1151	0.44	293.4828	0.41
Skilled Exports to Non-Asia	388.0053	0.41	1,512.565	0.38
Unskilled Exports to Non-Asia	569.3263	0.59	2,504.245	0.62
C. Ghana				
Skilled Exports to Asia	78.32141	0.65	145.2253	0.42
Unskilled Exports to Asia	41.97982	0.35	204.5643	0.58
Skilled Exports to Non-Asia	699.6022	0.38	1,155.22	0.61
Unskilled Exports to Non-Asia	1,142.018	0.62	727.0843	0.39

Source: BACI and staff calculations.
Note: A product's (HS 6-digit) skill intensity is measured by using the share of workers with high school completion or above in that sector. The detailed methodology is discussed in Ma, Tang, and Zhang (2014). Based on this product-level skill intensity measure, we aggregate exports from the entire Sub-Saharan African continent across all HS 6-digit sectors that have a skill intensity measure above the median (in the sample of more than 5,000 HS 6-digit categories) as the "skilled exports", and the rest is referred as "unskilled exports".

Table 4.4 reports statistics on the skill intensity of manufacturing exports for the other three countries in Africa5. Panel A shows that the share of high-skill exports in Kenya's total exports to Asia was significantly smaller than the continent's average in 2005. The share of high-skill exports from Kenya to Asia was about 34 percent in 2005, accounting for US$147 million of the country's exports. The share declined slightly, to 32 percent by the end of 2015, consistent with the increase in the share of primary exports reported in table 4.2. In Kenya's exports to non-Asian countries, the share of high-skill goods in total exports was also much smaller compared with the other Sub-Saharan African nations. The share of high-skill exports from Kenya to the rest of the world was only 38 percent in 2005, and it declined to 33 percent in 2015. In sum, the skill content of Kenya's exports has declined.

Table 4.4: High-Skill versus Low-Skill Exports from Kenya, Nigeria, and Tanzania to Asian and Non-Asian Destinations

	2005		2015	
	Exp Value (US$, millions)	Exp Share	Exp Value (US$, millions)	Exp Share
A. Kenya				
Skilled Exports to Asia	147.7184	0.34	253.1568	0.32
Unskilled Exports to Asia	285.734	0.66	536.8452	0.68
Skilled Exports to Non-Asia	1,176.252	0.38	1,449.79	0.33
Unskilled Exports to Non-Asia	1,932.774	0.62	2,893.353	0.67
B. Nigeria				
Skilled Exports to Asia	58.38698	0.40	325.3946	0.23
Unskilled Exports to Asia	89.10613	0.60	1,064.824	0.77
Skilled Exports to Non-Asia	1,534.224	0.58	1,303.401	0.67
Unskilled Exports to Non-Asia	1,095.746	0.42	641.0607	0.33
C. Tanzania				
Skilled Exports to Asia	69.36819	0.14	620.5738	0.37
Unskilled Exports to Asia	409.6711	0.86	1,038.862	0.63
Skilled Exports to Non-Asia	326.5098	0.32	1,140.506	0.36
Unskilled Exports to Non-Asia	683.1223	0.68	1,988.948	0.64

Source: BACI and staff calculations.
Note: A product's (HS 6-digit) skill intensity is measured by using the share of workers with high school completion or above in that sector. The detailed methodology is discussed in Ma, Tang, and Zhang (2014). Based on this product-level skill intensity measure, we aggregate exports from the entire Sub-Saharan African continent across all HS 6-digit sectors that have a skill intensity measure above the median (in the sample of more than 5,000 HS 6-digit categories) as the "skilled exports", and the rest is referred as "unskilled exports".

Table 4.4, panel B, reports the same set of statistics for Nigeria's exports to Asian and non-Asian destinations. The share of high-skill exports in Nigeria's total exports to Asia was 40 percent in 2005, amounting to US$58.4 million worth of goods. Despite the country's success in diversifying away from hyper-specialization in natural resources, as shown in table 4.2, the share of high-skill exports in the country's total exports to Asia declined to only 23 percent in 2015. For Nigeria's exports to non-Asian countries, the performance in skill upgrading was better. The share of high-skill exports from Nigeria to the rest of the world was 58 percent in 2005, and it increased to 67 percent in 2015. In sum, Nigeria's skill content in exports to Asia declined, while it increased in the country's exports to non-Asian countries. This is an example of how economic engagement with Asia may not necessarily result in growth-inducing outcomes.

Finally, table 4.4, panel C, shows the same set of statistics for Tanzania's exports to Asian and non-Asian destinations. The share of high-skill exports from Tanzania to Asia was merely 14 percent in 2005, which was much lower than the continent's average. The share increased significantly to 37 percent in 2015,

suggesting successful skill upgrading, along with the stellar diversification from primary exports to Asia, as documented in table 4.2. In Tanzania's exports to non-Asian countries, the share of high-skill manufactured goods was higher in 2005, at 32 percent, and it increased slightly to 36 percent in 2015.

In sum, similar to the pattern of extractive exports, there is significant heterogeneity in the share of high-skill exports and growth of the shares across countries. There is no systematic direction of the trend in skill upgrading in exports or how it is related to economic engagement with Asia. After discussing the top Asian destinations for Sub-Saharan Africa's exports, we will turn to regression analysis to offer a more systematic investigations of the relationships.

Top Asian Destinations for Selected Sub-Saharan African Nations' Exports

This subsection examines the potentially changing composition of Asian trading partners of Sub-Saharan African exporting countries. To this end, we aggregate the BACI trade data across all HS 6-digit categories to the country-pair level. For Sub-Saharan Africa as a whole and each of the Africa5 countries, we examine their major trading partners in Asia, for imports and exports. Similar to our analysis of the sectoral distribution of exports from each nation, we exclude destination countries in Asia that accounted for less than 1 percent of a Sub-Saharan African nation's exports in the respective year (2005 and 2015).

Figure 4.7 shows the distribution of Sub-Saharan Africa's exports to Asia, by destination country. Among Asian nations that accounted for more than 1 percent Sub-Saharan Africa's exports in 2005 or 2015, China stands as the top destination. In 2005, China accounted for 41 percent of Sub-Saharan Africa's total exports to Asia. The share increased modestly to 43 percent in 2015. Despite remaining Sub-Saharan Africa's main trading partner, the small increase contrasts sharply with the media's description of China as dominating Sub-Saharan Africa's trade. India is the second largest destination for the region's exports. In 2005, India ranked third in the share of exports from Sub-Saharan Africa to Asia, contributing 12 percent of Sub-Saharan Africa–Asia trade, following Japan, which accounted for 20 percent. The conventional thinking is that China has been increasing its dominance in Sub-Saharan Africa's trade. Although China has been rising rapidly as a source of investment in Sub-Saharan Africa, India is the Asian country that experienced the largest increase in export share from Sub-Saharan Africa, from 12 percent in 2005 to 29 percent in 2010. Japan used to be a much more important trading partner for Sub-Saharan Africa, but, as the shares of China and India were growing at a much faster pace, Japan's share declined, from 20 to about 10 percent. Other important Asian destinations for Sub-Saharan Africa's exports in both years include Malaysia, the Republic of Korea, Singapore, and Vietnam. Vietnam's share of trade with Africa was quite small (about US$745 millions) in 2005, but by 2015, Vietnam had become the region's eighth largest export destination.

Figure 4.8 shows the top destinations for Ethiopia's exports in 2005 and 2015. Similar to the overall pattern for the continent, China ranked as the top destination for Ethiopia's exports in 2015. Different from the continent's destination composition, Japan rather than China was the country's top destination in Asia in 2005. In 2015, Japan remained the second largest destination, instead of India. Ethiopia has become increasingly more dependent on China as an export market. In 2005, the share of exports to China in Ethiopia's total exports to Asia was 36 percent, and it increased to 55 percent in 2015. The share of exports to India rose rapidly as well, but since its base was much lower (only 5 percent in 2005), it only accounted for 9 percent of Ethiopia's exports to Asia in 2015. The first lesson from the comparison of Sub-Saharan Africa and Ethiopia is that what is true for the entire continent may not be true for an individual country in the continent.

Figure 4.7: Top Asian Destinations for Africa's Exports, 2005 and 2015 (share)
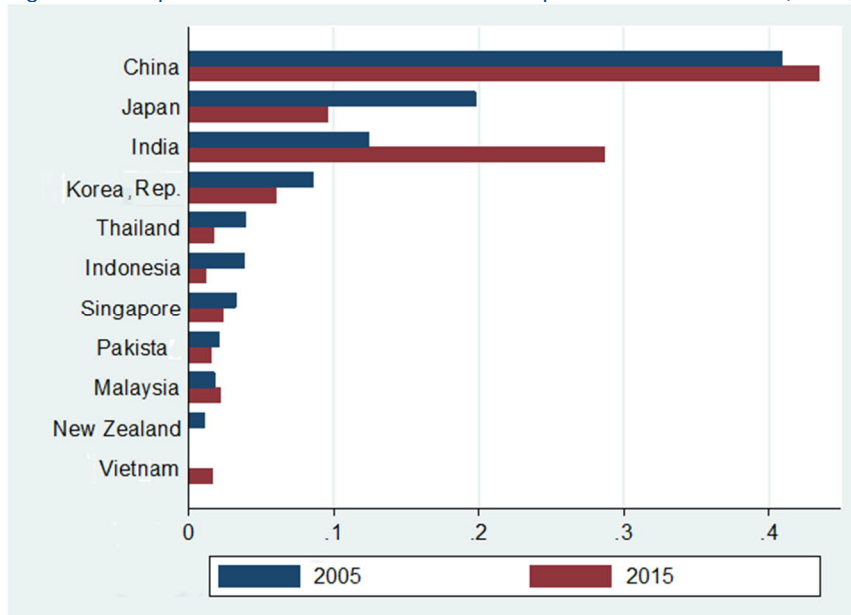
Source: Staff calculations using data from CEPII's BACI World Trade database.

