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What Can Trade Tell Us About Economic Transformation? Composition of Trade and Structural Transformation in African Countries

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Abstract

We explore the effects of exporting manufactures, primary commodities, and food and agricultural products, and we examine the impact of importing capital and semi-capital goods, on structural transformation in a group of 21 sub-Saharan African countries that were covered by the inaugural African Transformation Report (ACET, 2014). The empirical results suggest that the import of capital and semi-capital goods can be a good predictor of structural transformation, while concentration of exports in primary commodities, and food and agricultural products, seems to predict weak structural transformation. In addition, we obtain evidence suggesting that higher shares of capital goods in total imports seem to have a greater positive influence in resource (primary-commodity) rich economies.

Keywords: Structural Transformation, Africa, Export, Import.

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1. Introduction

The 2011 Economic Report on Africa (ECA and AUC, 2011) noted that "[m]eaningful economic transformation remains a major development challenge in Africa despite increased GDP growth over the last decade". The same report concluded that transforming African economies from low-income agrarian economies to high-income industrialized ones remains a major development challenge. Furthermore, lack of structural economic transformation in many African countries has been identified as one of the main reasons for lack of formal employment opportunities and for growth volatility.

In the same vein, in its inaugural flagship publication, the 2014 African Transformation Report, the African Center for Economic Transformation (ACET) argued that while the recent high economic growth in Africa is welcome, it will not by itself be sufficient to sustain development on the continent. The report argued that in order to ensure growth is sustainable and contributes to improving the lives of most people, African countries need to vigorously promote economic transformation.

Indeed, data from the last four decades show that most African countries have experienced high volatility in GDP growth rates. However, African economies in general experienced reasonably strong GDP growth rates in the post-independence period in the 1960s and 1970s—a period of state-led import-substituting policies—before the macroeconomic crises of the 1980s and the stagnation of a good part of the 1990s wiped out some of the economic gains of the previous two decades. In the 1980s and 1990s, most African countries experienced de-industrialization as manufacturing production shifted out of the continent and the African shares of world manufacturing production and world manufactured exports declined between 1980s and 2005 from 0.4% to 0.3%, and from 0.3% to 0.2%, respectively (UNIDO, 2009). Even when achieving strong growth, most African countries have experienced slow structural transformation in production and exports. This is clearly evident when comparing African performance with the structural transformation achieved by a group of eight earlier transformers (ACET, 2014)[1]. As Figure 1 shows, African countries have lower productivity in manufacturing and agriculture, and lower export competitiveness, and exhibit much less diversity in production and exports.

Measuring structural transformation and its drivers tends to involve assessment of the extent of production and export sophistication. The importance of trade composition and sophistication in the process of economic transformation has been emphasized by many studies (Havrylyshyn, 1985; Amsden, 1986; Baliamoune-Lutz, 2011 and 2019; Hausmann et al., 2007; Klinger, 2009), with more recent work focusing on the potential gains of South-South trade compared to South-North trade.

1. The eight comparator countries include Brazil, Chile, Indonesia, Malaysia, Singapore, South Korea, Thailand, and Vietnam.

In this paper, we use 1990-2010 disaggregated import and export panel data for 21 African countries that were studied in ACET's work on economic transformation in Africa. We develop new trade 'category intensity' indexes (TCII), which are then used in empirical estimations to investigate the role of trade in specific product categories in explaining structural transformation. More specifically, we use the trade 'category intensity' indexes as our variable of primary focus to shed light on two questions:

(1) Can the type of imports (capital goods versus other goods) predict structural transformation?
(2) Can the type of exports (manufacturing versus primary commodities) predict structural transformation?

Our indicator of structural transformation is ACET's African Transformation Index. We use fixed-effects and Arellano-Bond dynamic panel generalized method of moments (GMM) estimators and, in addition to the TCII on the right-hand-side, we control for several other relevant variables, including institutional quality, natural resource dependence, human capital, financial development, inward foreign direct investment, and income per capita. We find that the import of capital and semi-capital goods can be a good predictor of structural transformation, while concentration of exports in primary commodities and food and agricultural products seems to result in weak structural transformation. The empirical results also suggest that the composition of imports (import of capital goods) matters more for explaining structural transformation in natural-resource dependent countries. Surprisingly, we did not find any support for the effects of goods exports on structural transformation.

The rest of the paper is organized as follows. The next section provides an overview of the literature on the importance of structural transformation and its drivers. Section 3 focuses on the empirical analysis, while the results are discussed in section 4. Section 5 concludes the paper.

2. Structural Transformation: An Overview of the Literature

2.1 Structural Transformation in the Process of Economic Development

Hausmann et al. (2007), Hidalgo et al. (2007), Hidalgo (2009), and Hidalgo and Hausmann (2009), among others, have emphasized the importance of structural transformation in economic growth and development. These studies argue that different products have different consequences for development[2]. Hausmann et al. (2007) showed that the specific set of products that a country exports has significant consequences for the country's development. Empirically, they found that, after controlling for initial income per capita and other factors, the sophistication of a country's export basket is a good predictor of future growth. This implies that development is a process that involves not only the production of more of the same set of products, but also the introduction of new ones. Consequently, sustained growth involves the accumulation of more complex sets of capabilities.

