



Queen's Economics Department Working Paper No. 1460

Trade, poverty and food security: A survey of recent research and its implications for East Africa

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6-2021

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ABSTRACT. We survey the latest research on the linkages between international trade, regional integration, poverty and food security in developing economies and draw out its implications for East Africa and future research. While there is now an extensive literature on the impacts of trade reform on poverty outcomes, research on the actual and potential effects of trade and regional integration on food security is much more limited. This reflects inconsistencies in the definition and measurement of food security, substantial data limitations, and the complexity of food systems themselves. Nevertheless, we argue that there is an urgent need and considerable scope for further research on these linkages.

Date: Current version: June 2021.

Key words and phrases. Trade, food security, poverty, East Africa, regional integration, inequality, survey

JEL: F13, Q17, Q18, I3, D63.

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1. INTRODUCTION

Globally, hunger and malnutrition have been on the rise since 2014, leaving over 690 million people without access to enough reliable, safe, and nutrient-rich food (FAO et al., 2020).¹ According to the Food and Agricultural Organization’s (FAO) 2020 report on *The State of Food Security and Nutrition Around the World*, no progress has been made towards the Sustainable Development Goals 2.1 and 2.2, which focus on ensuring access to safe, nutritious, and sufficient food for all; and eradicating all forms of malnutrition, respectively. The most commonly cited reasons for this include deteriorating climate conditions (which has led to decreases in production and increases in commodity prices in some areas), unstable commodity prices, poor economic growth, severe economic shocks, and civil unrest. All of these have the potential to disrupt household access, availability, utilisation, and the stability of food sources (FAO, 2019; FEWSNet, 2019; FAO et al., 2020).

In the decades leading up to 2014, there were widespread signs of progress, as rates of malnutrition and hunger fell globally. However, since 2014 the gains experienced are being reversed and these issues have only been exacerbated by the COVID-19 pandemic and the associated economic downturn. This is particularly concerning given the substantial evidence documenting the impact that food insecurity and undernutrition has on health (Weaver and Hadley, 2009; Anema et al., 2009; Weiser et al., 2017). For instance, it is well documented that food insecurity and undernutrition are associated with stunting, wasting, anemia, limited physical and cognitive development, and increased risk of illness (Food Security Information Network, 2018; FAO, 2019; Martins et al., 2011). These are associated with billions of dollars worth of direct and indirect costs in the form of increased medical costs and decreased productivity each year.

Major strides have been made in the past decade on many of these health problems. For example, the incidence of stunting has decreased by 10 percent since 2011. Nevertheless, millions of people still suffer from various forms of malnutrition (FAO, 2019). Like food insecurity, the decline in extreme poverty (down to 10% from more than 33% in 1990) started to slow beginning in 2018. Indeed, poverty in 2021 is expected to increase back to 2017 levels due to COVID-19, increases in the incidence of violent conflict, and climate change (World Bank, 2020).

Africa, in particular, continues to face significant food security and poverty challenges. The continent has some of the highest rates of undernourishment and extreme poverty in the world; 25% of households in East Africa are experiencing severe food insecurity (FAO et al., 2020) while 42% of households in Sub-Saharan Africa

¹This is the estimate from before the COVID-19 pandemic began. COVID-19 is expected to lead an additional 83 to 132 million people becoming undernourished by the end of 2020 (FAO et al., 2020).

were living in extreme poverty in 2018 (Montes et al., 2020).² Indeed, two thirds of individuals experiencing food crises are from only eight countries - four of which are in East Africa (Food Security Information Network, 2018). The horn of Africa is regularly affected by droughts, and in some areas climate change is now producing the other extreme of significant rainfalls. This, combined with East Africa's reliance on pastoral land has led the region to experience one of the worst food security crises in the world.

In response to these substantial issues, governments and policy makers, including those in East Africa, are exploring the impact that trade openness and regional integration can have on improving food security and poverty issues. There are many good reasons why reduced barriers to trade could have this kind of positive impact. Increased specialization can increase overall production while simultaneously alleviating food shortages in specialized regions. At the same time, liberalized trade policies may also enhance risk-sharing possibilities across countries and incentivize the adoption of new technologies and more productive practices.

