5. DETERMINANTS OF AFRICAN AGRICULTURAL EXPORTS

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Trade is an important engine for economic growth, food security, poverty reduction, and overall development. It is also a complex and sensitive subject for policymaking because it involves negotiations, dialogues, and agreements among partner countries across a variety of sociopolitical boundaries. Trade issues become more complicated in the context of agriculture, a sector that profoundly relies on social and ecological dynamism.

In the aftermath of the trade liberalization of the 1980s, a series of studies were conducted to document the trends, determinants, and prospects of agricultural trade both in Africa and elsewhere (Bouët et al. 2005; Bureau, Jean, and Matthews 2006; Bouët, Mishra, and Roy 2008; Croser and Anderson 2011; Moïsé et al. 2013). These studies highlighted a wide array of crucially important constraints to improving African agricultural trade. More importantly, they indicated the importance of global trade-policy actions and the need to address the different trade constraints holistically. According to these studies, agricultural trade determinants can be broadly classified under five major thematic areas: production capacity, the cost of trade, trade policies, domestic agricultural supports, and global market shocks. While production capacity and the cost of trade are usually referred to as supply-side constraints, many trade policies and agricultural support mechanisms in importing countries are considered to be demand-side constraints (with the exception of export taxes). Constraints related to global food, oil, and financial crises are taken as market-level trade constraints that influence imports and exports in different ways and to different extents from both the demand and the supply sides.

Supply-side determinants affect the competitiveness of a country in global or regional markets through their impact on costs of production and trading. These constraints include the nature and extent of resource endowments, productivity (including technology), the quality of the infrastructure and institutions that facilitate trade, and domestic agricultural support services provided to smallholder producers and traders in exporting countries. Demand-side constraints usually result from factors that (unsurprisingly) affect demand in importing countries, such as income growth, trade policies, and competitors' sales. Africa exports more than 75 percent of its agricultural production outside of the continent, and many of its trade partners impose several trade-protection measures that directly or indirectly limit agricultural exports. This is particularly the case for processed agricultural products and certain commodities, such as tobacco, cotton, coffee, cocoa, and oilseeds, in which Africa has the comparative advantage. In these as well as many other markets, African exporters compete with suppliers from other parts of the world. Therefore, close monitoring of the extent and nature of these constraints and their linkages with the flow of agricultural exports is required to guide effective, evidence-based trade policymaking in Africa.

The purpose of this chapter is to offer comprehensive and updated evidence on agricultural exports from Africa by examining the determinants of performance and competitiveness in order to isolate the key areas that should receive priority attention in policymaking at continental, regional, and national levels. Africa aspires to triple the current level of regional agricultural trade by 2025, which requires a wide range of interventions in the form of policies and investments. For these interventions to be effective and achieve their intended targets, key areas of intervention have to be identified, prioritized, and regularly monitored. This chapter presents a review of existing evidence, identifies key determinants of trade in general, and describes how these determinants are specifically important to African agricultural trade. Empirical evidence is provided to show the relative importance of trade constraints, how those constraints have

changed over time, and how they vary across countries.

The next section briefly reviews specific factors included in each of the five major determinants of trade, along with their conceptual and empirical links with trade. Thereafter, an empirical assessment estimating the relative importance of trade determinants is described, as are the data sources, the variables used, and the overall model results estimated for global-African and intra-African bilateral export trade.

The subsequent section describes, discusses, and tracks the major determinants of export flows; their magnitude, significance, and trends; and the conditions under which a factor becomes detrimental. The final section summarizes the major findings and draws conclusions of relevance for policy dialogue and action.

Review of Trade Determinants

Agricultural export performance is determined by many domestic and international factors from both the demand and the supply sides. Theoretical and empirical evidence suggests that these factors can be broadly classified into the five major categories indicated above: production capacity, the cost of trade, trade policies, domestic agricultural supports, and global market shocks. These constraints influence imports and exports in different ways and at different magnitudes.

Production Capacity

Production capacity refers to those factors that affect the level of supplies from a given country, including resource endowments and other technological and institutional factors that enhance a country's productivity and comparative advantages in global and regional markets. Both classical and neoclassical theories have exhaustively explained the importance of comparative advantage for improving performance of trade among countries. Nevertheless, the source of this production capacity and, hence, the source of comparative advantage has been strongly contended. While the Ricardian hypothesis advocates the importance of technological (or productivity) change as the major source of comparative advantage, the Heckscher-Ohlin hypothesis argues for the importance of relative factor endowments as a prime source of trade competitiveness. According to the Ricardian theory, the relative efficiency of producing goods and services determines the direction and magnitude of trade between two countries. In contrast, the Heckscher-Ohlin factor endowment theory predicts that countries with an abundance of one or more of the factors of production (land, labor, and capital) will specialize in commodities that require much of the abundant resources. However, empirical studies have confirmed that differences in productivity (technology) and factor endowment only explain a very small part of trade performance variations over time and across countries (Bergstrand 1990; Bernstein and Weinstein 2002). Moreover, recent evidence suggests factor endowment has greater relative importance over productivity or technology in explaining international trade performance (Amoroso, Chiquiar, and Ramos-Francia 2011).

The Cost of Trade

Factors exacerbating the costs of trade are highly diverse. The two most important factors are poor infrastructure and institutional inefficiency related to trade services—in addition to other costs, such as financial fees associated with export and import activities. The role of infrastructure in enhancing trade has been widely discussed in policy circles and in the literature (Bougheas, Demetriades, and Mamuneas 1999; Francois and Manchin 2007; Bouët, Mishra, and Roy 2008; Moïsé et al. 2013). Empirical studies have generally confirmed positive and significant effects of infrastructure quality on trade values in exporting countries.

However, therelative importance of infrastructural elements varies across studies. While road density has significant positive effects on trade volumes in low income countries, the effect of cellular phone density has been found to be less significant (Bouët, Mishra, and Roy 2008).

Institutional Efficiency

Institutional efficiency refers to the ease of doing business in relation to agricultural imports and exports. It includes procedures and delays in customs clearing, access to finance for traders, and the strength of contractual enforcement. Although customs and administrative procedures are essential for facilitating trade and implementing trade policies, they have the potential to restrict trade, particularly in countries where administrative systems are less automated, capacitated, and transparent.

These procedures and requirements delay delivery and cause extra costs related to storage fees and losses. Empirical studies have indicated that a 10 percent reduction in the time spent to clear exports, the number of signatures required to clear exports, or the number of documents needed to cross borders increases trade by 6 to 11 percent globally (Wilson 2007). Trade is more responsive to the number of documents than to the other metrics.

Trade Policies

Trade policies include measures aimed at protecting trade through tariffs and nontariff barriers. The effect of tariffs on trade performance has been studied using economywide simulations (for example, Bouët et al. 2005), gravity equations (for example, Bouët, Mishra, and Roy 2008), and trade restrictiveness indexes (for example, Croser and Anderson 2011). Although the magnitudes are different, all the studies indicate that the effect of import taxes on trade volumes is convincingly and significantly negative. Bilateral, regional, and international trade agreements either reduce tariffs or other regulatory requirements to facilitate crossborder trade. The most important of these agreements for African countries are trade preferences, particularly nonreciprocal ones, which aim to open up markets to developing countries, either individually or in groups. This involves complete or partial lifting of import tariffs and quotas for specified products. Preferences are usually designed to offer commercial opportunities for developing countries but are widely criticized for not being used due to rules of origin, their focus on commodities for which beneficiary countries have little competitive advantage, and the presence of associated stringent standards related to sanitary and phytosanitary requirements (Brenton 2003; Panagariya 2003; Topp 2003).

Despite these criticisms, recent studies have shown that preferences are still useful and beneficial, particularly for African countries (Wainio and Gehlhar 2004; Bouët, Fontagné, and Jean 2005; Bouët et al. 2012).

Nontariff measures include trade barriers that limit the quantity and volume of imports through a variety of technical and nontechnical standards. The United Nations Conference on Trade and Development classifies nontariff trade measures into 16 broad categories, each of which comprises several specific classifications.

The major ones are sanitary and phytosanitary requirements and technical barriers to trade, which include packing and labeling, standardization, price controls (anti-dumping), licensing, quantitative restrictions, export subsidies, and export taxes. Nontariff barriers constrain trade by increasing the cost of inspection, certification, and testing.

This is particularly important for developing countries, which have poor quality assurance infrastructure and technological capacity to conduct these processes and, hence, have to recruit third parties to access the services.