In the African context, Page (2012) argued that Africa must industrialize, otherwise the continent would not be able to sustain the high growth rates it had experienced recently. Along the same line, in its inaugural flagship report, the 2014 African Transformation Report, ACET noted that while the recent high economic growth in Africa is welcome, it would not by itself sustain development on the continent. To ensure that growth is sustainable and plays a significant role in improving the lives of

2. This claim is not new in the literature. The importance of industrialization, for example, was highlighted by Kaldor (1967). The novel and significant contribution of the recent literature relates to the methods of analysis.

most people, African countries need to vigorously promote economic transformation.

2.2 Drivers of Structural Transformation

Two main schools of thought related to international trade exist in the literature on the drivers of structural transformation. On the one hand, there is the school of thought which analyzes the drivers of structural transformation based on the concept of product space, and on the other hand, the school of thought that considers that where a country exports matters for its structural transformation. Both schools of thought highlight the importance of the categories of goods produced and traded for structural transformation. This is consistent with the approach of our paper.

2.2.1 Drivers of Structural Transformation from the Perspective of Product Space

Product space is a network of products with varying degrees of linkage between them. It is one of the recent tools developed to analyze countries' structural transformations and was introduced in the literature by Hausmann and Klinger (2006 and 2007) and Hidalgo et al. (2007). These studies showed that countries tend to focus on goods that are 'near' to one another in the product space, and therefore a country's ability to move to new export sectors depends on how connected its existing export package is in this space. Some countries are concentrated in highly peripheral activities in the product space, such as producing oil or cotton. These sectors are poorly connected, as few countries are able to move from them to other products. But production in other countries is concentrated in more central activities in the product space, such as forestry or packaged food. These sectors are well connected, which means that the countries concerned are more able to move from these activities to a wide range of other activities.

Thus, product space reveals a country's current productive structure, and how easy or difficult its structural transformation might be, given its current productive structure. It also identifies the products that, given a country's current productive structure, could be most easily added to the country's export basket. One of the conclusions from the product space analysis is that the more a country produces a core of densely interconnected products (most of which are highly sophisticated and include hundreds of different varieties of chemicals and machinery, for example), the easier the country's structural transformation will be. On the other hand, the more a country produces poorly connected products— located on the periphery of the product space— (most of which are unsophisticated and primary products) the more difficult the country's structural transformation will be.

Product space has been used to analyze the potential and challenges of structural transformation in African countries. For instance, Abdon and Felipe (2011) used the concept of product space to analyze the evolution of sub-Saharan Africa's (SSA) productive structure and to discuss the opportunities for growth and diversification for four African countries: Ethiopia, Mozambique, Nigeria, and Senegal. The authors found that the majority of SSA countries are locked into exporting unsophisticated, highly standard products that are poorly connected in the product space. This makes the process of structural transformation of the region particularly difficult. The products that are nearby to those they already export have the same characteristics. Therefore, shifting to these products will do little to improve SSA's growth prospects. Abdon and Felipe (2011) concluded that to jump-start and sustain growth, SSA governments must implement policies and provide public inputs that will encourage the private sector to invest in new and more sophisticated activities.

Hidalgo (2011) also used the product space tools to explore Southern and East Africa's industrial opportunities by focusing on five countries: Kenya, Mozambique, Rwanda, Tanzania, and Zambia. The results suggested that the most natural avenue for future product diversification for these five Southern and East African nations resided in the agricultural sector, since all of these nations appear to have productive structures that are pre-adapted to the production of many agricultural products that none of them are currently exporting. Hidalgo (2011) also examined the potential benefits of further regional integration by pulling together the productive structure of these five countries. This exercise showed that the products that become more accessible in the combined economy are once again predominantly agricultural. The author concluded that these results suggest that while diversification into all sectors should remain an important long-term goal of the region, the path towards increased diversification in the near future may well lie in a more empowered and diverse agricultural sector.

Hausmann and Klinger (2008) applied the product space tool to South Africa's data, and explored the country's export performance over the past 50 years. They concluded that a lagging process of structural transformation was part of the explanation for South Africa's stagnant exports per capita. Slow structural transformation in South Africa was found to be a consequence of the peripheral nature of the country's productive capabilities.

Badibanga et al. (2009) compared the dynamics of structural transformation of African and Asian countries. More specifically, they developed a metric of structural transformation that captured the dynamics of an economy's transformation. They applied their measure of dynamic structural transformation to four-digit-level SITC trade data of China, Malaysia, and Ghana, over the period 1962–2000. The results showed that two important factors characterized the rapid transformation of the Chinese economy: the high proximity of its export basket to three main industrial clusters—capital goods, consumer durable goods, and intermediate inputs—and the increase in the values of the new goods belonging to those three clusters. Malaysia exhibited a similar but more modest pattern. In contrast, the structure of the Ghanaian economy appeared unchanged over the entire 1962–2000 period. Ghana's economy is dominated by primary goods clusters, and the values of the goods in those clusters have remained relatively low, suggesting that it faces a much more difficult structural transformation.