Figure 4.8: Top Asian Destinations for Ethiopia's Exports, 2005 and 2015 (share)
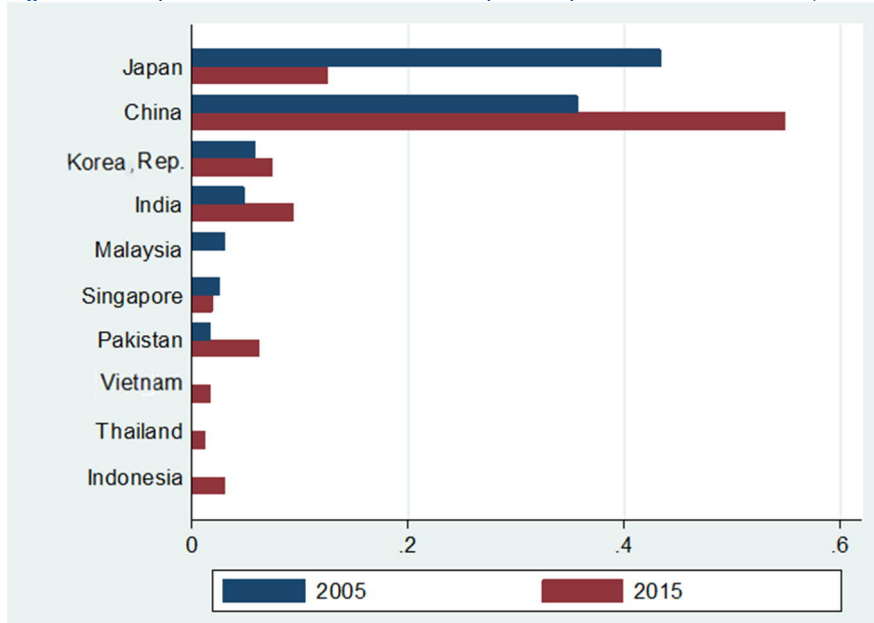
Source: Staff calculations using data from CEPII's BACI World Trade database.

Figure 4.9 examines Ghana's export partners in Asia. What stands out is that India has emerged rapidly as the most important export destination for Ghana. The country's top export destination in 2005 was China, which accounted for 26 percent of Ghana's exports to Asia. Since then, India's share of Ghana's exports to Asia has been increasing consistently, and India has become the top destination by a large margin. In 2005, India was only the second largest market for Ghana's goods outside the country, accounting for 24 percent of Ghana's exports to Asia. By 2015, its share went up to 64 percent, replacing China as the top destination, which only had 21 percent of Ghana's export share in the region. According to table 4.1, the natural or cultured pearls section expanded rapidly and became Ghana's main export sector. Indeed, this is a main reason why India has become Ghana's largest export destination in Asia.

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Unlike Ethiopia, Ghana has not become more dependent on China. This finding confirms that each African nation has a unique story of how Asia affects its trade. The continent's overall trade patterns should not be applied to understanding the experience of each individual country.

Figure 4.9: Top Asian Destinations for Ghana's Exports, 2005 and 2015 (share)

Source: Staff calculations using data from CEPII's BACI World Trade database.

Figure 4.10 examines Kenya's top Asian trading partners (for exports). The set of top trading partners is very different from those of Ethiopia and Ghana. Kenya's top export destination in Asia is Pakistan. In 2005, Pakistan accounted for 42 percent of Kenya's exports to Asia, and its share increased to 43 percent by 2015. Despite the significant increase in China's share of Kenya's exports, from 4.9 to 11.7 percent between 2005 and 2015, China remained a much less significant destination for Kenya compared with Pakistan. India, which was Ghana's second largest export destination in 2015, has been increasing rapidly as an export destination for other African nations.

Figure 4.11 shows the export destination composition in Asia for Nigeria. Different from Ethiopia, Ghana, and Kenya, China has never been a top destination for Nigeria's exports. In 2005, Nigeria's biggest trading partner in Asia (in terms of exports) was Japan, accounting for 31 percent of total Nigerian exports to Asia. Japan's contribution as a destination market dropped to 18 percent in 2015. India replaced Japan as the top destination in 2015. India's share of Nigerian exports to Asia was a mere 4 percent in 2005, and it increased to 64 percent in 2015. As figure 5.5 shows, the single most important sector for Nigerian exports to Asia has consistently been minerals, fuel, and mining. The sharp country churning in Nigeria's main trading partners between 2005 and 2015 implies that raw materials are fairly homogeneous, making switching destination countries relatively easier compared with other African nations that have different specialization patterns.

Figure 4.10: Top Asian Destinations for Kenya's Exports, 2005 and 2015 (share)
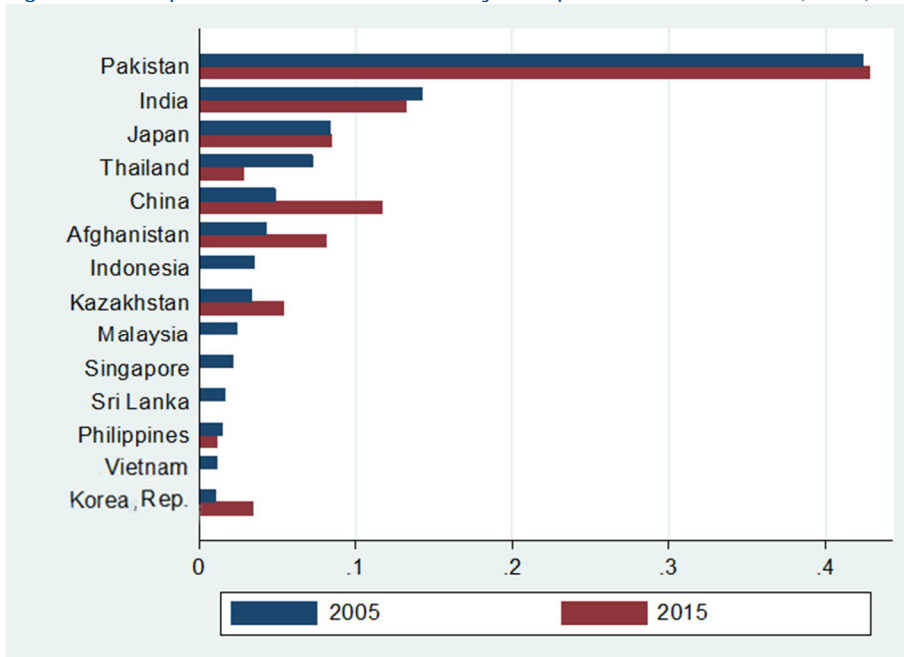
Source: Staff calculations using data from CEPII's BACI World Trade database.

Figure 4.11: Top Asian Destinations for Nigeria's Exports, 2005 and 2015 (share)
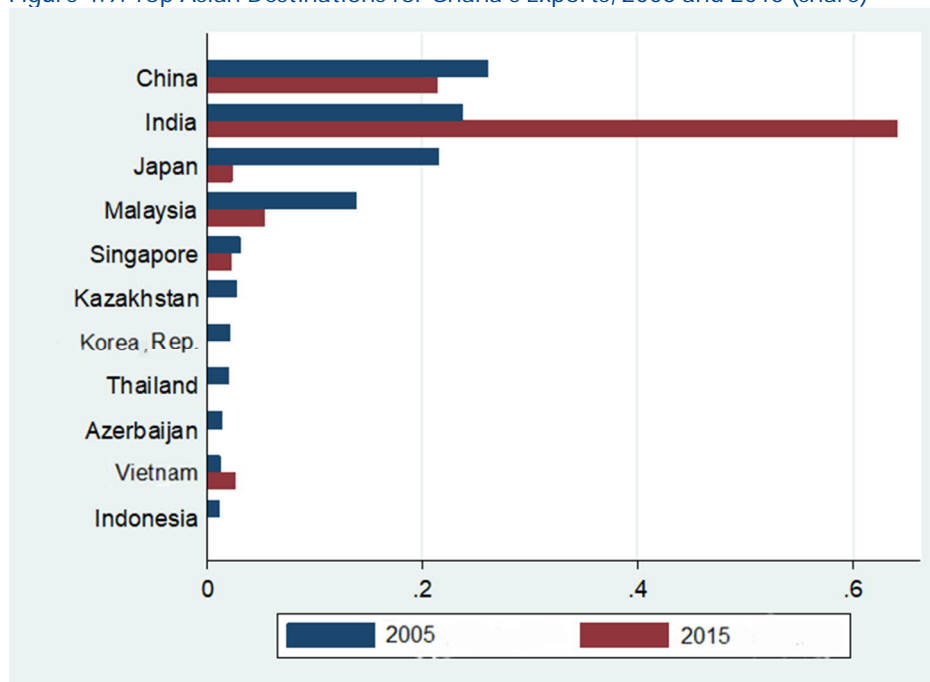
Source: Staff calculations using data from CEPII's BACI World Trade database.