Domestic Agricultural Supports

Both developed and developing countries provide financial and technical support to their agricultural producers for different reasons. The support provided by industrial countries to protect their agricultural sectors has been considered to be the most damaging for trade from developing countries. Supports in these countries take the form of border measures (import tariffs, export subsidies) and domestic measures (production and input subsidies). Domestic supports can be implemented through markets or through direct payments. Both approaches have the potential to reduce the amount of imports from foreign countries. These supports raise the price received by the producers of the supported country above the world price so that they become artificially more competitive than imports from outside the country. Empirical studies assessing the link between domestic subsidies and trade have revealed mixed results depending on the type of commodity and support (coupled or decoupled). Many have argued that the removal of European Union (EU) and U.S. agricultural subsidies could have a significant effect on the world prices of some commodities, such as cotton, tobacco, and soybeans (Bouët et al. 2005; Bureau, Jean, and Matthews 2006). However, the impact of domestic subsidies is lower than other crossborder measures (Hoekman, Ng, and Olarreaga 2004; Anderson and Martin 2005).

Payments that are less related to the quantity produced (decoupled) have lesser impacts than payments directly related to production (coupled). As a result, many Organisation for Economic Co-operation and Development (OECD) countries are moving toward payments that are less tied to the quantity of domestic production (Urban, Jensen, and Brockmeier 2016). Developing countries do also provide technical, financial, and institutional support to smallholder producers to boost productivity and improve market efficiency, thereby enhancing agricultural exports. The extent of agricultural support provided to smallholder farmers depends on the size, allocation, and efficiency of public agricultural expenditures. These expenditures serve to accumulate capital stock that would enhance the production, as well as the trading capacity of smallholder producers (Benin, Mogues, and Fan 2012). However, the actual effect on trade depends on the focus and efficiency of public investments. Investments focused on export sectors would likely improve trade more than those investments focused on domestic food production or food security.

Global Market Shocks

Global food, financial, and oil markets are increasingly interconnected (Tadesse et al. 2014). Shocks to any of these markets would likely affect the nature and extent of agricultural trade. The 2007/2008 food price crisis, for example, caused many countries to impose export barriers and relax import restrictions on food products, which further aggravated the problem of price spikes and adversely affected agricultural trade (Yu et al. 2011; Anderson and Nelgen 2012; Bouët and Laborde 2012; Anderson 2014; Anderson and Thennakoon 2015). Similarly, the ongoing oil price crises may also affect the level of agricultural exports, particularly in those countries that are oil dependent. When the price of oil declines, oil-dependent countries may try to shift export dependence from oil to agricultural products, for which prices are relatively stable

Empirical Assessment

Data and Methods

Gravity-type econometric equations were used to examine the empirical and relative relevance of the determinants listed above in the African context. Models were used to estimate the logarithm of bilateral agricultural export values of African countries over a number of demand- and supply-side factors. Four of the major thematic determinants described above were included[10], as well as scale variables used to control for the size of importing and exporting economies and income differences between trading partners. Two to five specific variables were chosen as proxies for each of the major thematic determinants. Total gross domestic product (GDP) of both importing and exporting countries was used as a proxy for the size of partnering-country economies. Per capita GDP in importing countries was used to capture income effects, and per capita GDP in exporting countries was used as a proxy for capital endowment. Other assets, such as farm machinery, irrigation facilities, and so on, would have been a good indicator of capital for agriculture, but the data on these variables had a large number of missing values. The quantity of land and labor were included to measure resource endowments; road density, quality of port, index of trade infrastructural quality, index of customs clearing efficiency, and financial fees for exporting were used to measure costs of trade; frequency of nontariff measures, average *ad valorem* equivalent tariff rates, and regional trade agreements were considered as proxies of external trade policy; and the ratio of the agricultural producer price index to the manufacturing producer price index of importing countries and agricultural public expenditure of exporting countries were used to measure the effect of domestic agricultural policy in importing and exporting countries, respectively. The list of determinants considered in the analysis and the metrics used to estimate their magnitudes are described in Appendix Table 5A.1.

Data on income, resource endowments, infrastructure, and efficiency of institutions were drawn from World Bank (2016), trade data were obtained from UN Comtrade (2016), and data on tariffs were extracted from World Integrated Trade Solution (WITS 2016). Other sources were used for specific variables, such as nontariff barriers (WTO 2016), public agricultural expenditure (ReSAKSS 2016), producer price indexes (FAO 2016), and producer support estimates (OECD 2016). The quality of trade data in Africa has always been a big concern because sizable crossborder transactions are carried out informally and are unrecorded. The purpose of this chapter, however, is not to show the size of trade, but rather to examine the determinants of export flows. Thus, as long as the omitted trade transactions are random, they will have little impact on the results. All export values are for agricultural products unless and otherwise specified.

All the regressions were estimated using cross-sectional data from 2013, the most recent year for which adequate data were available for many of the determinants. One-year lagged values were used, however, for some variables (productivity and public agricultural expenditure) that were deemed to be endogenous to export values. Visualization of trade data over years indicates that no extraordinary events occurred in 2013 that could bias the results.

Two groups of models were estimated. The first group was used to estimate African agricultural exports to the global market. In this model, only African countries were included as exporters (i). In addition to African countries, countries from all continents that had frequent transactions with Africa were included in the analysis as importers (j). In general, a total of 49 exporters and 161 trade partners were considered[11]. A second group of models was used to estimate intra-African exports, with African countries as both exporters and importers.

[11] The countries of the Southern African Customs Union—Botswana, Lesotho, Namibia, South Africa, and Swaziland—were treated collectively as one country because many sources aggregate the trade data for these countries; in some instances, the average or sum of all or some of the countries was used, depending on the variable.

African exports to the rest of the world were also estimated for comparison purposes.

Of all possible pairwise transactions between the 49 exporting and 161 importing countries, about 58 percent had zero trade transactions. Excluding these transactions would likely cause selection bias, whereas including them would cause censoring bias. Although other studies excluded them and controlled for the selection bias using the Heckman approach, the current study included them and addressed the censoring bias using a Tobit model approach. Zero trade was assumed to be as a country's optimal outcome rather than a strategic choice not to trade with a specific partner.

Due to multiple data sources for different variables, the dataset was seriously affected by missing values. To overcome this problem, several specifications were considered through step-wise inclusion of explanatory variables that had different sets of observations and represented specific sets of determinants. A total of six specifications were estimated for African global exports. The first model estimated the effect of resource endowments together with scale variables.

In addition to the variables in this first model, the second model incorporated infrastructural and institutional variables, and the third model added public agricultural expenditure. All three models shared a common feature: they only considered domestic (supply-side) constraints. The fourth model included international (demand-side) variables, such as nontariff barriers, tariffs, and regional trade agreements. The fifth and sixth models were Tobit specifications with and without the agriculture-to-manufacturing price ratio variable that represented domestic agricultural supports by OECD countries. Since the price ratio was calculated for OECD countries only, the number of observations was greatly reduced in the final specification.

Empirical Results

Results of the six specifications for African global agricultural exports are shown in Table 5.1. The table's six columns present the results of the different specifications to help test robustness under different numbers of observations and to examine the predictive power of additional variables. In general, many determinants show the theoretically expected signs, with the exception of resource endowment, which seems to be a less important factor for African agricultural trade. Variables related to infrastructure and institutional efficiency are more significant than other domestic factors. These variables explain about 11 percent of the variation in agricultural export growth among African countries. Public agricultural expenditure appears to have a positive and generally significant effect on trade. Trade policy variables appear to be important determinants, next to the cost of trade, although significant variation exists among policy instruments. Nontariff barriers and regional trade agreements appear more important than tariffs. The effect of producer price ratios, which represent domestic agricultural support in importing countries, seems significant but requires further explanation.

The results of comparisons between determinants of intra-African trade and African exports to the rest of the world are shown in Table 5.2. Here, the comprehensive models (four and five) were used as agriculture-to-manufacturing price ratios were not available for most African countries. The results indicate that many of the determinants are equally important for African exports, whether within or outside Africa. The level of per capita income in importing countries is more relevant for intra-African trade than for African exports to the rest of the world, which can be explained by the lower level of incomes and higher elasticity of demand for agricultural products, and in particular for food, in Africa. Similarly, resource endowments and nontariff barriers are not as relevant for intra-African trade as they are for African trade with countries in other regions. This is consistent with the fact that resource endowments within Africa are closely similar, and nontariff barriers are not as stringent as they are outside Africa. Public agricultural expenditures are more relevant to reaching markets outside rather than within Africa.