Despite the potential benefits of greater trade, the actual links between trade reform and poverty and food security, specifically, are less clear. While trade liberalization efforts can reduce poverty and increase productivity, the overall impact depends on multiple underlying constraints and distortions within the economy. Both reduced-form and structural approaches to studying the relationship between trade and poverty show that households in areas that directly benefit from trade liberalization are more likely to experience declines in poverty rates, but that these gains are not uniformly distributed. The overall distributional impact naturally depends on many factors, which we discuss in detail in Section 3. The impact of trade and regional integration on food security is equally complex, with evidence of both positive and negative impacts on food security depending on the regions being analysed and which dimensions of food security are considered.

The rest of the paper is organized as follows: Section 2 provides a background on trade and regional integration by broadly describing the potential benefits from trade, the types of trade barrier reductions, and the constraints to stable regional integration. We also describe the trade environment in East Africa specifically. This region is of particular interest given the regional integration efforts that are currently underway, which will have implications for regional food security. Sections 3 and 4 summarize the existing evidence on the relationship between trade and regional integration, on poverty and food security, respectively. We conclude in Section 5 with recommendations for future research on the trade-food security nexus.

²This is based on the poverty rate using the \$1.90 USD poverty line.

2. TRADE AND REGIONAL INTEGRATION

In this section, we describe the potential first-order benefits of increased trade, forms of trade barrier reductions, and the constraints to stable regional integration. This is important context for the following sections, which discuss how these factors are related to poverty and food security outcomes specifically. We also describe the trade environment of East Africa specifically, since that region of particular interest for this review.

It is important to distinguish between trade effects that are the result of unilateral trade liberalization and those that result from greater regional integration. While a key goal of regional agreements is typically to expand trade and investment amongst member nations, they may also have the effect of replacing trade with nations outside the region. Thus, the potential benefits of “trade creation” resulting from regional integration may be offset by the potential costs of “trade diversion” if it results in distortions in trade with the rest of the world. Unfortunately, recent trade disputes and the current impotence of the WTO make multilateral trade agreements that will benefit East African countries an increasingly uncertain outcome. In this context, regional integration may be a way of achieving benefits of trade openness, including poverty alleviation and increased food security, as well as stronger regional ties.

2.1. Potential Benefits from Increased Trade

2.1.1. *Specialization and Intra-Regional Labor Flows.* Neoclassical trade theory attributes the benefits from international trade to increased specialization in the production of goods and services in which a country has a comparative advantage. A key source of differences in comparative advantage across countries is the relative abundance of different factors of production at a given point in time. In many respects, the past and current composition of trade flows between East African nations and Europe reflects this relative factor abundance, with the former specializing in low-skilled, land intensive, low-value production and the latter in high-skilled, capital-intensive, high-value production.

On the other hand, specialization can also create serious problems for developing nations if the terms of trade moving against them over the long term or if recurrent shocks (due to climate change or commodity price instability, for example) impact those sectors. Credit market constraints and other resource limitations make it difficult for countries to invest in physical and human capital and thereby shift their comparative advantage towards higher-valued and less volatile sectors. If intra-regional institutions (e.g. legal mechanisms) function well, regional integration can allow nations to obtain the benefits of specialization while mitigating some of the associated risks. Increased regional trade could, in principle, enable the concentration of the production of different goods and services in different countries, in order to take advantage of economies of scale.

The benefits from specialization can be further enhanced by the free movement of labor across national borders. In the East African Community (EAC) agreement, for example, the Common Market Protocol is intended to eventually promote free-movement of workers between the member states.

2.1.2. *Integration into Global Value Chains.* Beyond the pure expansion of trade, a key feature of globalization over the past two decades has been the emergence of global value chains (GVCs). For regions with limited manufacturing or service export base and a large pool of labor, such as those in sub-Saharan Africa, this development can provide a significant opportunity. By specializing in a specific segment of a production chain, each participating country can generate a portion of the value added — whereas producing the whole product from scratch would never have been within reach in an increasingly competitive world.

Allard et al. (2016) study GVCs using the Eora database (Lenzen et al., 2013), which provides the global multi-region input-output tables that are necessary to derive the sources and destinations of the value added embodied in products. They find that five countries in sub-Saharan Africa stand out in having seen the share of foreign value added (FVA) in their exports increase by 5 percentage points or more during 1993-2012: Ethiopia, Kenya, Seychelles, South Africa, and Tanzania. In these countries, the sectors that benefited the most from deepening integration include agriculture and agro-business, and manufacturing (particularly in Tanzania).