Finally, figure 4.12 illustrates the composition of Tanzania's Asian export destinations. China, which was the top destination in 2005, accounted for 42 percent of Tanzania's total exports to Asia; it was replaced by India as the top destination in 2015. India accounted for over 44 percent of Tanzania's exports to Asia in 2015, rising from only 20 percent in 2005. Japan remained a stable number three market for Tanzania. Vietnam rose from an insignificant market to the fourth largest market for Tanzania, accounting for about 5 percent of Tanzania's exports to Asia in 2015.

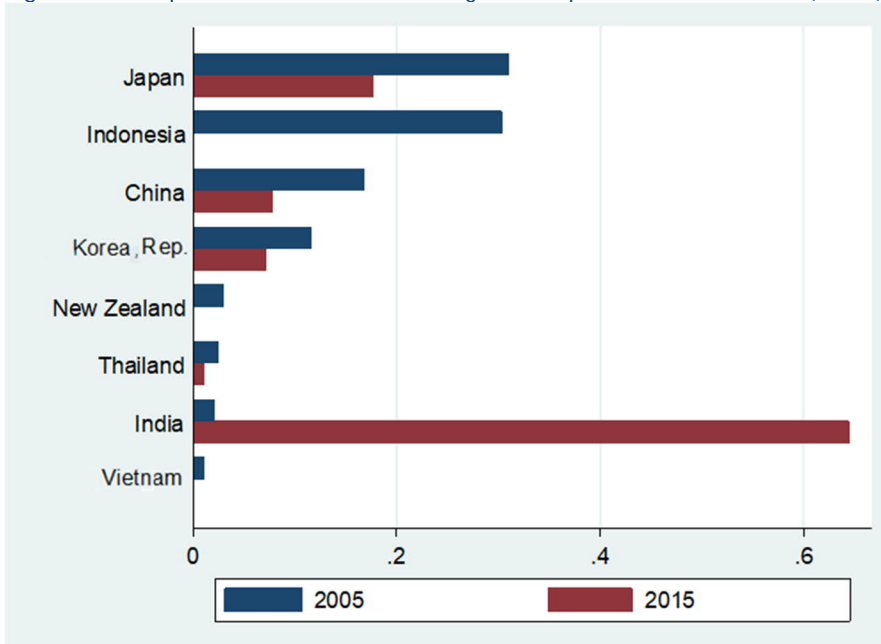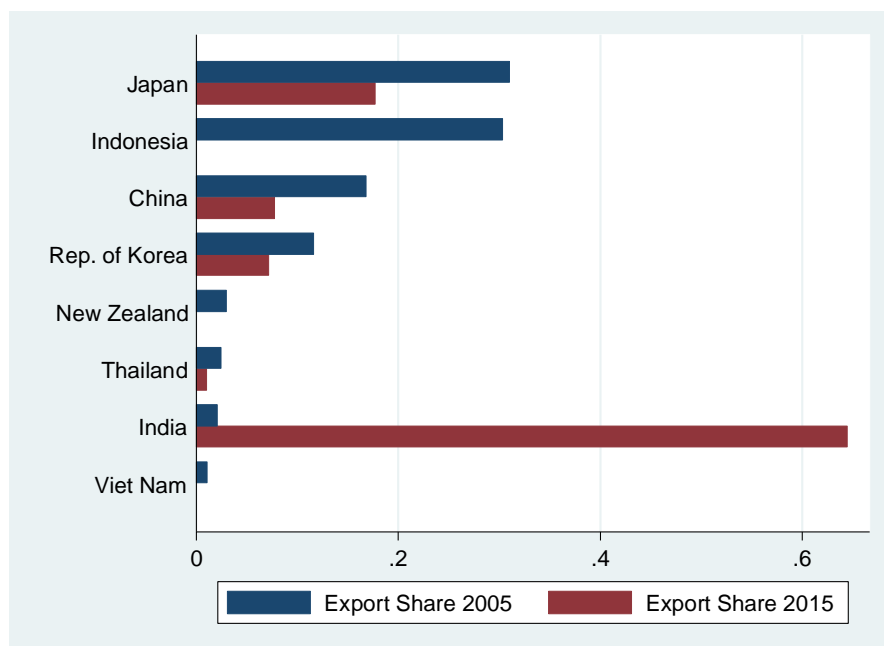Figure 4.12: Top Asian Destinations for Tanzania's Exports, 2005 and 2015 (share)
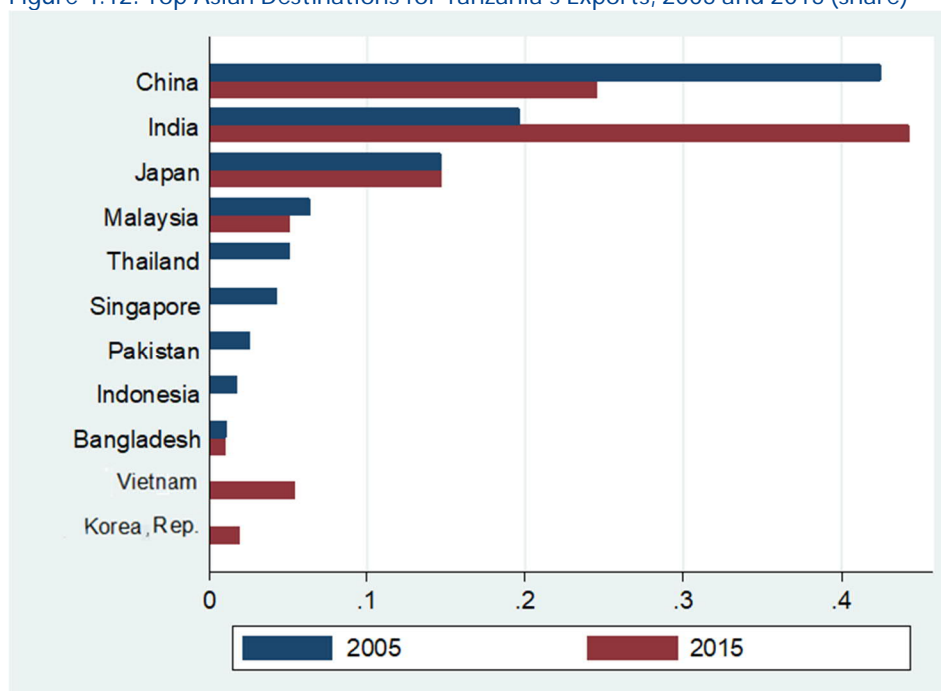
Source: Staff calculations using data from CEPII's BACI World Trade database.

In sum, each country has its own main trading partner in Asia. In contrast to the conventional thinking, China is not always the dominant trading partner for individual African nations, although it is the case for the entire African continent. India has emerged as an increasingly important trading partner of Africa. Since 2005, India has become the largest export destination in Asia for countries like Nigeria, Tanzania, and Ghana. A common feature among these three countries is that they are highly specialized in one particular raw material product (natural and cultured pearls for Ghana; minerals, fuel, and mining for Nigeria; and, to a lesser extent, ores, slag, and ash for Tanzania).

5   Econometric Assessment of Sub-Saharan Africa – Asia GVCs

Based on the stylized facts described in the previous section, this section conducts empirical analysis to understand whether their economic engagement with Asia has shaped the particular trade and GVC patterns observed in individual Sub-Saharan African nations.

Our main sample covers 46 countries in Sub-Saharan Africa over a 16-year period from 2000 to 2015 (table A.1, in annex A). Several facts stand out. First, Asia's economic engagement in trade with Sub-Saharan Africa increased significantly over the sample period. The share of imports from Asia in total imports for a median Sub-Saharan African country in 2005 was 0.18, which increased to 0.28 by 2015. The share of exports to Asia was only 0.12 in 2005, which rose to 0.20 in 2015. The share of imports from China in total imports for the median Sub-Saharan African country in 2005 was 0.05, which increased to 0.14 by 2015. The share of exports to China was only 0.02 in 2005, which tripled to 0.06 in 2015.

The three GVC measures that we use as the dependent variables of interest are the ratio of domestic value added (DVA) to gross domestic product (GDP), the length of production, and the upstreamness of exports. For the median country in our Sub-Saharan Africa sample, the DVA declined slightly (from 0.37 to 0.35 between 2005 and 2015), consistent with the global declining trend of DVA (Johnson and Noguera 2012). Over the same period, the production chain of Sub-Saharan African exports became more complex, as revealed by the increasing length of production chains. For the median country, the export-weighted average of the number of stages (sectors) involved before final exports rose from 2.31 to 2.36 between 2005 and 2015. Among the GVC measures, the upstreamness index, which captures the distance between the sector and final-good consumers (at home or abroad), increased the most. For the median country in the sample, the upstreamness index increased from 2.45 to 2.62. There are many reasons why a country's exports become "more upstream" over time. One tempting explanation is that Sub-Saharan Africa's exports, partly due to China's economic engagement, have become more resource-intensive. Given that natural resource–intensive sectors tend to be more upstream, the observed increase in export upstreamness may be related to the increasing resource intensity of Sub-Saharan Africa's exports. In this section, we empirically examine this hypothesis.

Do More Exports to Asia Crowd Out Exports to Other Countries?

Table 5.1 empirically examines the hypothesis that increasing demand from Asia could crowd out Sub-Saharan African countries' exports to other countries. To examine the "trade diversion" hypothesis, we use as the dependent variable the log of exports from each Sub-Saharan African country to the rest of the world excluding Asia in each year. We subtract exports to Asia from exports to the rest of the world to remove any mechanical correlation between the dependent and independent variables of interest. Controlling for (exporting) country and year fixed effects, we find a positive and statistically significant correlation between a country's (log) exports to the rest of the world and its (lagged log) exports to Asia, as reported in column (1). This result suggests that instead of trade diversion, exports to Asia complement exports to non-Asian countries. In column (2), we add a country's log imports from Asia to

consider the potential complementarity of imported inputs and technology from Asia on the country's exports. Controlling for country and year fixed effects, as well as (log) exports to Asia, we find that a country's imports from Asia are positively and significantly correlated with its exports to the rest of the world, suggesting that Asia may have provided intermediate inputs that facilitate individual countries' exports and participation in GVCs.