Table 5.1. Response of African global agricultural export value to domestic and international factors

	Logarithm of value of exports from i countries to j countries					
	OLS			Tobit		
Determinants	(1)	(2)	(3)	(4)	(5)	(6)
Importer's GDP (billions of US$)	1.57***	1.65***	2.16***	2.23***	3.35***	2.70***
Exporter's GDP (billions of US$)	0.79***	0.88***	0.92***	1.19***	1.80***	1.48***
Per capita GDP of exporters (US$)	–1.14***	–1.17***	–2.11***	–2.30***	-3.63***	-2.67***
Per capita GDP of importers (US$)	–0.10***	–0.12***	–0.13***	0.03	–0.04	–0.21
Arable land (millions of hectares)	–0.52***	–0.69***	–0.52***	–0.47***	–0.52***	–0.91***
Agricultural labor (millions)	–0.02	0.25***	–0.38**	–0.43**	–0.77***	0.05
Road density (km per km2 of land)		0.01	–0.03	–0.02	0.03	0.37***
Quality of port		4.43***	4.26***	4.62***	6.94***	8.63***
Quality of transport infrastructure		1.80***	1.17**	1.15**	0.82	1.47
Efficiency of customs clearing index		1.24***	1.64***	1.69***	3.81***	0.03
Export cost (US$ per container)		–0.05	–0.07	–0.01	-0.27	–0.13
Public agricultural expenditure per agricultural GDP of exporter			0.12**	0.16**	0.46***	0.28*
Incidence of importer's nontariff barriers				–0.32***	–0.39***	–0.32***
Average tariff rate of importer				–0.06	–0.18*	–0.46***
Being in the same regional economic community				3.52***	5.39***	5.24***
The ratio of agricultural producer price index to manufacturing producer price index						–5.96***
Constant	5.44***	–2.43*	3.30*	1.66	0.9	–1.44
Sigma (test for censoring)					4.32***	3.21***
R-squared	0.30	0.41	0.41	0.49		
Number of observations	6,552	4,836	4,524	3,113	3,113	754

Source: Authors' estimations based on model results.

Notes: All the determinants except being in the same regional economic community are in logarithmic form, hence, the coefficients are elasticities; i countries refers to the 49 exporting African countries and j countries include importing countries all over the world. The lagged value of public agricultural expenditure was used to control for possible endogeneity. OLS = ordinary least squares; *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

Table 5.2. Determinants of intra-African agricultural exports

	Intra-African exports		African exports to the rest of the world	
Determinants	**OLS**	**Tobit**	**OLS**	**Tobit**
Importer's GDP (billions of US$)	1.91***	2.75***	2.31***	3.48***
Exporter's GDP (billions of US$)	0.32**	0.44*	1.22***	1.84***
Per capita GDP of exporters (US$)	–1.39**	–1.89*	–2.51***	–4.03***
Per capita GDP of importers (US$)	1.24***	2.24***	0.01	–0.06
Arable land (millions of hectares)	–0.21	–0.1	–0.53***	–0.62***
Agricultural labor (millions)	–0.43	–0.54	–0.43**	–0.81***
Road density (km per km² of land)	–0.22	–0.37	0.03	0.12
Quality of port	4.46***	6.83***	4.68***	7.05***
Quality of transport infrastructure	0.71	–0.45	1.26**	1.13
Efficiency of customs clearing index	2.39*	5.45**	1.51**	3.39***
Export cost (US$ per container)	–0.14	–0.63	0.02	–0.18
Public agricultural expenditure per agricultural GDP of exporter	0.2	0.62**	0.14**	0.41***
Incidence of importer's nontariff barriers	0.2	0.24	–0.35***	–0.39***
Average tariff rate of importer	0.53***	0.95***	–0.11	–0.32***
Being in the same regional economic community	3.55***	5.68***		
Constant	–9.64*	–20.95**	2.62	2.49
Sigma (test for censoring)		4.53***		4.13***
R-squared	0.435		0.519	
Number of observations	619	619	2,494	2,494

Source: Authors' estimations based on model results.

Notes: All the determinants except being in the same regional economic community are in logarithmic form, and hence the coefficients are elasticities; i countries refers to the 49 exporting African countries and j countries include importing countries all over the world. The lagged value of public agricultural expenditure was used to control for possible endogeneity. OLS = ordinary least squares; *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

Since the determinants for intra-African and global African exports are similar, the next section focuses on why some variables are more significant than others, and on tracking trends and distributions of key determinants using the results of the global-Africa agricultural export estimations. The importance of a determinant for intra-African trade is briefly discussed where relevant.

Describing and Tracking Key Determinants

The econometric results described above indicate which variables determine the level of agricultural exports by African countries. The following section details each of the determinants and their role in shaping export performance among these countries.

Resource Endowment and Productivity

As this study exclusively considers agricultural products, it is assumed that agriculture is both land and labor intensive in the African context, but less capital intensive compared with other sectors' products; capital is therefore expected to have a negative effect and land and labor a positive effect on agricultural exports. Nevertheless, all three resource endowment variables—labor, land, and capital (represented by exporters' per capita income)—show negative effects on agricultural exports (see Table 5.1). According to this result, countries with a higher per capita income are less likely to export agricultural products than countries with a lower per capita income. This is in line with the relative resource endowment theory, which predicts that a country specializes in an industry that requires less of the scarcest resource in the country. Hence, as countries grow (accumulate capital), their export portfolios shift from agriculture (less capital intensive) to sectors that are more capital intensive. Thus, capital endowment reduces exports of primary agricultural products.

The results also suggest that countries with scarce arable land and agricultural labor export more than do countries with abundant agricultural land and labor endowments. The negative effect of land on agricultural exports is due to the exclusion of land productivity from the models. When land and labor productivity are included in the model, the results become significantly different (Table 5.3).

If productivity is controlled for, land positively affects the performance of agricultural exports both to the world and within Africa, although the elasticity is greater for intra-African trade than for global trade. The impact of labor remains negative. Labor-abundant countries export less than labor-scarce countries, keeping productivity constant. This could be because African agriculture is not as labor intensive as expected. Alternatively, in an area where labor is abundant with low productivity, agricultural production may serve only for household subsistence without any significant contribution to exports.

Similarly, while countries with high land productivity perform better than do countries with low land productivity, countries with high labor productivity perform worse than do countries with low labor productivity. Labor productivity negatively affects trade performance, probably because wherever the productivity of labor is high, the local market becomes more attractive to producers than the export market. Increased agricultural labor productivity might be good for reducing poverty, but it seems to negatively affect agricultural export performance in Africa. The negative effect may indicate the extent of economic transformation. Countries with higher labor productivity are countries in which economic activity is shifting from agriculture to nonagricultural sectors, and hence where the composition of exports is shifting from agricultural to nonagricultural products.

Table 5.3. African agricultural export response to land and labor endowments and productivity (elasticity)

Endowment and productivity indicators	Global trade			Intra-African trade	
	(3)	(7)	(8)	(9)	(10)
Arable land (million hectares)	–0.52***	5.82***		7.15***	
Agricultural labor (millions)	–0.38**	–6.00***		–6.88***	
Land productivity (US$ per hectare)		6.24***	0.56***	7.21***	0.35***
Labor productivity (US$ per person)		–6.43***	–0.13	–7.40***	0.00
R-squared	0.41	0.49	0.51	0.44	0.44
Number of observations	4,524	3,113	3,435	3,101	3,397

Source: Authors' estimations based on model results.

Note: Global trade denotes bilateral trade between African countries and selected countries globally, including other African countries. Intra-African trade denotes trade among African countries only. Estimations include additional variables for which results are not presented.

These results imply that, while availability of arable land and increased land productivity can positively affect agricultural trade, having abundant labor alone does not necessarily lead to higher export trade; rather, it may retard Africa's global and intra-regional trade. Moreover, trade seems more elastic with respect to land productivity than to land availability, implying that investment in land productivity-enhancing technologies or institutions would help not only to increase farmers' incomes, but also to boost regional trade. Results indicate that a 1 percent increase in land productivity increases trade flows by about 6 percent to the global market and 7 percent to the African market. Land productivity has a stronger effect on intra-African trade than on global trade, which further explains the importance of improving land productivity to triple intra-African trade. This is because many African countries have similar resource endowments and closely similar trade facilities, so their competitiveness in regional trade mainly depends on the extent of agricultural productivity.

Infrastructural Quality and Institutional Efficiency

Variables addressing the quality of ports and transport, road density, efficiency of customs clearing, and financial export costs explain a significant part of the variation in agricultural export performance among African countries (Table 5.1). However, there appear to be significant differences among cost indicators in explaining trade flows. Road density and financial export costs do not have statistically significant effects on export performance. In contrast, the quality of port infrastructure and the efficiency of customs clearing consistently and positively affect trade performance. Since the cost of trade affects not only export performance, but also trade competitiveness (defined as the ratio of a country's exports to total African exports to the world or to the African market), further analysis was carried out to shed light on how cost indicators affect the competitiveness of a country in global and regional markets.