2.2.2. The Importance of Export Destination for Structural Transformation

As noted earlier, the destination of exports has also been highlighted as an important factor in structural transformation. Here the discussions are based on two trade theories. The Heckscher-Ohlin (HO) model of trade predicts that a country will specialize in those activities that most intensively use its relatively abundant factors. Therefore, according to this model, the South (i.e., developing countries) is expected to specialize in those goods that are intensive in its abundant factors: land and labor. The North (i.e., developed countries), in turn, would specialize in goods intensive in its abundant factors: human and physical capital. As a result, South–North trade would confine developing countries to a specialization in unsophisticated products, which would have fewer learning-by-doing productivity-enhancing benefits than those exported by the North to the South (Stokey, 1991).

The HO model has little to say on the composition of South–South or North–North trade, when factor endowments are similar across countries. However, given that across the world, significant volumes of trade are observed between countries with similar factor endowments, alternative models that could explain such flows have emerged. First, was Linder's hypothesis (Linder, 1961) that trade was

determined by similarity in demand structures. According to this hypothesis, countries with similar levels of income per capita would trade more with one another, and therefore one would expect North–North and South–South trade to flourish, given similar demand structures among Southern countries. After correcting for the methodological shortcomings of earlier studies, it has been found that countries with similar levels of per-capita GDP trade more with one another. This has been shown at the international level (Hallak, 2006), among Organization for Economic Cooperation and Development (OECD) countries (McPherson et al., 2000) and among developing countries (McPherson et al., 2001).

While the HO model suggests that South–North trade will be confined to goods low in both human and physical capital, the alternative trade models based on Linder's hypothesis, predict that South–South trade allows for trade across a broader variety of sectors. According to these models, South–South trade would not necessarily be confined to the raw materials and simple labor-intensive manufactures that the HO model would expect to dominate South–North trade, but could also include more 'sophisticated' products. In other words, these models hold out the possibility of South–South trade taking place in more sophisticated sectors than would be the case for South–North trade.

Empirical findings on the effects of South-South trade on structural transformation are mixed. In the 1980s, several empirical studies examined the difference in skill composition between South–South and South–North trade, often seeking to test the HO predictions and evaluate the development potential of South–South trade. Most of these studies found that exports from the least developed countries (LDCs) to the countries of the South had greater skill content than exports from LDCs to the North (Amsden, 1976, 1980; Richards, 1983). This finding gives empirical justification for a model that states that greater learning effects and technological spillovers arise from South–South trade (Amsden, 1986). Havrylyshyn (1985) also found that while trade flows from the South to the North conform to HO predictions, exports from LDCs to other LDCs contain relatively more physical and human capital than exports to industrial countries. These studies suggest that South–South trade can contribute to structural transformation.

Klinger (2009) also analyzed the composition of South–South as opposed to South–North trade in recent years, applying emerging methodologies and highly disaggregated trade data to consider whether the South as a market provides developing countries with greater opportunities to transform their productive structures and to move to more sophisticated export sectors than the Northern market does. The results show that for a group of developing countries, primarily in Africa, Latin America, and Central Asia, exports within the South are more sophisticated and better connected in the product space than exports to the North, whereas the opposite is true for the faster growing economies of Asia and Eastern Europe (excluding the Commonwealth of Independent States).

Along the same lines, Baliamoune-Lutz (2011) explored the growth effects of Africa's trade with China, distinguishing between the effect of imports and the effect of exports, and controlling for the role of export concentration. Using Arellano-Bond GMM estimations with panel data over the period 1995–2008, the author found four important results. First, there is no empirical evidence that exports to China enhance growth unconditionally. Second, the results suggest that export concentration enhances the growth effects of exporting to China, implying that countries that export one major commodity to China benefit more (in terms of growth) than countries that have more diversified exports. Third, contrary to the widely held view that increasing imports from China would have a negative effect, the empirical results show that China's share in a country's total imports has a robust

positive effect on growth. Finally, the evidence suggests that there is an inverted-U relationship between exports to developed countries and growth in Africa. Baliamoune-Lutz (2011) concluded that overall, the results seem to provide support for the hypothesis of growth by destination, i.e., that where a country exports matters for the exporting country's growth and development. In a more recent study, Baliamoune-Lutz (2019) found that exporting to developed countries enhances export sophistication in the exporting developing country, but there are diminishing returns from this impact.

On the other hand, other studies have found that South–South trade is less sophisticated and more concentrated in raw materials than South–North trade (OECD, 2006). The United Nations Conference on Trade and Development (UNCTAD, 2005) performed a detailed examination of trade flows between 1995 and 2005, and found that in the dynamism of South–South trade, primary commodities have played a more important role than in South–North trade, and the most dynamic manufactured product categories in South–South trade tend to be less skill- and technology-intensive than those in South–North trade. This is largely due to the emergence of China, which significantly increased its raw material imports from Africa (South–South trade) and its manufactured exports to the United States of America and Europe (South–North trade).