There are several reasons why more exports to a country (or region) would complement exports to other countries. First, in the presence of internal economies of scale, increased sales at the firm level, by tapping into more export markets, implies spreading the fixed costs of production by exporting over a larger volume of production, driving down the firm's average cost. Second, in the presence of external economies of scale, increased exports may generate positive externalities between firms. Such positive externalities can take the form of labor pooling and technology spillover in exporting or special economic zones, or information spillover between firms through learning about foreign markets. The third reason, which is confirmed indirectly by the result of the positive correlation between imports from Asia and exports to the rest of the world, is that participation in GVCs is a two-way game. More exports to a country usually come with more imports from the same country or other countries. It has been shown in the literature that imports of foreign intermediate inputs can increase a firm's productivity, which in turn raises its sales and profits. So, the idea of trade diversion based on a zero-sum concept is a rare situation. There are many reasons why a country's participation in GVCs with a region that is growing fast can serve as an engine of growth of the same country.

Table 5.1: Sub-Saharan Africa's Exports to Asia versus Exports to Other Countries

Dependent Variable	(1) In(Exports to ROW except Asia)	(2)	(3) In(Exports to ROW except Asia5)	(4)	(5) In(Exports to ROW except China)	(6)
In(Exp to Asia)	0.184*** (2.749)	0.151** (2.454)				
In(Imp to Asia)		0.204*** (4.073)				
In(Exp to Asia5)			0.114** (2.626)	0.106** (2.446)		
In(Imp to Asia5)				0.139* (1.909)		
In(Exp to China)					0.0947*** (2.818)	0.0891*** (3.128)
In(Imp to China)						0.185** (2.594)
Year FE	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y
N	710	710	698	698	681	681
r2	.957	.958	.956	.957	.957	.959

Note: All independent variables are lagged one year. t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 46 countries over 2000–15. Asia5 = Bangladesh, Cambodia, China, India, and Vietnam; ROW = rest of the world.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In table 5.1, columns (3) and (4), we repeat the same analysis as in columns (1) and (2) but restricting it to (log) exports and imports, respectively, to the Asia5 countries as the regressors of interest. We adjust the dependent variable accordingly, by subtracting the exports to the Asia5 nations from Sub-Saharan African's exports to the rest of the world in a year, so that the positive correlation between (log) exports to Asia and those to the rest of the world is not spurious. Within an (exporting) country and year, a country's (log) exports to the rest of the world are positively correlated with its (log) exports to and (log) exports from the Asia5 countries (including China, India, and Vietnam), respectively. These statistically significant results suggest that instead of trade diversion, trade to Asia complements exports to other non-Asian countries. The elasticity of exports to the rest of the world with respect to exports to Asia5 is smaller than that with respect to exports to all of Asia. This is expected in light of the postulated spillover hypothesis. If internal and external economies of scale are the drivers, the positive effect of exporting to the entire Asian continent should be larger than exporting to only the Asia5 countries.

The last two columns in table 5.1 consider the potential crowding out effect of exporting to China. China has emerged as Sub-Saharan Africa's largest trading partner. Analysts have expressed concern that Chinese economic engagement has displaced Sub-Saharan Africa's local industrial capability and made the region more dependent on economic support from China. After all, although China's increasing economic engagement in Sub-Saharan Africa has boosted the continent's economic growth, it has also generated considerable controversy. We find that, in contrast to the concern raised in the press and some research, more exports to and imports from China are positively related to trade with the rest of the world (with China excluded). In other words, trade with China does not divert resources away from exporting to other nations.

Table 5.2: Sub-Saharan African Country C's Exports to Asia versus Exports to Other Countries

Dep Var	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$\ln(Exp_{cit})$ to ROW			$\ln(Exp_{cit})$ to ROW but Asia5			$\ln(Exp_{cit})$ to ROW but China		
ln(Exp to Asia)	0.403***	0.406***	0.413***						
	(20.034)	(19.769)	(18.800)						
ln(Exp to Asia5)				-0.0849**	-0.0733*	-0.0674*			
				(-2.349)	(-1.903)	(-1.752)			
ln(Exp to China) (lagged)							0.327***	0.329***	0.343***
							(17.587)	(16.408)	(13.870)
Year FE	Y			Y			Y		
Country FE	Y			Y			Y		
Industry (HS2) FE	Y	Y		Y	Y		Y	Y	
Country x Year FE		Y	Y		Y	Y		Y	Y
Industry x Year FE			Y			Y			Y
N	22860	22860	22860	9581	9581	9581	9556	9556	9556
r2	.661	.678	.696	.593	.621	.658	.675	.702	.738

Note: t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 46 countries over 2000–15. Asia5 = Bangladesh, Cambodia, China, India, and Vietnam; ROW = rest of the world.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The results reported in table 5.2 are based on aggregate export data from a Sub-Saharan African country. In the table, we empirically explore the "crowding out" hypothesis by using a country's exports to the rest of the world at the (HS 2-digit) sector level. Specifically, we regress (log) Sub-Saharan African country c's exports to the rest of the world on (log) exports to Asia from the same country and sector (i). Controlling for year, country, and industry fixed effects, we find a positive and statistically significant correlation between (log) exports to Asia and (log) exports to the rest of the world in the same industry. There may be a concern that a country's exports to Asia and any other country could be driven by a common supply shock (for example, technological shocks or government export-promotion policies). To address this concern, we control for country-year fixed effects in column (2). Or there may be a concern that a common global demand shock could lead to the observed positive correlation between a country's exports to Asia and the rest of the world. To tackle this concern, we control for industry-year fixed effects in column (3). The results reported in both columns remain robust and are quantitatively similar to those reported in column (1). In columns (4) to (6), based on the same regression specifications, we find complementary effects of exports to Asia on exports to the rest of the world (excluding Asia) at the industry level. For instance, the coefficient on (log) exports to Asia in column (3) suggests that a 1 percent increase in exports to Asia is associated with a 0.413 percent increase in exports to non-Asian countries.

Following parallel specifications as in table 5.2, columns (1) to (3), we repeat the regressions with (log) exports to Asia5 as the regressor of interest in columns (4) to (6) and (log) exports to China as the regressor of interest in columns (7) to (9), respectively. The dependent variable in each specification is adjusted accordingly by subtracting from exports to the rest of the world the exports to Asia5 or China. Interestingly, controlling for various combinations of fixed effects, we find a negative and marginally significant correlation between exports to Asia5 and exports to the rest of the world within the same HS 2-digit industry (columns (7) to (9)). When we restrict the analysis to exports to China only, however, we find complementarity between exports to China and exports to the rest of the world.

In sum, together with the results in table 5.1, we find no empirical evidence of trade diversion due to economic exchanges with Asia as a whole or China. However, exports to the Asia5 countries are found to be related to trade diversion at the sector level, suggesting that exporting to one of the other four Asia5 countries (that is, Bangladesh, Cambodia, India, and Vietnam) could be related to trade diversion.

Factor Content in Exports

The next analysis takes a deeper look into the effects of Asian economic engagement on the pattern of Sub-Saharan Africa's exports. There have been concerns that the rapid economic growth of Asian emerging markets, by increasing the demand for natural resources, could act as a source of the resource curse. If this speculation is correct, we would expect to see that more exports to Asia or selected Asian countries, such as China, are associated with deeper specialization in material-intensive exports. To this end, we regress the weighted average of a Sub-Saharan African country's material intensity on the country's exports to Asia, Asia5, and China (lagged by a year). We measure a sector's material intensity by the average firm's material cost per worker in the U.S. manufacturing sector. We then compute the export-weighted average material intensity of a country in year t, using sector exports as weights. As is reported in table 5.3, we find no statistically significant correlation between exports to Asia, Asia5, or

China with the weighted average material intensity of overall exports (to the rest of the world) from an individual Sub-Saharan African nation, controlling for country and year fixed effects.

Table 5.3: Asian Economic Engagement and Material Intensity of Exports

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Export-weighted Material Intensity					
Imp from Asia/ Tot Imp	0.336		0.350						
	(1.070)		(1.084)						
Exp to Asia/ Tot Exp		0.239	0.247						
		(1.659)	(1.651)						
Imp from Asia5/ Tot Imp				0.611		0.680			
				(1.435)		(1.546)			
Exp to Asia5/ Tot Exp					0.0100	0.0352			
					(0.064)	(0.227)			
Imp from China/ Tot Imp							1.059		0.953
							(1.504)		(1.434)
Exp to China/ Tot Exp								0.0965	0.106
								(0.545)	(0.588)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	710	710	710	710	698	698	710	687	687
r2	.849	.849	.85	.85	.863	.865	.851	.868	.871

Note: All regressors are lagged one year. t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 46 countries over 2000–15. Asia5 = Bangladesh, Cambodia, China, India, and Vietnam.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In table 5.4, we repeat the same set of regressions to examine whether engaging in a GVC with Asia is associated with more specialization in capital-intensive products. To the extent that it is, we can argue that trade with Asia raises the demand for capital, which may lead to more investment and thus long-run growth. As shown in columns (1) to (3), we find that proportionally more exports to but not imports from Asia are positively correlated with higher average capital intensity in exports to the rest of the world (including Asia), controlling for year and fixed effects. When we restrict the set of destinations to Asia5 countries (columns (4) to (6)) and China (columns (7) to (9)), we continue to find a positive correlation between the two variables. In addition, we find that the shares of imports from Asia5 and China are also positively correlated with capital deepening in countries' exports. The correlation with the share of imports from China is quantitatively larger, suggesting that Sub-Saharan African countries' engagement in the same value chains, with GVCs in particular, encourages investment and long-run economic growth.