Results of the analysis of the effects of trade cost indicators on global and regional competitiveness show that, although road density and financial export costs have no effect on export volumes, they do have significant effects on competitiveness (Table 5.4). This is particularly significant when it comes to financial payments to clear exports. Financial export costs include all costs exporters pay for documents, administrative fees for customs clearance and technical control, customs brokers, terminal handling charges, and inland transport, and these costs are found to be crucial for trade

competitiveness. The lower these fees, the more likely a country becomes competitive both in regional and global markets. Unfortunately, financial fees for exports have been increasing over time in Africa south of the Sahara (SSA), particularly for landlocked countries (Figure 5.1). Sixteen African countries do not have their own ports and, hence, incur higher financial export costs per unit than do coastal countries. The cost gap between these groups of countries has widened over time. Lack of port access may induce preferential fees for port services and increased inland transport costs that raise export costs. Lack of port access also creates business insecurity.

Although the effect of road density on export performance was insignificant in most specifications (Table 5.1), it appears to have a significant and positive effect on competitiveness (Table 5.4). This could be because the African road networks are biased toward connecting local markets more than regional markets (Gwilliam et al. 2008).

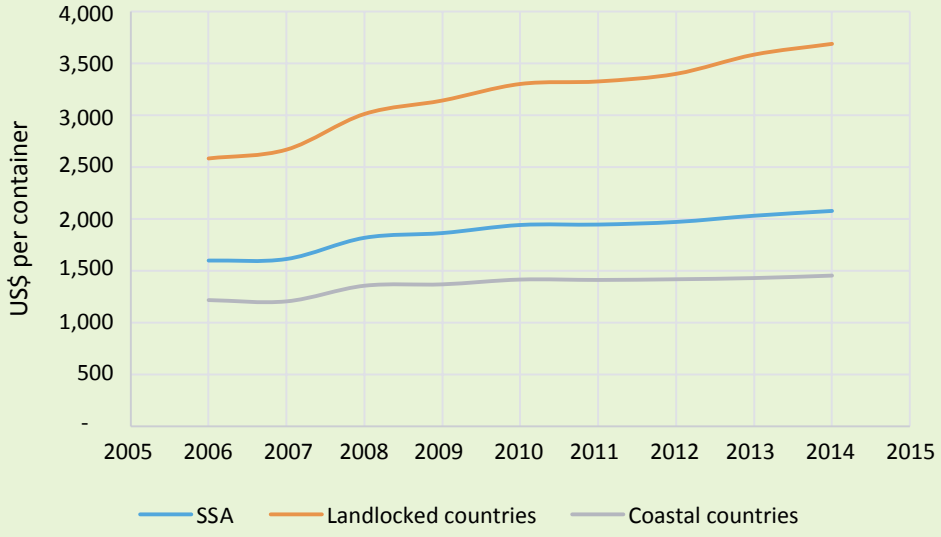
Table 5.4. The effect of trade costs on agricultural trade competitiveness in Africa

Cost indicators	Share of i country's supply of total African supply to:	
	Global markets	African markets
Road density (km per km2 of land)	0.002***	0.003***
Quality of port	0.105***	0.118***
Quality of transport infrastructure	–0.003	0.000
Efficiency of customs clearing index	–0.016***	–0.019**
Financial fees for exports (US$ per container)	–0.004***	–0.006***

Source: Authors' estimation based on international sources

Note: Estimations include additional variables for which results are not presented here.

Figure 5.1. Trends in the average costs of exports in Africa south of the Sahara, 2006–2014



Source: Authors' calculation based on World Bank (2016).

Note: Coastal countries have their own ports, whereas landlocked countries do not

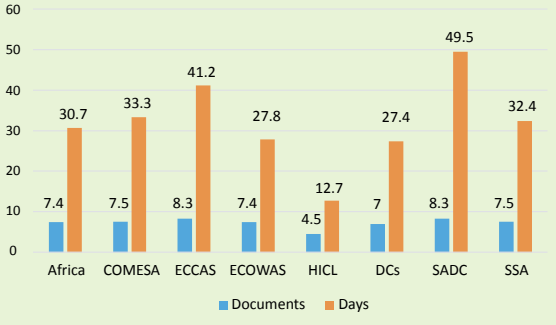
Even though domestic road networks have improved in many African countries in the past two decades, they are not well-connected to regional roads. As a result, they failed to support increased export volumes but did contribute to the countries' competitiveness. Unlike export volumes, which primarily depend on external efficiency, competitiveness mainly depends on internal efficiency. A country might be competitive compared with other producers, but its export volumes may not grow faster than others. This is exactly what the road density results demonstrate. Improved road density improves a country's internal competitiveness to supply cheaper products to external markets, so that the country's supply share is relatively higher than countries with lower road density. Yet, since the roads do not adequately connect local markets with regional or global markets, their effect on absolute export volumes remains insignificant. Despite the significance of road density, Africa remains poorly connected both internally and externally. According to the World Bank Rural Accessibility Index, only 34 percent of the rural population of SSA lives within 2 kilometers of an all-weather road (Carruthers, Krishnamani, and Murray 2010).

Port quality is important both for absolute export volumes (Table 5.1) and for trade competitiveness (Table 5.4). However, Africa has the lowest port quality of all regions of the world. Based on the quality of port infrastructure, the World Bank ranks ports from 1 (extremely underdeveloped) to 7 (efficient by international standards). According to this classification SSA scores 3.65, which is 13 percent below the world average and 29 percent below the average for high-income countries. This indicates an urgent need for African countries to invest in port infrastructure to improve both regional and global trade.

Other variables related to transport infrastructure and institutional efficiency are important for export performance but not for competitiveness (Table 5.4). The negative effect of institutional efficiency on competitiveness is puzzling. The institutional efficiency indicator was developed based on the number of documents, signatures, and days required to clear customs, both for imports and exports. The mix of these requirements may explain how the institutional efficiency index is related to trade competitiveness.

The mean number of documents and days required for clearing exports across different regions during 2006–2014 is shown in Figure 5.2. SSA had the highest level of requirements for both indicators compared with other regions. On average, it took more than 32 days to clear exports in SSA compared with less than 10 days for high-income countries and 27 days in all least developed countries. Significant differences were observed across regional economic communities (RECs), the worst being SADC member countries in which the average export during 2006–2014 took close to 50 days. The same is true for the number of documents required to clear exports; however, both indicators have declined over time (Figure 5.3). The number of documents fell from an average of nine in 2006 to seven in 2010 and remained constant thereafter. It seems that (as of 2014) countries had stalled in making progress to improve customs clearing processes. The number of days fell from 36 in 2006 to less than 30 in 2014, but the pace of the decline was very slow.

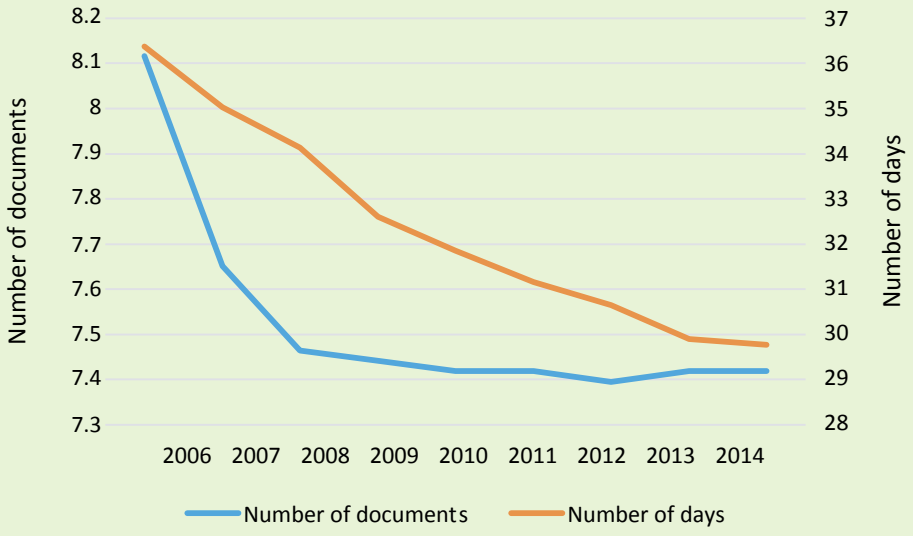
Figure 5.2. Number of days and documents needed to clear exports, 2006–2014 mean



Source: Authors' calculations based on World Bank (2016).

Notes: COMESA = the Common Market for Eastern and Southern Africa; ECCAS = the Economic Community of Central African States; ECOWAS = the Economic Community of West African States; HIC = high-income countries; LDCs = least developed countries; SADC = the Southern African Development Community; and SSA = Africa south of the Sahara.