Our study complements the existing literature by providing further evidence about the drivers of structural transformation in the African context. More specifically, our paper makes three main contributions. It is the first study that utilizes a new indicator, the African Transformation Index, developed by ACET to investigate the drivers of structural transformation. Second, our paper uses panel data, which allows identifying factors that on average, contribute to structural transformation in Africa. Third, in addition to our variables of interest, our approach allows us to control for the effects of other factors, including policy-related factors. Indeed, besides trade-related variables —i.e., composition of exports and imports—which are our variables of primary interest, we also control for the effects of institutional variables that could also affect structural transformation in Africa.

3. Empirical Analysis

For the empirical analysis, ACET's African Transformation Index (ATI) is our proxy variable for measuring structural transformation. The ATI assesses the performance of countries on five attributes of transformation and aggregates them into an overall index. It is a composite index of the following five elements: diversification, export competitiveness, productivity, technology upgrading, and human economic well-being. According to ACET, the five elements are used to construct the ATI, based on the premise that for their transformation, African economies need to diversify their production, make their exports competitive, increase the productivity of farms, firms, and government offices, and upgrade the technology they use throughout the economy—all to improve human well-being. The overall ATI is constructed by combining sub-indexes related to the five aforementioned elements of economic transformation. The ATI ranges between 0 and 100, with a higher score indicating better performance[3]. It aims to compare the performance of all SSA countries, but because of the lack of data, only 21 countries are represented (see the list of the countries in the appendix)[4]. ACET aims to cover more countries with more recent data, but this is not yet done.

We use 1990-2010 disaggregated import and export (annual) panel data for the 21 African countries

3. ACET's ATI ranges between 0 and 100. However, for convenient econometric analysis we have changed the scale to a 0-1 range.
4. For further discussions on the ATI, see ACET (2014).

covered in ACET's work on economic transformation, and develop new trade 'category intensity' indexes (TCII), which are then used in empirical estimations to investigate the role of trade in specific product categories in explaining structural transformation. The TCII is derived as follows. We classify the top five categories (by value) of imports/exports either as capital goods, semi-capital goods, manufactures, primary commodities, or food and agricultural products. This yields five categories and we refer to the % share of each category in total imports/exports as trade category intensity index, with a higher share (index value) implying higher intensity.

We use the TCII as our right-hand-side (RHS) variable of primary interest to shed light on two questions. First, we assess whether the type of imports (capital goods versus other goods) predicts structural transformation. Second, we examine whether the type of exports (manufacturing versus primary commodities and food and agricultural products) can help predict structural transformation.

The methodology we use in the empirical analysis consists of performing fixed-effects and Arellano-Bond dynamic panel GMM estimations. In addition to TCII variables on the right-hand side, we also control for a number of relevant variables, including institutional quality (rule of law), agriculture (share in GDP), industry (share in GDP), human capital, financial development, inward foreign direct investment, and income per capita.

Table 1 shows summarized descriptive statistics for relevant variables, while Table 2 reports correlations among the main variables. We observe that the mean value for our indicator of structural transformation is rather low (0.29) and the maximum value is 0.74 (reached by Mauritius). In addition, we note (from the raw data) that large disparities exist among countries in the shares of primary commodities, food and agricultural products, and manufactures in exports, as well as in the relative import shares of capital and semi-capital goods.

The correlation coefficients reported in Table 2 indicate a strong positive linear correlation of the ATI with GDP per capita, financial development (broad money), share of manufactures in exports, human capital (tertiary school enrolments), and measures of institutional quality. On the other hand, the correlations of ATI with exports of primary commodities, food and agricultural products are negative, but much weaker in magnitude. The association of the ATI and imports of capital and semi-capital goods is also low and is positive in the case of semi-capital goods imports and negative in the case of capital goods.

4. Econometric Results

Table 3 reports the results associated with the fixed-effects estimations. The statistical evidence suggests that higher shares of raw materials (i.e., primary commodities), and food and agricultural products in exports are associated with lower structural transformation. Surprisingly, the results indicate that the share of manufactures in exports is negatively associated with structural transformation. On the other hand, imports of capital and semi-capital goods do not seem to have a significant effect on the indicator of structural transformation. However, we need to take into consideration the possibility of endogeneity of some of the RHS variables. We try to address the issue of endogeneity by estimating Arellano-Bond generalized method of moments (A-B GMM) equations, in which we treat all the RHS variables, except the rule of law, as endogenous.