Table 5.4: Asian Economic Engagement and Capital Intensity of Exports

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Export-weighted Capital Intensity					
Imp from Asia/ Tot Imp	0.399		0.422						
	(1.473)		(1.471)						
Exp to Asia/ Tot Exp		0.386**	0.395**						
		(2.640)	(2.556)						
Imp from Asia5/ Tot Imp				0.685*		0.724*			
				(1.864)		(1.889)			
Exp to Asia5/ Tot Exp					0.317*	0.344*			
					(1.720)	(1.839)			
Imp from China/ Tot Imp							1.144**		1.051*
							(2.056)		(1.879)
Exp to China/ Tot Exp								0.506**	0.516**
								(2.610)	(2.607)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	710	710	710	710	698	698	710	687	687
r2	.855	.857	.858	.856	.866	.869	.858	.873	.878

Note: All regressors are lagged one year. t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 46 countries over 2000–15. Asia5 = Bangladesh, Cambodia, China, India, and Vietnam.
$* p < 0.10, ** p < 0.05, *** p < 0.01$.

Next in table 5.5, we repeat the same set of regressions as in tables 5.3 and 5.4 to examine whether engaging in a GVC with Asia is positively associated with specialization in skill-intensive exports. To the extent that it is, we can argue that trade with Asia can potentially increase the demand for skills and thus education, which may enhance a country's long-run growth. In contrast to our encouraging findings in table 4.4, however, we find no significant correlation between (lagged) exports to Asia, Asia5, or China and the weighted average of the skill intensity of overall exports from individual Sub-Saharan African nations.

Table 5.5: Asian Economic Engagement and Skill Intensity of Exports

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Export-weighted Skill Intensity					
Imp from Asia/ Tot Imp	-0.00354		-0.00809						
	(-0.047)		(-0.106)						
Exp to Asia/ Tot Exp		-0.0777	-0.0779						
		(-1.417)	(-1.406)						
Imp from Asia5/ Tot Imp				0.0625		0.0158			
				(0.524)		(0.142)			
Exp to Asia5/ Tot Exp					-0.0846	-0.0840			
					(-1.086)	(-1.085)			
Imp from China/ Tot Imp							0.142		0.0809
							(0.729)		(0.456)
Exp to China/ Tot Exp								-0.0785	-0.0778
								(-0.894)	(-0.879)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	710	710	710	710	698	698	710	687	687
r2	.725	.727	.727	.725	.75	.75	.726	.754	.754

Note: All regressors are lagged one year. t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 46 countries over 2000–15. Asia5 = Bangladesh, Cambodia, China, India, and Vietnam.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Patterns of GVC Participation

This subsection examines whether China's economic engagement has changed the way Sub-Saharan African nations participate in GVCs. To this end, we consider three value chain measures that are commonly used in the literature—upstreamness, the DVA ratio, and the length of production. Although each measure captures a distinct concept of the extent to which a country participates in GVCs, they have been used as indicators for whether a country has been participating in GVCs in a way to benefit the most from globalization. Upstreamness captures how far a sector is from final-goods consumers. The DVA ratio captures how much of a country's GDP is generated by domestic content. If the DVA ratio is higher, then proportionally more of the export revenue will be paid to domestic owners of factors or suppliers of intermediates and materials. As such, any policies or shocks that enhance exports will have a larger impact on the exporting country's GDP. The length of production of exports measures how many sector-country pairs are involved in the production of exports from a sector. The longer is the production process behind an exported product, the more complex it is, which implies more potential channels through which exports can benefit the rest of a country's economy.

We first examine whether China's economic engagement is related to the upstreamness of a country's exports. There are no direct implications about whether exports being more upstream is good for economic development, but the level of upstreamness portrays the structure of the domestic supply chain that generates the country's exports. Some of the most upstream sectors, constructed based on information from the 2005 U.S. input-output tables, include vegetable plaiting material; ores, slag, and ash; and fertilizers. These sectors have a large share of costs paid for raw materials and capital, and thus higher material and capital intensity. Tables A.2 to A.5 show the top export sectors and trade partners of Ethiopia, Ghana, Kenya, and Nigeria.

Using the same regression specifications and panel structure of the data as in table 5.5, we regress the export-weighted average of a country's upstreamness (with weights equal to the sectoral export shares in the total gross exports of a country) on a Sub-Saharan African country's (lagged) shares of imports from and exports to Asia. Table 5.6 reports the results. In column (1), we find a positive and marginally significant (at the 10 percent level) correlation between a country's export upstreamness and the share of imports from Asia, after controlling for country and year fixed effects. Column (2) shows a positive and statistically more significant correlation between a country's export upstreamness and the share of exports to Asia. These results imply that when a country is more engaged in GVCs with Asia, its exports on average will move upstream (away from consumers, at home and abroad). In column (3), when the shares of exports to and imports from Asia are included as regressors, in addition the fixed effects, only the share of exports to Asia seems to matter.

Table 5.6: Asian Economic Engagement and Upstreamness of Exports

Dependent Variable				Export-weighted Upstreamness					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Imp from Asia/ Tot Imp	0.333* (1.712)		0.367 (1.678)						
Exp to Asia/ Tot Exp		0.584** (2.229)	0.592** (2.205)						
Imp from Asia5/ Tot Imp				0.464 (1.498)		0.586* (1.719)			
Exp to Asia5/ Tot Exp					0.631** (2.151)	0.652** (2.190)			
Imp from China/ Tot Imp							0.866* (1.742)		0.895* (1.713)
Exp to China/ Tot Exp								0.991*** (3.411)	0.999*** (3.418)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	710	710	710	710	698	698	710	687	687
r2	.875	.884	.885	.875	.885	.887	.877	.897	.901

Note: All regressors are lagged one year. t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 46 countries over 2000–15. Asia5 = Bangladesh, Cambodia, China, India, and Vietnam.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In table 5.6, columns (4) to (6) repeat the same set of analyses but now consider trade with Asia5 countries only. Column (6) shows that imports from and exports to Asia5 are correlated to a country's exports "moving up the value chain." According to the coefficients, the economic effects appear to be larger than those from trading with Asia only. When the share of imports from Asia5 countries increases by 10 percentage points, a country's overall exports will move away from final-goods consumers by about 0.04 sector. The same magnitude increase in export share (to Asia5 countries) implies a movement of exports toward the most upstream sector of supply chains by 0.06 sector. The effect of exports to Asia5 is found to be economically significant.

The last three columns in table 5.6 consider trade shares with China. Column (9), which includes variables of imports from and exports to China, shows that the economic effects of trading with China on a country's export usptreamness seems to be even stronger. When the share of imports from China increases by 10 percentage points, a country's overall exports will move away from final-goods

consumers by about 0.09 sector. The same magnitude increase in the share of exports to China implies a movement of exports toward the most upstream sector of supply chains by 0.1 sector.

We next examine whether trade with Asia affects Sub-Saharan African nations' movement along a GVC, as measured by the ratio of DVA to gross exports. The Global Trade Analysis Project input-output tables are only available for 2004, 2007, and 2011. Thus, instead of using the fixed effect models that we used to examine the other dependent variables of interest, we adopt a long-difference approach. We regress the change in the DVA ratio of a country's exports on all regressors of interest from 2004 and 2011. As reported in table 5.7, we find that (the change in) the share of imports from Asia is not related to the average DVA ratio of Sub-Saharan African countries' exports (column (1)). However, changes in the share of exports to Asia seem to be negatively correlated with the DVA ratio of exports from a country (column (2)). However, when we include changes in shares of imports from and exports to Asia, in column (3), the statistical significance disappears. The rest of the table shows that there is no significant relationship between a country's DVA ratio and engagement in a GVC with Asia. A possible reason behind the lack of significant results is that the sample size only covers 23 countries, which is half the original sample of 46 Sub-Saharan African nations.

In table 5.8, we use the same long-difference specification to examine the relationship between Asian economic engagement and the average length of production involved in a country's exports. An increase in the length of production implies more complex production, suggesting that there are large potential gains from trade for a country. Similar to the findings on the relation between exports to Asia and a country's DVA ratio, we find no significant relationship between changes in the share of imports from Asia and the length of production for Sub-Saharan Africa's exports. However, we find a negative but marginally significant relation between the share of exports to Asia and the length of production. Such negative correlation is quantitatively larger when a country imports proportionally more from Asia5 countries, as shown in columns (4) and (6). These results suggest that, if anything, imports may have shortened the supply chain in Sub-Saharan Africa, by replacing some of the complex intermediate inputs that used to be sourced locally. However, we find no significant correlation between trade with China and the average length of production behind Sub-Saharan Africa's exports (columns (7) and (9)).