Figure 5.3. Trends of export clearing efficiency in Africa south of the Sahara, 2006–2014



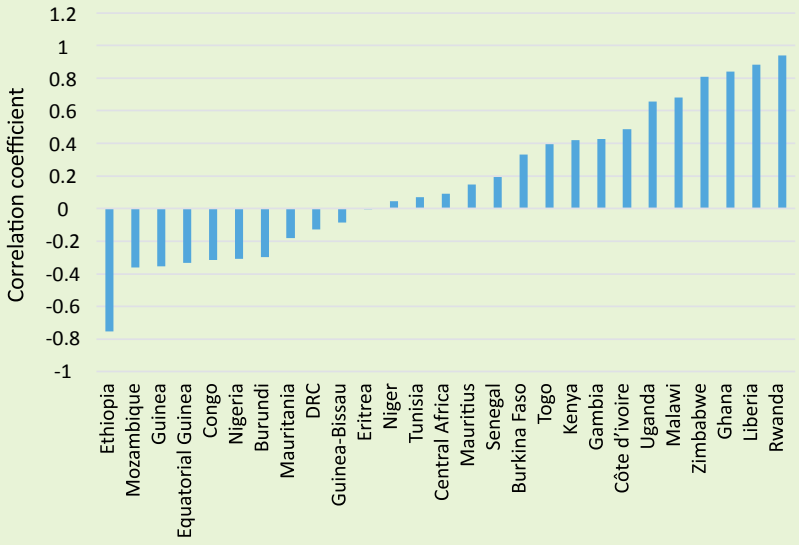
Source: Authors' calculations based on World Bank (2016).

Public Agricultural Expenditure

The effect of domestic agricultural support in exporting countries could be an important determinant of export growth in developing countries because farmers and traders in these countries are poor and less commercialized, and therefore less able to facilitate production and trade by themselves. The support provided in these countries is different from the support provided in high-income countries. In developing countries support is given to facilitate provision of agricultural extension, advisory, market access, and financial services. Public agricultural expenditure (PAE) is used as a proxy variable to measure the significance of government support in promoting agricultural exports in Africa. The empirical results reveal a positive and statistically significant association between PAE and export performance. On average, a 10 percent increase in PAE relative to agricultural GDP increases agricultural exports in the following year by about 2 to 4 percent.

The correlation between public agricultural spending and export performance significantly varies across countries (Figure 5.4). Unexpectedly, PAE has either no correlation or a negative correlation with exports in many countries. While Ethiopia stands out as having the largest negative correlation, Rwanda takes the lead as the most successful country from the positive perspective. Many factors could explain why countries experience a negative correlation. First, they might have focused more on domestic food security, so public expenditure has little or no relevance in promoting external trade. This is the case in Ethiopia, where a significant part of the public budget is allocated to large food security projects, such as the Productive Safety Net Program, and extension personnel who primarily provide services for food crop production. The country's competitive commodities, such as coffee, oilseeds, and hides and skins, have received very little financial support relative to their importance as exports. Second, these countries' investments in export commodities might be less efficient in facilitating trade and production. Third, a decline in the terms of trade could explain part of the paradox, but empirically this should have little contribution to the negative correlation. In contrast, many countries utilized the public budget as a policy tool to create incentives for agricultural exports (Figure 5.4). Rwanda is followed by Liberia, Ghana, and Zimbabwe, in which expenditures and exports are strongly correlated, with coefficients above 0.8.

Figure 5.4. Correlation between public agricultural expenditure and agricultural exports, 2005–2013



Source: Authors' estimations based on UN Comtrade (2016) for export data and ReSAKSS (2016) for public expenditure data.

Note: Correlations are calculated between current export values and the previous year's public agricultural expenditure

Regional Trade Agreements

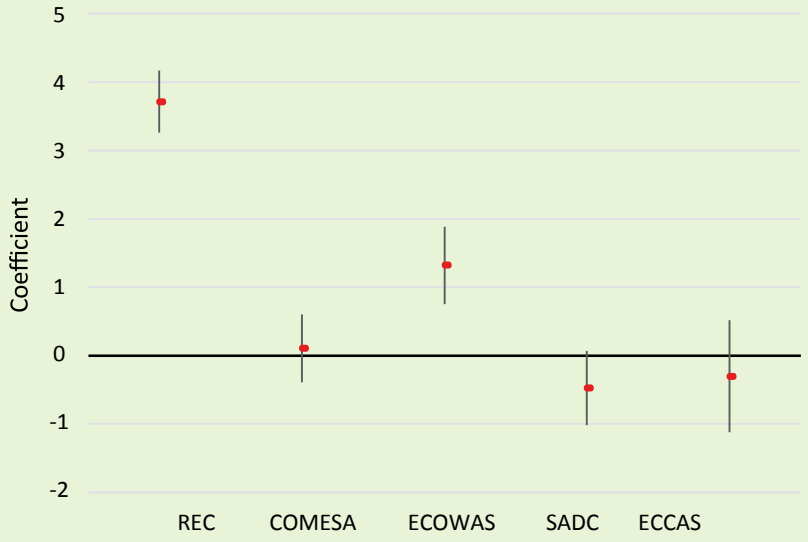
Regional trade agreements remove or reduce tariffs and facilitate joint trade for REC members. These agreements create trade within the trade agreement zone and divert imports from the rest of the world. Empirical results have shown that the trade creation effects of African RECs, such as the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of West African States (ECOWAS), the Southern African Development Community (SADC), and the Economic Community of Central African States (ECCAS), are stronger than their trade diversion effects (Figure 5.5). The overall trade creation effect—as captured by the REC variable (taking the value of 1 if the importing and exporting countries are from the same REC and otherwise zero)—has a positive and statistically and economically significant effect on export performance. Being a member of any of the RECs increases a country's export value by 3 to 5 percent. This effect captures not only the effect of free trade agreements, but also the effect of trade facilitations commonly targeted for crossborder trade. Countries within the same REC are geographically closer to each other, so this variable may also capture proximity effects. In any case, the trade creation effects of African RECs are convincingly large and significant.

The trade diversion effects of these RECs are not yet significant and uniform. The effects were captured by including dummy variables for each REC (taking the value of 1 if the importing country is a member of a given REC and the exporting country is not, and zero otherwise). This variable measures openness of member countries to nonmember countries. The variable representing ECOWAS has a significant and positive effect on exports, implying that being an ECOWAS member makes countries open to nonmembers, signifying a positive trade diversion effect (Figure 5.5). SADC has a protective effect, but it is only significant at the 10 percent (90 percent confidence) interval. COMESA and ECCAS show positive and negative trade diversion effects, respectively, but the coefficients are not statistically significant. These results are consistent with previous evidence (Makochekanwa 2012). Since welfare depends on the extent of both trade diversion and trade creation, policymakers should target increasing the diversion, as well as the creation effects. Internal institutions and efficiency may explain the differential effects of RECs on trade diversion.

Tariffs and Preferences

Despite declining trends in tariff rates imposed on agricultural products worldwide, tariffs are still important determinants of trade. The modeling results of this study estimate that a 10 percent increase in tariff rates reduces African agricultural exports by about 3 percent (Table 5.1), which is closely similar to previous studies (Bouët, Mishra, and Roy 2008; Moïsé et al. 2013). Luckily, Africa, particularly SSA, is increasingly receiving tariff preferences from importing countries.

Figure 5.5. The effects of trade creation and diversion in Africa's regional economic communities, 2013



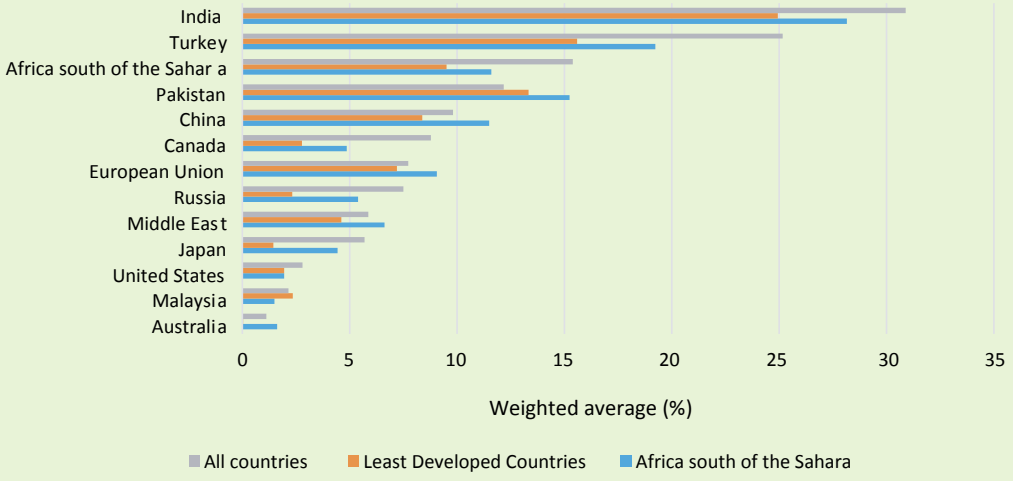
Source: Constructed by authors.