Table 4 shows results from the A-B GMM estimations. The statistically significant coefficients on the imports of capital and semi-capital goods suggest that these variables exert a positive impact on structural transformation. Similarly, the statistical evidence also suggests that a greater share of industry in output, a more developed financial sector, and stronger rule of law lead to more structural transformation. On the other hand, higher concentration of exports on primary commodities and food and agricultural products seems to lead to lower structural transformation levels. Surprisingly, again we find that exporting more manufactures (as a share of merchandise exports) leads to lower levels of structural transformation. We investigated the presence of non-linearity in the relationship between exports of manufactures and structural transformation, but the results do not show evidence of non-linearity. In alternative estimations (results not shown but available upon request), we omitted the variable industry from the RHS, but the coefficient on the variable 'Manufactures Exports' remained statistically nonsignificant. In addition, we fail to find support for a significant effect of human capital (tertiary school enrolment) on structural transformation.

In column (7) of Table 4, we include the interplay of capital goods imports with the share of raw materials in exports and the share of manufactures in exports. We obtain evidence supporting a positive effect from the interplay of capital goods imports and primary commodity exports, suggesting that the composition of imports may contribute to predicting structural transformation more in the case of countries that export primary commodities. Perhaps importing more capital goods may help those economies move into processing/manufacturing or improve other aspects of structural transformation. During the years of commodity price increases in the 2000s, high prices may have helped countries accumulate foreign exchange and use it to fund imports of the capital goods needed to upgrade their production systems.

5. Conclusion

In recent years, many African countries have reversed the trend of low or negative growth rates and some countries have experienced remarkably high growth rates. However, significant GDP growth cannot be sustained in the absence of economic diversification, enhanced export competitiveness, technological upgrading, productivity increases, and availability of formal employment opportunities for women and men. Indeed, a country's economic transformation requires these processes of structural transformation to be in place, along with the institutions and policies that advance and support economic transformation (ACET, 2014).

We have examined the impacts of exporting manufactures, primary commodities, and food and agricultural products, as well as importing capital and semi-capital goods, on structural transformation in a group of 21 sub-Saharan African (SSA) countries. The empirical results suggest that the import of capital and semi-capital goods can be a good predictor of structural transformation, while concentration of exports in primary commodities and food and agricultural products seems to predict weak structural transformation. Additionally, the statistical evidence suggests that the import of capital goods has a stronger positive influence in economies dependent on primary commodities.

To the extent that importing capital goods allows countries to upgrade production systems and potentially move into manufacturing (processing), the relative size of capital goods imports may be positively correlated with the level of structural transformation. This is an important finding in the context of increasing trade tension between China and the United States of America. Indeed, trade tensions may raise the relative price of machinery and equipment (International Monetary Fund, 2019), which will negatively affect SSA countries' efforts to achieve structural transformation.

The finding that the share of manufactures in total exports does not seem to be a significant predictor of structural transformation may appear puzzling. A possible explanation, or at least speculation, however, could be the low level of manufactures exports in most countries in the covered sample, or that the level of product sophistication is very low (Abdon and Felipe, 2011; Hidalgo et al., 2007) and data on manufacturing may reflect mainly processing of primary products rather than sophisticated manufacturing. We intend to investigate this in future research.