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Table 5.7: Asian Economic Engagement and Participation in Domestic Value Added

	Dep Var: Weighted Average of Domestic Value Added to Gross Exports Ratio								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Change in Share of Imports from Asia	0.0652 (0.276)		-0.0329 (-0.129)						
Change in Share of Exports to Asia		-0.263* (-1.708)	-0.266 (-1.674)						
Change in Share of Imports from Asia5				0.0397 (0.158)		0.0678 (0.252)			
Change in Share of Exports to Asia5					0.107 (0.481)	0.111 (0.484)			
Change in Share of Imports from China							0.751 (1.341)		0.717 (1.246)
Change in Share of Exports to China								0.716 (1.192)	0.697 (1.240)
N	46	46	46	46	46	46	46	46	46
r2	.00098	.0967	.097	.000296	.00821	.00906	.0569	.093	.145

Note: t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 23 countries over 2000–15. Asia5 = Bangladesh, Cambodia, China, India, and Vietnam.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5.8: Asian Economic Engagement and Participation in a Complex GVC

	Dep Var: Export-weighted Production Length								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Change in Share of Imports from Asia	-0.420 (-0.421)		-0.783 (-0.908)						
Change in Share of Exports to Asia		-0.933 (-1.619)	-0.981* (-1.746)						
Change in Share of Imports from Asia5				-1.496** (-2.181)		-1.585* (-1.891)			
Change in Share of Exports to Asia5					-0.247 (-0.229)	-0.352 (-0.321)			
Change in Share of Imports from China							-2.243 (-1.443)		-2.337 (-1.518)
Change in Share of Exports to China								1.817 (0.746)	1.881 (0.736)
N	46	46	46	46	46	46	46	46	46
r2	.00317	.0944	.105	.0328	.00343	.0396	.0395	.0466	.0893

Note: t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 23 countries over 2000–15. Asia5 = Bangladesh, Cambodia, China, India, and Vietnam.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Finally, we use export data at the country-sector level to study whether exports to Asia change the pattern of exports to other countries. In other words, we are interested in examining whether trade diversion happens in certain types of industries (or exporting countries) but not others. To this end, we

regress (log) exports at the sector (HS 2-digit) level to the rest of the world or Asia (both excluding China as a destination) on (log) exports to Asia as well as its interaction with various sector factor intensities. Country-year fixed effects are included to capture exporting country–specific supply shocks; industry-year fixed effects are included to control for global demand shocks for a particular product, such as a commodity.

Table 5.9 reports the results. As shown in column (1), we continue to find complementary effects of exports to Asia on exports to the rest of the world. However, we do not find stronger complementary effects in the more upstream sectors, suggesting that the increase in upstreamness of exports observed in a country's overall exports should be related to more upstream products exported to Asia, rather than to the rest of the world. In column (2), we find that the complementary effects on exports to the rest of the world are weaker for skill-intensive products.

Table 5.9: Do More Exports to Asia Change the Pattern of Trade to Other Countries?

Dependent Var	(1) $\ln(Exp_{cit})$ to ROW but Asia	(2) $\ln(Exp_{cit})$ to ROW but Asia	(3) $\ln(Exp_{cit})$ to ROW but Asia5	(4) $\ln(Exp_{cit})$ to ROW but Asia5	(5) $\ln(Exp_{cit})$ to ROW but China	(6) $\ln(Exp_{cit})$ to ROW but China
Destination Country Group	Asia		Asia5		China	
ln(Exp to Group) (lagged)	0.379***	0.237	-0.415***	-1.265***	0.270***	0.170
	(8.838)	(1.595)	(-6.108)	(-6.475)	(6.845)	(1.136)
ln(Exp to Group) (lagged) x w/						
upstreamness	0.0161		0.111***		0.0351**	
	(1.020)		(4.247)		(1.992)	
capital intensity$_{US}$		0.0117		-0.0105		0.0160
		(0.490)		(-0.251)		(0.587)
material intensity$_{US}$		-0.0174		0.171***		-0.00230
		(-0.635)		(3.980)		(-0.079)
skill intensity$_{US}$		-0.157***		-0.221***		-0.0869
		(-2.770)		(-4.529)		(-1.527)
Country x Year FE	Y	Y	Y	Y	Y	Y
Industry x Year FE	Y	Y	Y	Y	Y	Y
N	30373	29698	13700	13477	13611	13389
r2	.697	.704	.656	.665	.727	.734

Note: t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 46 countries over 2000–15. Asia includes all member countries of the Asian Development Bank except China, Australia, and New Zealand. Asia5 = Bangladesh, Cambodia, China, India, and Vietnam. ROW = rest of the world, excluding Asia, Asia5, or China.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The regression results from analyzing the complementary effects of participation in Asia5's GVCs are more intriguing. First, as reported in table 5.9, column (3), the overall complementary effects on exports are concentrated in the more upstream sectors. Column (4) shows in addition that the effects are stronger in the material-intensive sectors, and weaker in the skill-intensive sectors. These results appear to contrast with the findings in tables 5.4 and 5.5, which show capital deepening instead of resource intensification in overall exports in response to increased engagement in GVCs with Asia. Based on the same reasoning we employed to explain the seemingly conflicting results between table 5.9 column (2) and table 5.6, we postulate the following possibility: although more exports to Asia5 are not associated with more material-intensive exports to Asia5, they do induce more exports of those goods to non-Asia5 countries.

In table 5.9, the final two columns show that more exports to China are associated with more exports to the rest of the world, particularly for the more upstream sectors. However, we find no systematic change in the specialization patterns measured in terms of the three factor intensities.

Characteristics and Policy Implications of the Trade Linkages between Sub-Saharan Africa and Asia

This subsection aims to conduct empirical analysis to examine what country characteristics will impact the way trade with Asia shapes Sub-Saharan African nations' participation in GVCs. We hope to identify several key policy interventions for countries to consider for maximizing the benefits of trade with Asia. To this end, we add interaction terms between key country characteristics of economic fundamentals and institutions and the measures of trade with Asia. The country characteristics we consider include three individual country measures of institutions, namely, rule of law, corruption, and political stability, and three measures of economic fundamentals, namely, (ln) GDP per capita, (ln) natural resources, and whether the country is landlocked.

Given that we have found that trade with Asia can increase Sub-Saharan African countries' average upstreamness and capital intensity of exports, we use these two averages as our dependent variables of interest for the policy analysis. As reported in table 5.14, when a country's export-weighted average of upstreamness is used as the dependent variable, we find that although a larger proportion of a country's exports to Asia is associated with the country's overall export upstreamness, the relation is weaker for Sub-Saharan African countries that have a higher corruption index on average (column (2)). There is no significant relation between export upstreamness and individual countries' share of imports from Asia. However, we find that a country's measure of rule of law (column (1)) or political stability (column (2)) does not seem to be related to its export upstreamness.

In table 5.10, columns (4) through (6), we find that the positive relation between export upstreamness and the share of exports to Asia is weaker for countries that have a larger GDP per capita and access to the sea (that is, not landlocked), as suggested by the negative and significant coefficients on the corresponding interaction terms.

We next consider how the same sets of countries' characteristics affect the relation between the extent of trade with Asia and the capital intensity of the countries' overall exports (to the rest of the world). As reported in table 5.11, although we find that proportionally more exports to Asia is associated with capital deepening of Sub-Saharan African countries' exports, the additional effects related to the six country characteristics are not as strong as those in table 5.10. The only country characteristic that appears to matter is GDP per capita. Sub-Saharan African countries that are relatively poorer appear to benefit more from exporting to Asia, in terms of capital deepening in their export baskets.

Table 5.10: Institutions, Asian Economic Engagement, and Upstreamness

Dependent Variable	Export-weighted Upstreamness					
Country Characteristic	Rule of Law	Corruption	Pol Stabilty	(ln) gdp per capita	(ln) resources	landlocked
	(1)	(2)	(3)	(4)	(5)	(6)
Imp from Asia/ Tot Imp	0.231	0.150	0.396	1.383	0.339	0.373
	(0.622)	(0.229)	(1.588)	(1.114)	(1.205)	(1.256)
Exp to Asia/ Tot Exp	0.215	2.092**	0.443	2.853**	0.440	0.815***
	(0.506)	(2.603)	(1.289)	(2.654)	(0.991)	(3.097)
Country Characteristic x						
Imp from Asia/ Tot Imp	-0.119	0.118	0.0433	-0.145	-0.00742	0.0197
	(-0.284)	(0.378)	(0.178)	(-0.973)	(-1.006)	(0.054)
Exp to Asia/ Tot Exp	-0.270	-0.896**	-0.0269	-0.310**	0.00465	-0.797**
	(-0.563)	(-2.090)	(-0.100)	(-2.521)	(0.419)	(-2.622)
Year FE	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y
N	691	691	691	602	592	608
r2	.887	.89	.887	.908	.902	.893

Note: All regressors are lagged one year. t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 46 countries over 2000–15.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5.11: Institutions, Asian Economic Engagement, and Capital Intensity of Exports

Dependent Variable	Export-weighted Capita Intensity					
Country Characteristic	Rule of Law	Corruption	Pol Stabilty	(ln) gdp per capita	(ln) resources	landlocked
	(1)	(2)	(3)	(4)	(5)	(6)
Imp from Asia/ Tot Imp	-0.188	1.069	0.0194	1.843	0.236	0.255
	(-0.350)	(1.101)	(0.065)	(1.209)	(0.598)	(0.766)
Exp to Asia/ Tot Exp	0.0532	1.026**	0.264	2.717***	0.220	0.489***
	(0.175)	(2.102)	(1.320)	(3.819)	(0.815)	(3.141)
Country Characteristic x						
Imp from Asia/ Tot Imp	-0.528	-0.417	-0.391	-0.187	0.00182	0.820*
	(-0.886)	(-0.785)	(-1.172)	(-0.983)	(0.183)	(1.934)
Exp to Asia/ Tot Exp	-0.317	-0.377	-0.162	-0.316***	0.00485	-0.127
	(-0.927)	(-1.285)	(-0.672)	(-3.509)	(0.646)	(-0.455)
Year FE	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y
N	691	691	691	602	592	608
r2	.862	.856	.861	.87	.863	.863

Note: All regressors are lagged one year. t-statistics, based on standard errors clustered at the country level, are in parentheses. The sample covers 46 countries over 2000–15.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

From the results in tables 5.10 and 5.11, we learn that countries that are relatively poorer or have access to the sea benefit more from GVC engagement with Asia. Governments of Sub-Saharan African countries, especially those that are along the coast of the continent, can consider policies to promote exports to Asia as a tool for poverty reduction. And policies that reduce corruption can enhance a country's economic efficiency in general and increase the benefits of trade with Asia in particular.