2.1.3. *Risk Sharing.* The susceptibility of regions in East Africa to drought and flooding is only expected to worsen with global climate change (FAO, 2019). Both intra-regional and extra-regional trade can potentially play a crucial role in mitigating the impacts of domestic climatic shocks by enabling risk-sharing between nations (Gilbert, 2011). That is, if agricultural products can flow from regions currently experiencing relative abundance to those that are currently drought-stricken, this may allow rural households to maintain their livelihoods without being forced to undertake coping strategies with long-term negative consequences. Moreover, the existence of alternative regional sources for agricultural products could help reduce price volatility.³

2.1.4. *Technology Adoption and Improved Methods.* Perhaps the most significant potential long-run gains from reduced costs of trade come from the impact it can have on the incentives to adopt new technologies and better, more productive practices (for a recent survey, see Shu and Steinwender (2019)). While adoption of Green Revolution technology (e.g. higher yielding crop varieties) has been widespread in Asia and Latin America, for example, adoption rates in sub-Saharan Africa have generally been much lower, and yields of staple cereal grains have not experienced

³Since low and middle income countries tend to be price-takers, these regions are particularly vulnerable to price volatility (FAO, 2019).

comparable increases. Reducing trade costs raises output prices in net exporting regions and reduces them in net importing regions. It also decreases the price of inputs — many of which, like fertilizer, are almost entirely imported from outside of Africa (Porteous, 2020).

However, the connection between trade and incentives to adopt is complex. Generally speaking, small-scale farmers are highly risk-averse and participate in complex livelihood systems that are deeply socially-embedded (Anderson et al., 2016). Such complex and embedded socio-ecological relationships represent key sources of resilience for small-scale farmers and as a result, influence farmer adoption of new technologies and participation in markets and trade. While economic considerations are important for small-scale farmer decision-making, they are far from deterministic, with a number of non-economic factors (e.g. the institutional and policy environment, socio-cultural factors) being essential considerations that influence the uptake of technology and participation in trade as well (Anderson et al., 2016; Barrett, 2008; Ouma et al., 2010).

2.1.5. Export Sophistication and Diversification. A related benefit of greater cross border trade is that it can increase the size of the market for each item, thereby making it worthwhile to invest in the fixed costs needed to support its production by individual producers and governments. Enhanced intra-regional trade could potentially generate regional markets for more sophisticated non-agricultural goods. However, it also requires a sustainable market for the resulting goods and services, which could depend on additional investments in physical and human capital, infrastructure, and institutional quality.

2.2. Forms of Trade Barrier Mitigation. Whether we are talking about interventions designed to increase formal trade within the region or with other nations outside the region, there are several broad forms that these can take.

2.2.1. Tariff Reduction Agreements. Tariff reduction agreements are a type of preferential trade agreement that are focused on eliminating tariffs applied to tradable goods. These types of agreements became widespread with the introduction of the General Agreement on Tariffs and Trade (GATT) which was established in 1947 and later succeeded by the World Trade Organization, and focused on reducing tariffs to increase multilateral trade amongst member nations.

Since the introduction of the GATT, food and agricultural products have repeatedly been excluded from tariff reduction agreements, due to their highly sensitive nature (Clapp, 2016). This has led to many agricultural products being excluded from trade liberalization efforts for a number of years and, in some cases, permanently. Selective exclusion of sensitive products can change the welfare and poverty implications substantially. Which sectors and products are included in the regional agreement matters considerably for the impact of regional integration.

East African nations are party to many such agreements, both intra-regional and extra-regional. For example, tariff liberalization within regional trade agreements under GATT Article XXIV are supposed to cover a large fraction of trade (World Trade Organization, 2021). Selective exclusion of sensitive products can, however, change the welfare and poverty implications substantially, as we discuss in more detail in Section 3.

2.2.2. Trade Facilitation. We can distinguish between two broad types of trade facilitation: those that encourage specific trading relationships and those that make cross-border trade (CBT) easier and less costly.