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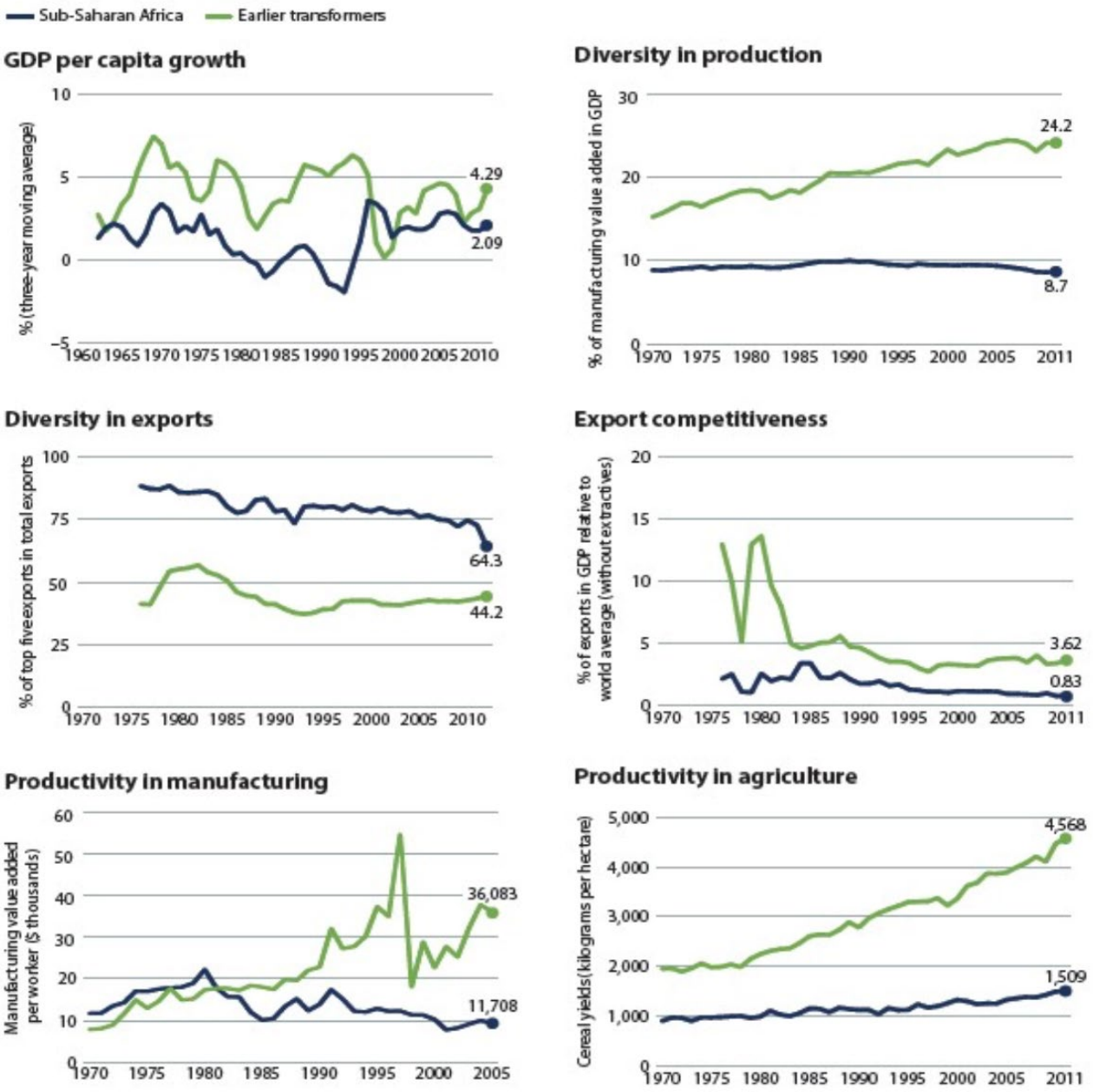
Figure 1: Indicators of Growth and Structural Transformation in sub-Saharan African Countries and Earlier Transformers



Source: ACET (2014).

Table 1: Descriptive Statistics of the Main Variables

Variable Name	Obs	Mean	Std. Dev.	Min	Max
ACET ATI	441	0.29	0.15	0.08	0.74
GDP per capita, PPP (constant 2011 international $)	441	3638	4608	401	20463
Agriculture, value added (% of GDP)	435	27.93	14.26	2.03	67.25
Industry, value added (% of GDP)	434	25.41	11.71	6.42	64.28
Broad Money (% of GDP)	441	28.84	17.14	7.60	102.21
Foreign direct investment, net inflows (% of GDP)	439	2.04	2.68	-8.59	13.57
% share of Manufactures in total Exports	347	10.86	8.69	0.05	63.02
% share of Primary Commodity in total Exports	347	33.60	29.86	0.09	99.67
% share of Food and Agriculture in total Exports	347	39.42	29.43	0.01	98.38
% share of Capital Goods in total Imports	346	35.33	7.74	16.24	57.58
% share of Semi-Capital Goods in total Imports	346	15.92	6.11	6.86	54.86

Source: Authors' calculations based on data from two online databases: UNCTAD Comtrade for manufactures, primary commodity, food and agriculture, capital goods, and semi-capital goods exports) and the World Development Indicators (2015) for the remaining variables.

Table 2: Correlations Analysis

	ACET ATI	GDP per capita	Agriculture	Industry	Broad money	FDI	Manufactures Exports	Raw Materials Exports	Food &Agricultural Exports	Capital Goods Imports	Semi-Capital Imports	School, tertiary	Corruption	Government Effectiveness	Regulatory Quality	Rule of Law
GDP per capita	0.56															
Agriculture (% GDP)	-0.74	-0.77														
Industry (% GDP)	0.30	0.76	-0.67													
Broad money (% GDP)	0.76	0.47	-0.49	0.11												
FDI (% GDP)	-0.03	-0.09	-0.10	0.10	0.02											
Manufactures Exports	0.64	0.26	-0.42	0.09	0.37	-0.18										
Raw Materials Exports	-0.11	0.37	-0.36	0.70	-0.18	0.21	-0.28									
Food and Agricultural Exports	-0.48	-0.61	0.73	-0.72	-0.34	-0.21	-0.25	-0.72								
Capital Goods Imports	-0.17	0.34	-0.03	0.41	-0.12	0.04	-0.24	0.36	-0.16							
Semi-Capital Imports	0.17	0.12	-0.16	0.01	0.26	0.22	-0.05	-0.07	-0.19	-0.17						
School, tertiary	0.69	0.66	-0.62	0.38	0.72	0.02	0.33	0.14	-0.51	0.00	0.02					
Corruption	0.53	0.39	-0.52	0.13	0.57	0.09	0.28	-0.11	-0.27	-0.18	0.37	0.39				
Government Effectiveness	0.68	0.49	-0.64	0.21	0.66	0.07	0.42	-0.06	-0.36	-0.12	0.26	0.53	0.81			
Regulatory Quality	0.64	0.54	-0.68	0.33	0.54	0.13	0.32	0.03	-0.37	-0.05	0.22	0.51	0.66	0.85		
Rule of Law	0.62	0.51	-0.60	0.23	0.64	0.14	0.38	-0.06	-0.37	-0.17	0.38	0.44	0.80	0.86	0.78	
Voice and Account	0.60	0.41	-0.60	0.17	0.63	0.11	0.40	-0.05	-0.38	-0.22	0.33	0.45	0.74	0.82	0.76	0.87