6   Conclusion and Policy Implications

This paper studies the effects of Asia's economic engagement on individual Sub-Saharan African nations' participation in GVCs. It first uses detailed trade statistics to describe the overall GVC trends between Asia and Sub-Saharan Africa in recent years. It measures and identifies the key exporting sectors driving participation in GVCs by Sub-Saharan Africa and selected Sub-Saharan African nations. The findings show that although overall exports from Sub-Saharan Africa to Asia are still highly concentrated in resource-intensive sectors, a few countries have leveraged the export booms to Asia to diversify their export portfolios. Furthermore, each Sub-Saharan African nation has a distinct main trading partner in Asia, in contrast to the traditional thinking that China has become Sub-Saharan Africa's dominant trading partner. For example, India has emerged as a leading trading partner of many Sub-Saharan African nations.

There are several reasons why more exports to a country (or region) would complement exports to other countries. First, in the presence of internal economies of scale, increased sales at the firm level, by tapping into more export markets, implies spreading the fixed costs of production by exporting over a larger volume of production and driving down the average cost of production. Second, in the presence of external economies of scale, increased exports may generate positive externalities between firms. Such positive externalities can take the form of labor pooling and technology spillover in exporting or industrial agglomeration, or information spillover between firms through learning about foreign markets. The third reason, which is confirmed indirectly by the result of the positive correlation between imports from Asia and exports to the rest of the world, is that participation in GVCs is a two-way street. More exports to a country usually come with more imports from the same country or other countries. It has been shown in the literature that imports of foreign intermediate inputs can increase a firm's productivity, which in turn raises its sales and profits. So, the idea of trade diversion based on a zero-sum concept is a rare situation. There are many reasons why a country's participation in GVCs with a region that is growing fast can serve as an engine of growth of the same country.

Using a panel data set of trade for 46 Sub-Saharan African countries over 16 years from 2000 and 2015, the regression analyses show that Asian countries' economic engagement complements rather than crowds out Sub-Saharan African countries' exports to the rest of the world. Using panel data on trade at the country-industry level, the analysis finds that Asian economic engagement in the continent is associated with an increase in upstreamness. Proportionally more imports from Asia are associated with shortening of the production chains of a Sub-Saharan African nation's exports. Trade with Asia has no effect on the domestic content in Sub-Saharan Africa's exports. Engagement with Asian GVCs resulted in capital deepening of Sub-Saharan African exports, but no enhancement in the skill content of exports. Such capital deepening of exports is mostly driven by more exports of capital-intensive goods to Asia, rather than exports of such goods to the rest of the world.

The regression results show that proportionally more exports to but not imports from Asia can help Sub-Saharan African nations move up the value chains. The effects are particularly strong among Sub-Saharan African countries that have access to the sea but are relatively poorer than their Sub-Saharan African peers. Corruption appears to impede not only trade, but also the benefits from participation in GVCs. This result helps explain why anti-corruption policies can enhance economic efficiency. Surprisingly, the general measure of a country's rule of law does not affect the relation between countries' trade with Asia or their GVC outcomes.

On identifying which value chains in Asia, if any, promise the largest potential for Sub-Saharan African nations to diversify their exports or move up the value chains, based on the assessment in this paper, it is not easy to come up with a definite list of products or countries. The study does reveal that countries

that are more dependent on natural resources, like Nigeria, seem to have diversified successfully away from primary goods, thanks to trade with Asia. Also, based on the finding, governments of Sub-Saharan African countries, especially those that are along the coast of the continent, could consider policies to promote more participation in Asian value chains as a vehicle for poverty reduction.

Annex A: Assessing Asia-Africa Global Value Chain Linkages

Table A.1: List of African Countries in the Study Sample

ISO	Country
DZA	Algeria
AGO	Angola
BEN	Benin
BDI	Burundi
CPV	Cabo Verde
CMR	Cameroon
CAF	Central African Rep.
TCD	Chad
COG	Congo, Rep.
CIV	Côte d'Ivoire
COD	Congo, Dem. Rep.
DJI	Djibouti
EGY	Egypt, Arab Rep.
GNQ	Equatorial Guinea
ERI	Eritrea
ETH	Ethiopia
GAB	Gabon
GMB	Gambia, The
GHA	Ghana
GIN	Guinea
KEN	Kenya
LBR	Liberia
LBY	Libya
MDG	Madagascar
MWI	Malawi
MLI	Mali
MRT	Mauritania
MUS	Mauritius
MAR	Morocco
MOZ	Mozambique
NER	Niger
NGA	Nigeria
RWA	Rwanda
STP	São Tomé and Príncipe
SEN	Senegal
SYC	Seychelles
SLE	Sierra Leone
ZAF	South African Customs Union

SSD	South Sudan
SDN	Sudan
TGO	Togo
TUN	Tunisia
UGA	Uganda
TZA	Tanzania
ZMB	Zambia
ZWE	Zimbabwe

Table A.2: Ethiopia's Top Five Sectors with Its Top Five Trade Partners

Top Destinations	Sector Rank	HS Code	Sector	Exports (Million US$)	Top Destinations	Sector Rank	HS Code	Sector	Exports (Million US$)
			2005					2015	
Japan	1	9	Coffee, tea, mate	114.298	China	1	12	Oil seeds	294.143
	2	41	Raw hides and skins	1.994		2	41	Raw hides and skins	47.495
	3	12	Oil seeds	1.419		3	64	Footwear, gaiters	15.065
	4	15	Animal or vegetable fat	0.401		4	86	Railway/ tramway locomotives	7.555
	5	5	Dairy produce	0.090		5	26	Ores, slag and ash	6.911
China	1	12	Oil seeds	66.360	Japan	1	9	Coffee, tea, mate	76.238
	2	41	Raw hides and skins	14.994		2	12	Oil seeds	6.340
	3	26	Ores, slag and ash	8.739		3	6	Live trees and other	4.251
	4	9	Coffee, tea, mate	5.619		4	15	Animal or vegetable fat	0.932
	5	13	Lac; gums; resins	0.666		5	72	Iron and steel	0.792
Korea, Rep.	1	72	Iron and steel	10.862	India	1	7	Edible vegetables	39.119
	2	12	Oil seeds	2.600		2	12	Oil seeds	8.549
	3	9	Coffee, tea, mate	1.591		3	41	Raw hides and skins	8.243
	4	5	Dairy produce	0.774		4	71	Natural or cultured pearls	6.422
	5	41	Raw hides and skins	0.019		5	9	Coffee, tea, mate	2.869
India	1	41	Raw hides and skins	4.882	Korea, Rep.	1	9	Coffee, tea, mate	34.924
	2	69	Ceramic products	1.639		2	12	Oil seeds	17.733
	3	7	Edible vegetables	1.633		3	62	Apparel access, non-knitted	0.784
	4	12	Oil seeds	1.271		4	5	Dairy produce	0.511
	5	9	Coffee, tea, mate	1.089		5	41	Raw hides and skins	0.256
Malaysia	1	41	Raw hides and skins	6.587	Pakistan	1	7	Edible vegetables	41.180
	2	12	Oil seeds	1.261		2	9	Coffee, tea, mate	3.192
	3	52	Cotton	0.252		3	12	Oil seeds	0.343
	4	7	Edible vegetables	0.179		4	23	Food residues and waste	0.120
	5	9	Coffee, tea, mate	0.156		5	41	Raw hides and skins	0.030

Source: CEPII's BACI World Trade database.