- (1) Facilitating trading relationships involves bringing producers from different countries together. This could involve the use of trading platforms such as the USAID East Africa Trade and Investment Hub (EATIH), was intended to increase intra-regional trade of staple foods in the East African Community (EAC), by improving the access to, availability of and utilisation of African-grown commodities through regionally integrated markets (USAID, 2018).
- (2) Facilitating cross border trade: The simplification of trade laws and procedures, and border enforcement coordination by Customs and other agencies is critical to the reduction of release times and costs. Trade Facilitation in this sense greatly impacts food security and cross-border trade of food and agricultural products. Moreover, full implementation of the WTO Trade Facilitation Agreement remains a key challenge for most African nations (Hassan, 2020). For many developing areas, including East Africa, facilitating cross border trade will also depend on improving and expanding transport infrastructure (Eberhard-Ruiz and Calabrese, 2018), as well as harmonizing and enforcing commodity standards.

2.3. Constraints to Achieving Gains from Removing Trade Barriers. There are many factors that make the reduction of trade barriers difficult to achieve or sustain, and which limit the extent to which many households in poor regions can benefit from them.

2.3.1. Heterogeneous Effects. The nature of the relationships between the trade environment, food security, and poverty varies in important ways with the characteristics and activities of households. For example, female-headed houses are often among the poorest and, within households, income changes for females may affect their standing in intrahousehold decision-making. By impacting these incomes, trade liberalization and regional integration can partly determine their poverty status. Other relevant characteristics observed in the literature include:

- **Household economic activities:** The impact of changes in trade barriers depends on the existing structures of production and on the consumption habits of households (Martuscelli and Gasiorek, 2019). For example, if the

prices of agricultural products fall (e.g., due to tariff reductions) and these form a large part of the consumption bundle of households at the bottom of the income distribution, then this will increase real incomes of low-income consumers. However, the incomes of producers may fall and if these farmers are members of low-income households this may offset reductions in poverty on the consumption side.

- **Scale of production:** An important source of variation across farming households in East Africa is their mode and scale of production. A large fraction of farmers are smallholder farmers producing at a small scale using low-productivity, labor-intensive methods. In the absence of other interventions, their capacity to benefit from any reduced costs of formal trade is typically lower than larger-scale farmers. High initial costs, as well as long-term costs represent key barriers to participation, which large farms are often able to manage better than smaller farms (Anderson et al., 2016; Barrett, 2008; Barrett et al., 2010) as larger scale producers are better able to undertake the documentation and certification required for formal trade and have access to lower average transportation and logistics costs.
- **Geography:** A region’s physical geography has an impact on the capacity of households to benefit from changes in the trading environment and can both incentivize and discourage participation in trade (Barrett et al., 2010; Omiti et al., 2009). Climate, soil quality, and patterns of precipitation are key determinants of the variation in agricultural productivity across districts and can determine whether a particular community has the capacity to produce marketable goods or a surplus of commodities. The extent to which price changes at ports and border crossings “pass through” to price changes in remote areas is severely limited by transportation costs. Most agricultural production and the households who depend on it for a living are concentrated in rural areas, whereas manufacturing and processing activities are more likely to take place in urban locations. Since the poor are often concentrated in rural areas, reductions in poverty are more likely where there is agricultural (productivity) growth such that farmers are able to produce marketable surpluses (Olwande et al., 2015).

2.4. Distortions. The extent to which small scale producers and poorer households can take advantage of reduced trade barriers is typically constrained by multiple distortions and constraints along the production value chain (Atkin and Khandelwal, 2020). These include those in the markets for labor, since the presence of informal labor markets and limited labor mobility can limit the productivity benefits of increased trade associated with reallocation (Artuc et al., 2015). Similarly, access to other inputs, such as capital and land have been shown to moderate the impact

that trade liberalization policies have on populations (Ramírez-Rondán et al., 2020; Arcand et al., 2015; Chang et al., 2009; Goldberg et al., 2009; Boone, 2019).

Lack of access to information and the role of social and cultural norms and practices also play a key role (Anderson et al., 2016). For example, the costs associated with identifying buyers or sellers in other countries and the acquisition of productive knowledge can significantly outweigh other more obvious costs, like tariffs (Omiti et al., 2009; Atkin and Khandelwal, 2020). Although the recent surge of mobile phone usage in developing countries has provided an opportunity for innovative market information system projects to get critical market information into the hands of farmers and traders, it remains unclear whether these can be delivered on a profitable basis by the private sector (Fabregas et al., 2019).