Source: Authors' calculations based on data from two online databases: UNCTAD Comtrade for manufactures, primary commodity, food and agriculture, capital goods, and semi-capital goods exports) and the World Development Indicators (2015) for the remaining variables.

Table 3: Results of Fixed-effects Model

Dependent variable: ATI	**(1)**	**(2)**
GDP per capita	0.0001 (0.000)	0.0003 (0.000)
Agriculture (% GDP)	0.032 (0.038)	0.031 (0.032)
Industry (% GDP)	0.237*** (0.046)	0.124*** (0.032)
Broad Money (% GDP)	0.180*** (0.031)	0.146*** (0.028)
Foreign Direct Investment (% GDP)	-0.022 (0.065)	0.035 (0.063)
Manufacturing, share of merchandise exports	-0.143*** (0.034)	-0.125*** (0.036)
Primary Commodity, share of merchandise exports	-0.100*** (0.020)	-0.094*** (0.021)
Food and Agricultural products, share of merchandise exports	-0.114*** (0.019)	-0.125*** (0.020)
Capital Goods, share of merchandise imports	0.013 (0.032)	-0.012 (0.032)
Semi-Capital Goods, share of merchandise imports	-0.013 (0.035)	-0.012 (0.033)
Rule of Law		0.74** (0.45)
Obs	328	328
R-sq: within between Overall	0.37 0.60 0.60	0.31 0.64 0.62
Hausman test: Chi2 (p value)	69.74 (0.00)	57.32 (0.00)

Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level.

Source: Authors' calculations based on data from two online databases: UNCTAD Comtrade for manufactures, primary commodity, food and agriculture, capital goods, and semi-capital goods exports) and the World Development Indicators (2015) for the remaining variables.

Table 4: A-B Dynamic Model Results

Dependent variable: ATI

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ATI_lag	0.795*** (0.022)	0.778*** (0.023)	0.686*** (0.028)	0.693*** (0.028)	0.684*** (0.029)	0.692*** (0.028)	0.671*** (0.021)
GDP per capita	0.0003 (0.001)	0.0001 (0.001)	0.0001 (0.001)	0.0001 (0.001)	0.0001 (0.001)	0.0001 (0.001)	0.0001 (0.001)
Agriculture (% GDP)	-0.003 (0.019)	-0.003 (0.018)	-0.003 (0.018)				
Industry (% GDP)	0.038** (0.01)	0.033** (0.01)	0.052** (0.02)	0.049** (0.02)	0.050** (0.02)	0.049** (0.02)	0.038** (0.02)
Broad Money (% GDP)	0.045*** (0.01)	0.043*** (0.013)	0.071*** (0.011)	0.070*** (0.014)	0.069*** (0.014)	0.070*** (0.014)	0.063*** (0.014)
Foreign Direct Investment (% GDP)	0.005 (0.02)	-0.008 (0.02)	0.032 (0.03)	-0.043* (0.026)	-0.036 (0.026)	-0.043 (0.026)	-0.033 (0.028)
Manufacturing, share of merchandise exports	0.012 (0.01)	0.003 (0.01)	-0.030** (0.01)	-0.034** (0.01)	-0.006 (0.03)	-0.034** (0.014)	0.012 (0.01)
Primary Commodity, share of merchandise exports	0.007 (0.004)		-0.026*** (0.008)	-0.025*** (0.009)	-0.024*** (0.008)	-0.025*** (0.008)	-0.021*** (0.006)
Food and Agriculture, share of merchandise exports		-0.019*** (0.005)	-0.033*** (0.009)	-0.030*** (0.009)	-0.027*** (0.009)	-0.030*** (0.009)	-0.028*** (0.009)
Capital Goods, share of merchandise imports	0.040*** (0.012)	0.039*** (0.012)	0.024* (0.013)	0.029** (0.013)	0.033** (0.013)	0.029** (0.013)	0.023** (0.01)
Semi-Capital Goods, share of merchandise imports	0.039*** (0.014)	0.034** (0.015)	0.039** (0.017)	0.042** (0.016)	0.048*** (0.017)	0.042** (0.016)	0.037** (0.01)
Rule of Law				0.951** (0.35)	1.449** (0.57)	0.95** (0.45)	0.82** (0.27)