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Table A.3: Ghana's Top Five Sectors with Its Top Five Trade Partners

Top Destinations	Sector Rank	HS Code	Sector	Exports (Million US$)	Top Destinations	Sector Rank	HS Code	Sector	Exports (Million US$)
			2005					2015	
China	1	26	Ores, slag and ash	51.58022	India	1	71	Natural or cultured pearls	3010.022
	2	18	Cocoa and cocoa prep	25.7293		2	8	Edible fruits	86.39117
	3	44	Wood	3.390273		3	44	Wood	59.56935
	4	74	Copper & articles	2.997937		4	76	Aluminum & articles	16.5372
	5	12	Oil seeds	1.601391		5	12	Oil seeds	14.1742
India	1	44	Wood	33.81974	China	1	27	Mineral fuels, miner	863.6833
	2	8	Edible fruits	27.36729		2	26	Ores, slag and ash	94.99428
	3	18	Cocoa and cocoa prep	8.285026		3	18	Cocoa and cocoa prep	50.65181
	4	72	Iron and steel	5.406672		4	44	Wood	49.94178
	5	12	Oil seeds	4.300058		5	12	Oil seeds	5.373074
Japan	1	18	Cocoa and cocoa prep	65.69483	Malaysia	1	18	Cocoa and cocoa prep	244.2733
	2	26	Ores, slag and ash	4.478655		2	15	Animal or vegetable fat	14.03919
	3	3	Fish and crustaceans	3.249041		3	40	Rubber and articles	10.39072
	4	22	Beverages, spirits & vinegar	0.8040604		4	74	Copper & articles	1.086118
	5	44	Wood	0.465309		5	76	Aluminum & articles	0.2758972
Malaysia	1	18	Cocoa and cocoa prep	47.19221	Vietnam	1	8	Edible fruits	112.5423
	2	44	Wood	0.6226062		2	44	Wood	17.76075
	3	14	Vegetable plaiting material	0.411897		3	12	Oil seeds	0.2752131
	4	22	Beverages, spirits & vinegar	0.129917		4	3	Fish and crustaceans	0.2352556
	5	40	Rubber and articles	0.04738819		5	52	Cotton	0.1852522
Singapore	1	18	Cocoa and cocoa prep	8.329779	Japan	1	18	Cocoa and cocoa prep	109.2291
	2	22	Beverages, spirits & vinegar	1.080018		2	3	Fish and crustaceans	2.853577
	3	44	Wood	0.740608		3	78	Lead & articles	1.611685
	4	14	Vegetable plaiting material	0.224966		4	71	Natural or cultured pearls	0.934073
	5	82	Tools, implements, cutlery	0.199289		5	46	straw	0.6153649

Source: CEPII's BACI World Trade database.

Table A.4: Kenya's Top Five Sectors by Its Top Five Trade Partners

			2005					2015	
Top Destinations	Sector Rank	HS Code	Sector	Exports (Million US$)	Top Destinations	Sector Rank	HS Code	Sector	Exports (Million US$)
Pakistan	1	9	Coffee, tea, mate	167.7666	Pakistan	1	9	Coffee, tea, mate	328.4318
	2	28	Inorganic chemicals	6.594103		2	7	Edible vegetables	4.362798
	3	41	Raw hides and skins	6.404759		3	28	Inorganic chemicals	3.73237
	4	72	Iron and steel	3.341439		4	41	Raw hides and skins	1.743296
	5	74	Copper & articles	2.171675		5	49	Printed books, newspapers	0.54378
India	1	28	Inorganic chemicals	27.73189	India	1	7	Edible vegetables	35.01711
	2	9	Coffee, tea, mate	7.490801		2	28	Inorganic chemicals	18.23705
	3	41	Raw hides and skins	6.018839		3	9	Coffee, tea, mate	16.15962
	4	25	Salt, sulfur, earths	5.592788		4	41	Raw hides and skins	10.49447
	5	8	Edible fruits	4.979142		5	25	Salt, sulfur, earths	6.871029
Japan	1	21	Misc edible prep	8.788734	China	1	26	Ores, slag and ash	52.40169
	2	9	Coffee, tea, mate	8.204363		2	41	Raw hides and skins	16.78475
	3	6	Live trees and other	5.610801		3	53	Other vegetable textile fibers	6.498787
	4	7	Edible vegetables	3.346803		4	3	Fish and crustaceans	3.947056
	5	8	Edible fruits	2.688063		5	9	Coffee, tea, mate	3.621609
Thailand	1	28	Inorganic chemicals	25.71048	Japan	1	9	Coffee, tea, mate	16.67972
	2	29	Organic chemicals	4.365899		2	6	Live trees and other	13.16013
	3	84	Nuclear reactors	0.834008		3	26	Ores, slag and ash	11.73737
	4	71	Natural or cultured pearls	0.6467115		4	74	Copper & articles	7.982799
	5	85	Electrical machinery	0.158189		5	21	Misc edible prep	6.389079
China	1	41	Raw hides and skins	4.514817	Afghanistan	1	9	Coffee, tea, mate	64.4741
	2	26	Ores, slag and ash	3.828447		2	48	Paper and paperboard	0.1002294
	3	74	Copper & articles	2.994845		3	27	Mineral fuels, miner	0.05059287
	4	53	Other vegetable textile fibers	2.932382		4	62	Apparel access, non-knitted	0.003449
	5	5	Dairy produce	1.46863		5	84	Nuclear reactors	0.001584

Source: CEPII's BACI World Trade database.

Table A.5: Nigeria's Top Five Sectors by Its Top 5 Trade Partners

	2005					2015			
Top Destinations	Sector Rank	HS Code	Sector	Exports (Million US$)	Top Destinations	Sector Rank	HS Code	Sector	Exports (Million US$)
Japan	1	27	Mineral fuels, miner	846.4929	India	1	27	Mineral fuels, miner	9033.217
	2	12	Oil seeds	27.65013		2	8	Edible fruits	52.67016
	3	18	Cocoa and cocoa prep	0.2507521		3	76	Aluminum & articles	45.10517
	4	96	Misc manu	0.161791		4	41	Raw hides and skins	19.71897
	5	13	Lac; gums; resins	0.1044741		5	9	Coffee, tea, mate	9.447653
Indonesia	1	27	Mineral fuels, miner	849.5049	Japan	1	27	Mineral fuels, miner	2379.1
	2	18	Cocoa and cocoa prep	3.395985		2	12	Oil seeds	91.01012
	3	52	Cotton	2.667463		3	76	Aluminum & articles	60.51258
	4	44	Wood	0.7519785		4	71	Natural or cultured pearls	0.3967107
	5	78	Lead & articles	0.4311129		5	3	Fish and crustaceans	0.233185
China	1	27	Mineral fuels, miner	452.912	China	1	27	Mineral fuels, miner	686.9305
	2	41	Raw hides and skins	7.634421		2	44	Wood	308.6758
	3	26	Ores, slag and ash	7.120077		3	26	Ores, slag and ash	66.27371
	4	74	Copper & articles	1.820759		4	74	Copper & articles	11.29131
	5	18	Cocoa and cocoa prep	1.551082		5	41	Raw hides and skins	9.215628
Korea, Rep.	1	27	Mineral fuels, miner	327.9057	Korea, Rep.	1	27	Mineral fuels, miner	835.1745
	2	74	Copper & articles	0.1231622		2	74	Copper & articles	82.53073
	3	29	Organic chemicals	0.056706		3	73	Articles of iron or steel	38.676
	4	78	Lead & articles	0.03900329		4	78	Lead & articles	30.07333
	5	3	Fish and crustaceans	0.029914		5	76	Aluminum & articles	19.64158
New Zealand	1	27	Mineral fuels, miner	85.25531	Thailand	1	27	Mineral fuels, miner	131.7149
	2	84	Nuclear reactors	0.011223		2	76	Aluminum & articles	3.593936
	3	73	Articles of iron or steel	0.007939713		3	78	Lead & articles	2.899792
	4	85	Electrical machinery	0.007146		4	26	Ores, slag and ash	1.634907
	5	71	Natural or cultured pearls	0.005037		5	3	Fish and crustaceans	1.086911

Source: CEPII's BACI World Trade database.

Table A.6: Tanzania's Top Five Sectors by Its Top Five Trade Partners

Top Destinations	Sector Rank	HS Code	Sector	Exports (Million US$)	Top Destinations	Sector Rank	HS Code	Sector	Exports (Million US$)
			2005					**2015**	
China	1	26	Ores, slag and ash	165.1134	India	1	71	Natural or cultured pearls	550.2276
	2	52	Cotton	36.6135		2	8	Edible fruits	198.1937
	3	12	Oil seeds	11.2141		3	7	Edible vegetables	197.8772
	4	44	Wood	9.287435		4	3	Fish and crustaceans	65.52719
	5	5	Dairy produce	1.922866		5	44	Wood	21.44036
India	1	8	Edible fruits	42.95194	China	1	15	Animal or vegetable fat	218.4573
	2	7	Edible vegetables	24.07207		2	26	Ores, slag and ash	124.0552
	3	44	Wood	8.844825		3	12	Oil seeds	118.4395
	4	71	Natural or cultured pearls	6.944141		4	74	Copper & articles	55.19548
	5	52	Cotton	5.330626		5	53	Other vegetable textile fibers	22.35697
Japan	1	9	Coffee, tea, mate	24.48582	Japan	1	26	Ores, slag and ash	222.4491
	2	26	Ores, slag and ash	23.45496		2	12	Oil seeds	53.24211
	3	12	Oil seeds	14.02304		3	9	Coffee, tea, mate	42.03813
	4	3	Fish and crustaceans	11.25978		4	24	Tobacco	36.44255
	5	24	Tobacco	1.564161		5	3	Fish and crustaceans	10.32331
Malaysia	1	74	Copper & articles	16.47798	Vietnam	1	8	Edible fruits	95.09376
	2	24	Tobacco	13.56269		2	52	Cotton	14.87302
	3	52	Cotton	4.287202		3	12	Oil seeds	12.09502
	4	51	Wool, fine or animal hair	0.110281		4	23	Food residues and waste	10.53931
	5	3	Fish and crustaceans	0.07253794		5	3	Fish and crustaceans	2.32257
Thailand	1	52	Cotton	23.57944	Malaysia	1.5	26	Ores, slag and ash	75.13701
	2	26	Ores, slag and ash	1.600344		1.5	74	Copper & articles	31.75936
	3	44	Wood	1.049194		3	18	Cocoa and cocoa prep	17.54297
	4	71	Natural or cultured pearls	0.6638155		4	52	Cotton	1.056782
	5	12	Oil seeds	0.1755385		5	20	Prepa vege, fruits, nuts	0.598706

Source: CEPII's BACI World Trade database.

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