Note: The value range for REC (Regional Economic Community) indicates the combined trade creation effect for all communities. RECs is a dummy variable that takes the value 1 if both importing and exporting countries are from the same REC and zero otherwise. Effects denoted by each of the REC indicate the trade diversion effects. For example, the value under "COMESA" indicates the effect of a variable that takes 1 if the importing country is a COMESA member and the exporting country is not, and zero otherwise. It therefore measures the trade diversion effect of COMESA, and the same holds for the other RECs. The figure shows coefficients and 95 percent confidence intervals. If zero is included within the confidence interval, the coefficient is interpreted as statistically insignificant.

The average tariff rates imposed by selected countries on agricultural products imported worldwide, from least developed countries, and from within SSA are presented in Figure 5.6. Although India and Pakistan impose the largest tariff rates on global agricultural imports, they impose lower rates for imports from SSA. Other countries, such as Canada, Russia, and the United States, also impose lower average duties on imports from SSA. As expected, the countries of SSA impose lower taxes on imports from within the region than from outside it. In some countries and regions, including China, the EU, and the Middle East, agricultural products from SSA are being taxed more than the world average. This could be because selected products are given preference, especially by the EU. If exports from SSA are not among the preferential products, they would be subject to higher tariff rates than those imposed on preferential products from other areas.

In many countries, African products are taxed at higher rates than the average for other developing economies or least developed countries. This indicates that, although several preferences are enacted in the EU and the United States, African products are still highly taxed compared with other developing countries. Most importantly, on average, SSA countries impose a higher rate of import tax on other SSA countries than they do on all least developed countries. This implies that some African countries provide a lower tax rate for non-African countries than they do for African countries.

Figure 5.6. Tariff rates imposed on agricultural imports by major African trade partners, 2005–2015

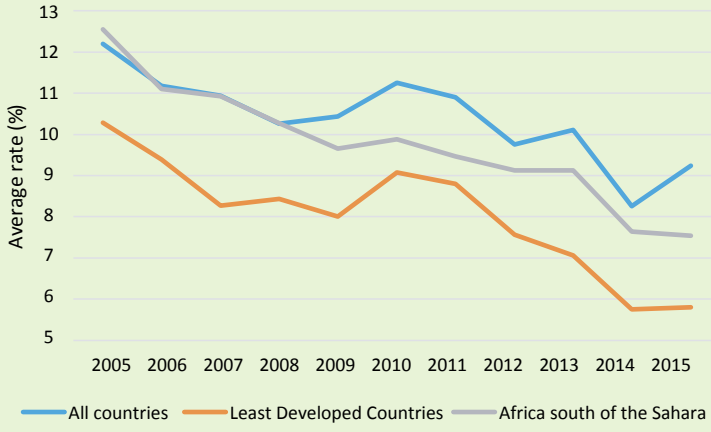


Source: Authors' estimation based on WITS (2016).

Notes: Tariff rates are weighted averages based on the amount of imports. Each country or group of countries levies different rates for different countries for the same products. The rates are averaged for all countries, for least developed countries, and for Africa south of the Sahara.

An encouraging trend is that tariff rates applied on imports of agricultural products from any part of the world have declined sharply over time (Figure 5.7). Average tariff rates fell from more than 12 percent in 2005 to close to 8 percent in 2014—a 3 percent yearly rate of decline. Multilateral negotiations through the World Trade Organization and the increasing global food demand as demonstrated by the food price crisis in 2007/2008 might have contributed to this effect. The decline is proportionally similar among the rates applicable to the world as a whole, to SSA, and to least developed countries. Globally, African products have been taxed at lower rates than the world average since 2009, and the gap between these tax rates has widened since then. On the other hand, African exporters have consistently faced higher taxes than other developing countries.

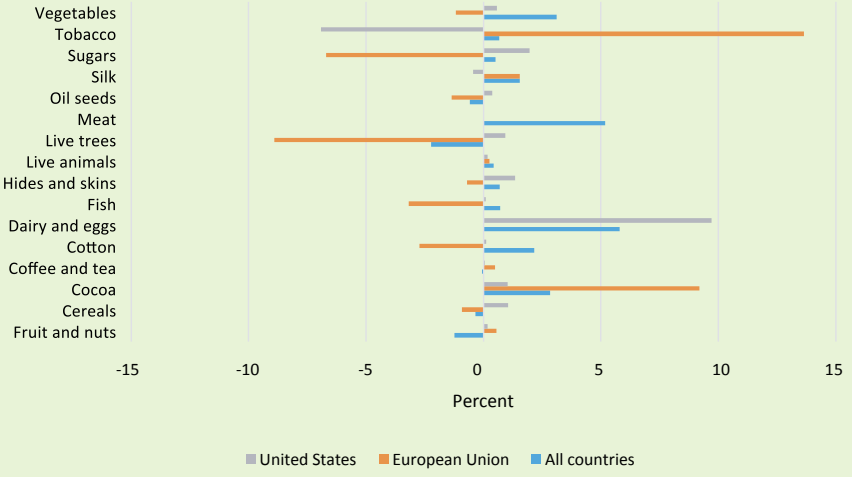
Figure 5.7. Trends of tariff rates imposed on Africa south of the Sahara, least developed countries, and world exports, 2005–2015



Source: Authors' estimation based on WITS (2016).

Despite clear evidence that, on average, greater preferences are given to African exports than to those of other regions, there is broad debate about the benefits of such preferences in enhancing African trade[12]. One of the criticisms is that preferences are given to commodities or products for which Africa has no comparative advantage. Although this criticism applies to comparisons of manufactured and agricultural products, it can also be applicable to agricultural products. Significant variations exist in the preference rates given to SSA by the world, the United States, and the EU across different agricultural products (Figure 5.8). The United States provides preferences for a wider range of products than do the EU and others; however, the United States does not provide preferences for silk or tobacco. In contrast, the EU provides the highest preference for tobacco. The United States provides the highest preference for dairy products, followed by sugar, and then hides and skins. Although some African countries could have a comparative advantage in sugar and in hides and skins, many countries may not have a global comparative advantage in dairy products (Badiane, Odijo, and Jemaneh 2014). While preference rates for cocoa are reasonably significant, preference rates for coffee and tea are minimal, confirming that preferences are given irrespective of a country's comparative advantage.

Figure 5.8. Rates of preference given to exports of major products from Africa south of the Sahara, 2013



Source: Authors' estimations based on WITS (2016).

Note: Values indicate rates of preferences and are calculated as the average tariff rates imposed by all countries, by the EU, and by the United States on world imports, minus tariff rates imposed on SSA imports.

Nontariff Barriers

Much empirical evidence, including the findings of this chapter, indicates that trade is more responsive to nontariff barriers than it is to tariffs (Table 5.1). This shows the increasing importance of nontariff barriers following the declining trends of tariffs due to bilateral and multilateral trade agreements and preferences. Yet, despite the growing understanding of the significance of nontariff barriers to trade, certain issues are still unclear, including (1) which type of nontariff barriers cause significant impacts on trade, (2) which type of nontariff barriers are prevalent in agricultural trade, (3) how these measures are evolving, and (4) what strategic options African countries have to reduce the effect of nontariff barriers on trade performance.

The prevalence of different nontariff barriers across major African trade partners, which import about 90 percent of African agricultural

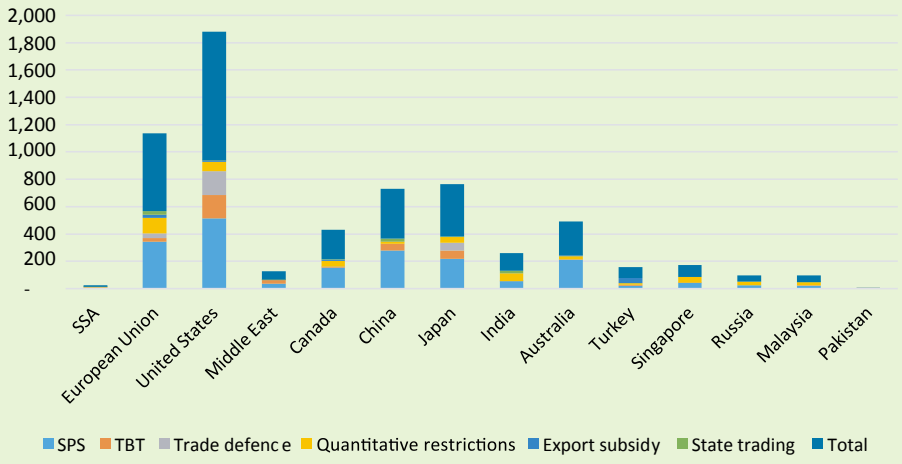
[12] Preference rates are defined as the difference between the average tariff rates on imports from the world and imports from SSA.

exports, is shown in Figure 5.9. Of all the countries, the United States takes the lead in terms of the number of measures imposed on the import of agricultural products. During the 2012–2015 period, the United States imposed about 1,000 measures per year, which were counted across products and types of nontariff barriers (WHO, 2016). Close to 50 percent of these relate to sanitary and phytosanitary measures, which—followed by technical barriers to trade—are the dominant type of nontariff barriers in many countries. Quantitative restrictions are widely prevalent in the EU. Unlike many other measures, sanitary and phytosanitary requirements are politically and environmentally acceptable because they relate to health, safety, and hygiene. Unfortunately, these requirements have a greater impact on trade than do any other measures (Figure 5.10). A 10 percent increase in the number of products affected by sanitary and phytosanitary measures reduces trade by about 3 percent. This result is consistent with a previous study indicating that sanitary and phytosanitary measures penalize poor countries more strongly than other countries (Disdier, Fontagne, and Mimouni 2008).