(Manufacturing, share of merchandise exports)_ squared					-0.005 (0.005)		
Tertiary School Enrolment						0.023 (0.04)	
(Primary Commodity, share of merchandise exports) X (Capital Goods, share of merchandise imports)							0.032*** (0.001)
(Primary Commodity, share of merchandise exports) X (Manufacturing, share of merchandise exports)							-0.005 (0.03)
Obs	293	293	293	281	281	281	281

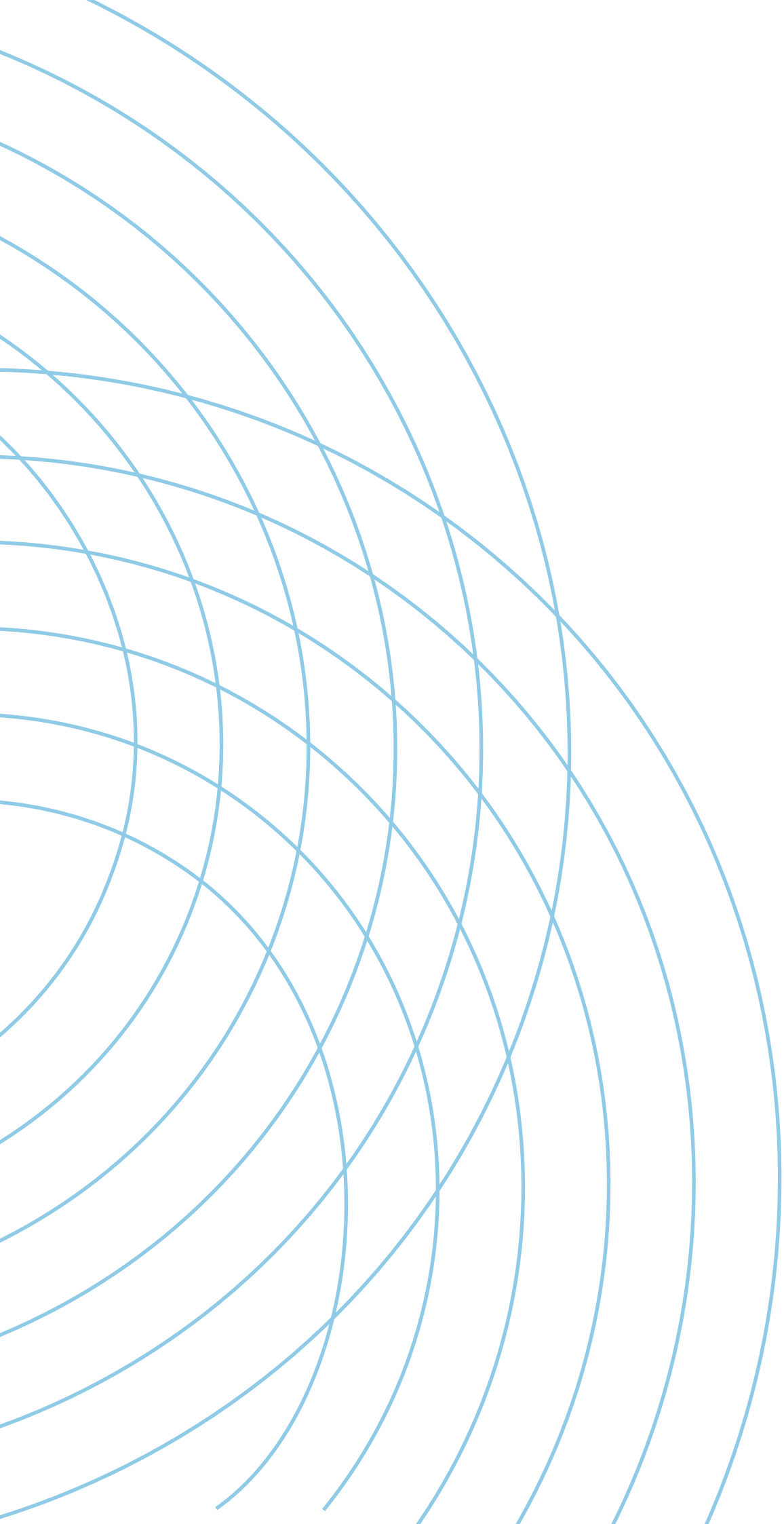
Note: Values in the parenthesis are standard errors. A single asterisk (*) denotes significance at the 10% level, two asterisks (**) at the 5% level, and three asterisks (***) at the 1% level. Sargan test and A-B second-order autocorrelation test results are omitted to conserve space but may obtained from the authors.

Source: Authors' calculations based on data from two online databases: UNCTAD Comtrade for manufactures, primary commodity, food and agriculture, capital goods, and semi-capital goods exports) and the World Development Indicators (2015) for the remaining variables.

Appendix

Table A.1: List of countries

Benin	Ethiopia	Malawi	Senegal
Botswana	Gabon	Mauritius	South Africa
Burkina Faso	Ghana	Mozambique	Tanzania
Burundi	Kenya	Nigeria	Uganda
Cameroon	Madagascar	Rwanda	Zambia
Cote d'Ivoire			



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