Relatedly, access to storage and warehousing are another important part of the value chain. In some years, certain regions experience drought, while in others there is a bumper harvest that results in wasted surpluses and low prices if the surplus cannot be distributed. To address these imbalances at a regional level requires the ability to trade both spatially and intertemporally, which in turn requires a functional system of storage and warehousing. East African countries are currently experiencing acute shortages in warehousing facilities, which results in delays, losses and high prices. According to Research Tree Africa (2018), the high costs of poor warehousing in developing countries are the greatest contributor to high consumer goods prices, accounting for up to 50 - 75 percent of the retail cost of food.

2.4.1. Loss of Tariff Revenue. Another source of resistance to the implementation of trade agreements is that reductions in tariff revenue can undermine the government's capacity to undertake socially and economically beneficial investments. Raising revenue from other sources could be equally or even more distortionary or, if borrowed, contribute to an already precarious sovereign debt situation. In their recent Economic Outlook, the African Development Bank (2019, p.120) argue that these revenue losses are likely to be relatively small for most countries. However, in some countries, customs is one of the largest, if not the largest sources of revenue and, in the negotiations associated with the AfCTA, the potential loss of tariff revenue remains a significant sticking point for many countries (Saygili et al., 2018).

2.5. The Trade Environment in East Africa. The trade policy environment in Africa specifically is complex and consists of eight regional economic communities (RECs) and dozens of overlapping bilateral and multilateral regional trade agreements (Bank, 2019). Over the past few decades the countries of East Africa have experienced many changes in their trading environment (USAID, 2018). These include regional trade programming carried out through RECs, trade-focused interventions and capacity building, to help remove constraints and bottlenecks faced

by the private sector (e.g. trade and investment facilitation, training, B2B events, etc.).

The East African Community (EAC) is the most advanced REC in Africa, establishing a common market in January 2010 that provides for the free movement of goods, services, capital, labor and persons, plus rights of establishment and residence. The six member states, Uganda, Kenya, Tanzania, South Sudan, Rwanda and Burundi, have adopted a three-tiered duty structure for imports from outside the Customs Union. Most finished products are subject to a 25 percent duty, while intermediate products face a ten percent levy. Raw materials (excluding food) and capital goods may enter duty free. In addition, an allowance for goods valued under \$2000 to enter duty free has been introduced to encourage small scale trade. Imported goods are charged a VAT of 18 percent and a 15 percent withholding tax, which is not reclaimable. Imports are also charged a 1.5 percent infrastructure tax to finance railway infrastructure development.

The EAC has been making steady progress in implementing common standards, rules of origin and completely eliminating internal tariffs. There have also been significant reductions in non-tariff barriers amongst EAC countries (World Trade Organization, 2019). The introduction of common documentation, Single Windows at intra-EAC customs ports, and the development of the Northern Corridor scheme, for example, have all contributed to improved integration. However, there are ongoing challenges, especially in the effectiveness and implementation of various agreements. This partly reflects the fact that the EAC has little power to enforce agreements amongst member nations.

Recently, ambitious and wide-ranging trade liberalization agreements are under negotiation: the African Continental Free Trade Area (AfCFTA) and the Tripartite Free Trade Area (TFTA), which seeks to combine the big three RECs: COMESA-EAC-SADC. These are complex negotiations with many challenges (especially with regard to implementation) and it is unclear how long it will take for them to fully come into effect. If they are successfully implemented, they may affect the balance currently in existence between regional integration and overall global trade with African nations in a variety of ways. Most African imports flowing into EAC countries are from countries with which those EAC countries already share REC agreements (or would be covered by the TFTA when it comes into force). Imports from elsewhere in Africa accounted for only 2 percent of African imports into EAC countries in 2017 (United Nations Economic Commission for Africa, 2019). Consequently, the AfCFTA will have a significant impact on imports into EAC countries only if it stimulates substantial new trade from central, western and northern Africa.

There have been multiple efforts to reduce the many barriers to trade beyond the tariff and tax reductions specified in various trade agreements (i.e. non-tariff

barriers), including many of the alternatives described above, such as improving transport infrastructure and harmonizing and enforcing standards.