Export subsidies, which are prevalent in the EU, Turkey, and the United States, have the next-largest negative effect on African agricultural trade. In contrast, the involvement of state enterprises in imports and exports positively affects African exports, probably due to the discretionary preference that these enterprises may provide to African imports. The involvement of state enterprises in agricultural trade is most prevalent in China and India, and in some EU member states. In general, the number of nontariff barriers has been steadily increasing over time in both the United States and the EU, which impose the largest number of trade-reducing nontariff barriers of all of Africa's trading partners (Figure 5.11).

The significant impact of nontariff barriers on trade, and their growth over time, present significant challenges to policymakers as to how to minimize the adverse effects of these measures. Given public concerns, reducing the prevalence of nontariff barriers through international negotiation is unlikely. Rather, African policymakers should focus on reducing the vulnerability of their trade to these measures, the majority of which demand certification and labeling and, hence, involve increased costs. Efficient institutional and infrastructural arrangements are required to reduce these costs. Establishing a certification and accreditation center for an individual country could be costly and, in some cases, impossible. Therefore, regional cooperation should be an important area of policy focus. Furthermore, areas exist where individual countries could facilitate exports by establishing facilitation centers to assist exporters in fulfilling the requirements imposed by importers.

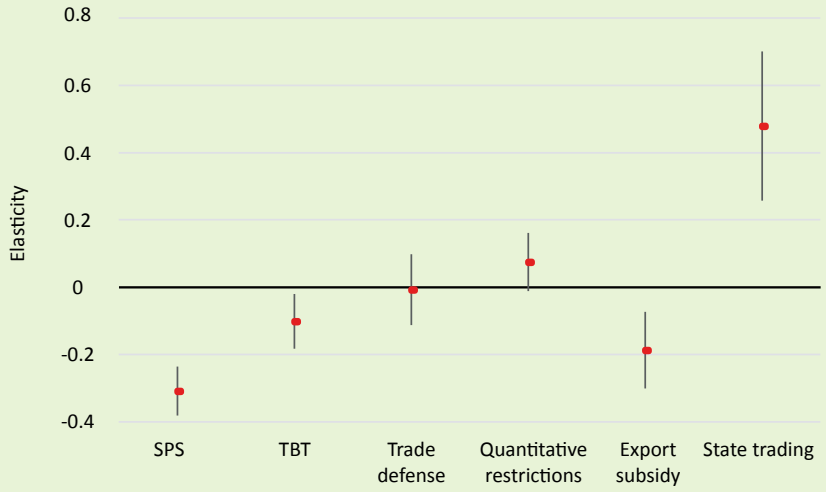
Figure 5.9. Frequency of nontariff measures on agricultural products, 2012–2015 mean



Source: Authors' estimations based on WTO (2016).

Notes: SPS = sanitary and phytosanitary measures; and TBT = technical barriers to trade based on United Nations Conference on Trade and Development classifications. The frequency of nontariff barriers is measured as the sum of all types of measures for all HS6 classified products. For example, if two measures are imposed on one product, three measures on three products, and zero on all other products, the frequency will be 2*1+3*3=11.

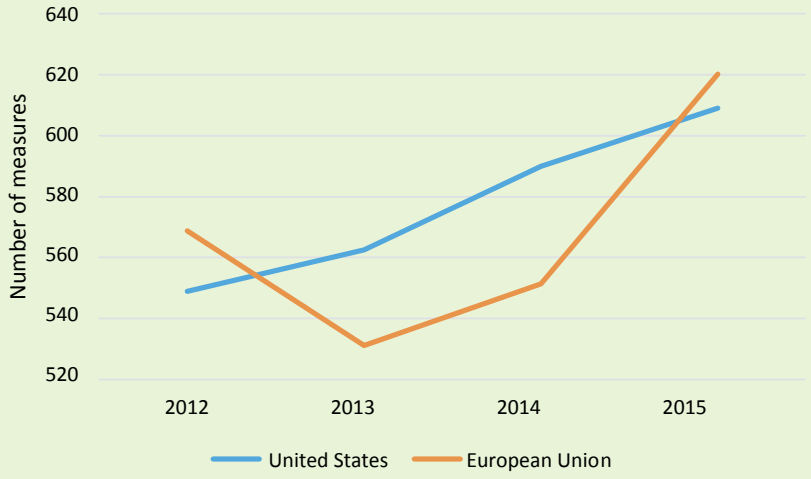
Figure 5.10. Effects of nontariff measures on export growth in Africa, 2013



Source: Authors' estimations based on WTO (2016).

Note: SPS = sanitary and phytosanitary measures; and TBT = technical barriers to trade based on the United Nations Conference on Trade and Development classifications. The figure shows coefficients and confidence intervals. Where zero is included within the confidence interval, the coefficient is interpreted as statistically insignificant.

Figure 5.11. Trends of nontariff measures in the United States and European Union, 2012–2015



Source: Authors' calculation based on WTO (2016).

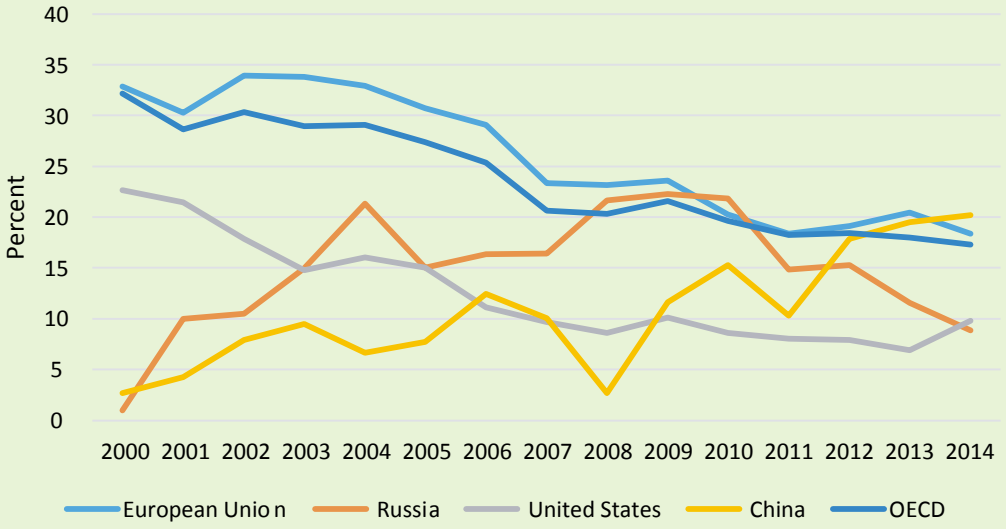
Domestic Agricultural Supports in OECD Countries

The empirical link between domestic agricultural supports in OECD countries and the value of agricultural exports in African countries was assessed using the ratio of agricultural and nonagricultural producer prices. This price ratio may capture the effect of all border and domestic supports, including tariffs, export subsidies, and production and input subsidies. Since tariffs and nontariff barriers are included as explanatory variables, the price ratio should predict the effect of domestic supports. The effect of this price ratio is negative and statistically significant (Table 5.1). According to this estimation, a 1 percent increase in the price ratio reduces African exports by about 5 percent. However, the implication of this elasticity

depends on the actual correlation of the price ratio with domestic support. Many economists argue that, since most payments to agricultural producers are made through direct payments, the impact of agricultural subsidies on trade is limited (Hoekman, Ng, and Olarreaga 2004; Anderson and Martin 2005; Croser and Anderson 2011). But when comparing producer prices of agricultural and manufacturing products, in many cases the resulting ratio is greater than one, implying that agriculture is treated preferentially and that this treatment restricts imports from developing countries. Generally, this leads to the conclusion that, although the effect of domestic support might not be as large as crossborder measures (such as tariffs and nontariff barriers), it still plays a significant role.

It appears, however, that the rate of agricultural support has generally declined over time in many OECD countries (Figure 5.12). Of all the countries considered, EU countries provided the highest support throughout the two decades to 2015. Emerging economies, such as China and Russia, are also increasingly supporting their producers despite the instability and unpredictability of that support, which is said to mainly take the form of tariffs and nontariff barriers rather than subsidies.

Figure 5.12. Trends of producer support estimates in OECD countries, 2000–2015



Source: Authors' estimations based on OECD (2016).

Note: OECD = Organisation for Economic Co-operation and Development.

Both the empirical analysis presented in this chapter and recent public support estimates trends suggest the importance of domestic support in high-income countries for the performance of African exports. Nevertheless, African countries, in particular, and developing countries, in general, have few policy options to curb the adverse effects of this domestic policy action in foreign countries. Although multilateral trade negotiations through the World Trade Organization are usually of limited effectiveness, they remain the most likely avenue for developing countries to compel high-income countries to reduce or redesign their agricultural supports. Economic growth in many African and Asian countries, and the increasing threat of climate change, may create leverage for developing countries to organize themselves and enforce effective global policy actions through the World Trade Organization.

Conclusion

African countries continue to strive to expand market opportunities for domestic producers both regionally and globally; however, this effort is being impeded by emerging and evolving constraints. Although many of the constraints seem conventional and traditional, the nature and extent of these constraints are evolving dramatically following global and regional shocks and opportunities. The examination of the key determinants of trade presented in this chapter generally found the existing evidence to be insufficiently comprehensive, lacking in the needed focus on Africa, and in need of updating. Realistic and updated assessments are required to feed the increasing policy momentum to improve African agriculture. The analysis did confirm that agricultural trade determinants are both diverse and complex, ranging from farm-level, supply-side constraints to global-level, demand-side barriers. Consequently, they call for regular monitoring and prioritization to facilitate immediate policy and development actions.

The empirical analysis, which aimed to identify and track key determinants of trade, indicated that supply-side constraints, including production capacity and the costs of trade, are more important determinants than are demand-side global constraints. This offers African policymakers the opportunity to focus on domestic production and trade facilitation, which can easily be influenced through national and regional policies and investments. A lot can be achieved simply by focusing on domestic factors instead of assuming that international factors are the culprits for low and, in some countries, declining agricultural exports.

This does not, however, rule out the importance of cooperation, both regionally and globally.

Regional cooperation is key to enhancing trade by reducing trade barriers and increasing productivity. The empirical analysis clearly confirmed that Africa's RECs had significantly contributed to agricultural export growth. These regional entities can be further utilized to reduce regional as well as global trade barriers. One important function of regional bodies could be joint trade facilitation initiatives that help fulfill the growing nontariff trade requirements facing African trade partners.

Despite a growing tendency toward import tariff reductions, partly due to preferential trade, nontariff barriers are significantly increasing and affecting African exports more than tariffs. This trend demands not only regional cooperation, but also global cooperation. Ensuring global cooperation has always been a challenge for developing countries, but growing opportunities exist that can enhance the bargaining power of developing countries in general, and African countries in particular. These include the growing importance of the continent as a consumer market and investment destination, given rising incomes and populations. In addition, Africa can play a pivotal role in mitigating the global climate threat. Nevertheless, global cooperation should not be viewed solely as an instrument for influencing international trade policies; rather, Africa should also seek this cooperation to facilitate trade and enhance domestic agricultural value addition.

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Appendix 5A. Supplementary Tables

Table 5A.1. List of determinants and indicators used to estimate African agricultural export performance

Determinants	Indicators and definitions
Size and income level	Total GDP and per capita GDP were used to control for the size of both importing and exporting economies. GDP was measured as real values deflated by 2005 constant prices in billions of U.S. dollars. Per capita GDP was measured in U.S. dollars per person. In both cases, the 2013 values were used. Missing values were replaced by values of the previous year.
Resource endowment and productivity	Land and labor for exporting countries were chosen to test the role of resource endowments for trade. Land was measured as the total arable land in millions of hectares and labor was measured as total agricultural labor in millions of persons. The productivity of these resources was also included at a later stage of the analysis to test the relevance of endowment vs. technology. Land productivity was measured as agricultural value-added per hectare of land; similarly, labor productivity was estimated as the ratio of agricultural GDP to agricultural labor force. All data were from ReSAKSS (2016).
Infrastructural quality	Road density, port quality, and quality of trade transport infrastructure were used to measure the effect of infrastructure on trade performance. Data on road density were obtained from NationMaster (2016), with road density measured in terms of kilometer of road per square kilometer. Indexes of port and trade transport qualities were obtained from the World Bank "Doing Business" survey. The indexes were represented by scalar cores ranging from 1 to 7 (1 being extremely poor/inaccessible and 7 being very efficient/accessible). Since the survey data cover different years for different countries, the averages of available data for the 2010–2013 period were used.
Institutional efficiency	The World Bank Logistics Performance Index, specific to the efficiency of customs clearance processes, was used as a proxy for institutional efficiency related to trade. The index aggregates the respondents' rankings of the efficiency of customs clearance processes (that is, speed, simplicity, and predictability of formalities), on a rating ranging from 1 (very low) to 5 (very high). Scores were averaged across all respondents.
Financial cost of exports	Infrastructural quality and institutional efficiency, which were used as a proxy for costs of trade, do not capture all costs involved in the export of import of commodities. The cost of exports estimated by the World Bank was used to control for unaccounted trade costs. The indicator measures the fees levied on a 20-foot container in U.S. dollars. All the fees associated with completing the procedures to export or import the goods are included (the costs for documents, administrative fees for customs clearance and technical control, customs broker fees, terminal handling charges, and inland transport). Tariffs and trade taxes are not included. The average cost of the exporting country for the 2010–2013 period was used.
Public agricultural expenditure	This variable was included to examine the empirical link between public investment and trade performance. While it is highly relevant from a policy perspective, it may cause endogeneity problems and may also correlate with other explanatory variables. To avoid these problems, its lagged value was used for the regression analysis. The nominal value was normalized by agricultural GDP.
Regional trade agreements	This variable was included as a dummy variable, taking the value of 1 if both trading countries were members of the same regional economic community (COMESA, ECOWAS, SADC, and ECCAS), and otherwise zero. At a later stage dummy variables were also included for each regional bloc to measure the trade diversion effects of each REC. In this case, for example, a dummy for COMESA was included, taking 1 if the importing country was member of COMESA and otherwise zero. Similar dummies were used for the other RECs.

Determinants	Indicators and definitions
Tariffs	Aggregation is the primary concern for measuring the effect of tariffs on trade. The use of tariff indexes, such as the trade restrictiveness index, ad valorum equivalent, trade reduction index, and nominal rate of assistance, is quite common to aggregate the different tariff lines. These indexes are preferred over averages because simple averages of tariff rates of the different agricultural lines will include untraded products and the weighted average based on imports will be endogenous to trade. However, an all-inclusive index for all the countries considered in this study is not available. Thus, a mix of weighted and simple averages of ad valorum rates from WITS (2016) was used as a proxy for the effect of tariffs on trade. Weighted averages were used to aggregate tariff rates on products up to the HS2 level and rates imposed on different countries, and then simple averages were used to approximate a tariff rate imposed by a country on global imports. Since only exports of African countries were considered in the analysis, the weighted tariff rates of other countries are less likely to be endogenous to trade, as the share of imports from Africa is relatively small.
Nontariff measures	The total number of nontariff measures imposed by the importing country, which is the sum of all measures reported to the World Trade Organization (WTO 2016), was used to capture the effect of nontariff barriers on African trade. Measures were counted across products and types of measures. Alternatively, the frequencies of six major types of nontariff measures were used separately. Only measures applicable to all World Trade Organization members were considered. Nontariff measures imposed bilaterally were not considered because they are mostly for non-African countries. Unfortunately, not all countries reported to the World Trade Organization, so this variable had many missing values.
Domestic agricultural supports	Data on the extent of domestic agricultural support specifically for production and input subsides are not available for all countries. The ratio of the agricultural producer price index to the manufacturing producer price index for OECD countries was used as a proxy to represent domestic agricultural support. The agricultural producer price index was obtained from FAO (2016), and the manufacturing producer price index was collected from the OECD (2016).

Source: Authors.

Notes: COMESA = the Common Market for Eastern and Southern Africa; ECCAS = the Economic Community of Central African States; ECOWAS = the Economic Community of West African States; GDP = gross domestic product; REC = regional economic community; and SADC = the Southern African Development Community