2.5.1. *Unrecorded Trade.* Undocumented trade is estimated to account for approximately 30-40 percent of the total trade within East Africa (FAO, 2018). There are multiple reasons why traders engage in unrecorded cross border trade: the existence of communities that transcend borders, internal conflicts within certain countries, internal transport costs, corruption and delays at border crossings, cultural issues, lack of trust in government officials to be facilitators of trade, limited understanding of the technical and regulatory aspects of trade, a lack of information as to how to trade formally and the costs of formal trade (tariffs, value added tax) for some items. The nature of informal trade increases traders' vulnerability to being victims of abuse (many are women) or participating in activities like bribery at checkpoints. Informal trade, however, allows food and agricultural products to move across borders when formal trade routes cannot operate efficiently (Porteous, 2017).

3. TRADE, REGIONAL INTEGRATION, AND POVERTY

This section provides an overview of research that relates to the impacts of changes in the trading environment on poverty in general. Many such changes have implications for, or are affected by, food security. However, we leave these more specific implications, mainly associated with induced agricultural productivity improvements and commodity market stability, to the following section.

3.1. **Impacts of Trade Reform.** There are now many examples of developing countries that have undergone substantial trade reform, either unilaterally or as part of regional trade agreements. Quantitative approaches to understanding the impacts of changes in the trading environment differ in terms of methodology and the outcomes studied. It is challenging, however, to attribute outcomes to changes in the trading environment since there are typically many confounding factors.

3.1.1. *Cross-Regional, Reduced-Form Evidence.* A recent methodological approach has tried to address these attribution problems by comparing the impact of sector-weighted tariff changes across regions within a country. The sector weights refer to the share of employment in the region allocated to the sector associated with a given tariff. This approach helps to identify the effects on wages or poverty rates of tariffs, by comparing changes over time across different subnational regions. Prominent applications of this methodology include: Topalova (2010) and (Topalova and Khandelwal, 2011) for India; Erten and Leight (2019) for South Africa; Costa et al. (2016) and Dix-Carneiro and Kovak (2017) for Brazil; and Chiquiar (2008) for Mexico.⁴

⁴See Pavcnik (2017) for a recent survey.

These studies find that the distribution and persistence of gains associated with tariff reductions depend crucially on underlying constraints and distortions in the economy. In the case of India, for example, there was significant trade liberalization in 1991 following IMF conditions after a balance of payments crisis. Topalova and Khandelwal (2011) find that the lower tariffs resulted in increases in producer-level productivity, improved access to foreign inputs, and increased competition among producers. However, Topalova (2010) finds that poverty-reduction was much slower in (rural) districts where share-weighted tariff reductions were higher. Moreover, these effects were surprisingly persistent over time. These findings are common across these types of studies of the regional effects of trade liberalization within other countries. The persistent effects on inequality are typically attributed to a lack of resource reallocation, possibly due to rigid labor laws or financial market frictions. However, as discussed above, there are many other distortions and frictions that could play a role and the exact mechanisms remain unclear.

Similarly, individuals in regions with a high concentration of industries benefiting from lower export costs or increased demand for their exports experience persistently higher earnings than individuals in less exposed regions. See, for example, McCaig (2011) for Vietnam; Costa et al. (2016) for Brazil; Chiquiar (2008) for Mexico; and Erten and Leight (2019) for China. In the case of Vietnam, for example, costs of exporting fell following a bilateral trade agreement with the U.S. in 2001. Families in provinces with a greater concentration of industries that observed a decrease in export costs experienced greater declines in poverty relative to those in less exposed regions McCaig (2011). Because regions that benefited more from the trade policy changes were better off to begin with, trade in this instance amplified regional inequalities.

It is important to note that these effects are all relative because they compare the effects of trade costs on incomes or poverty between regions more and less affected by trade. In India, for example, aggregate poverty declined after 1991, so to the extent that trade contributed to reduced poverty through its effect on aggregate growth, these adverse relative effects could imply smaller gains for poorer regions (as opposed to losses). Without a model and additional assumptions, this approach cannot establish trade's overall contribution to poverty reduction. Moreover, the reduced form approach taken in these studies does not reveal much about the precise channels through which trade reform impacts households.

3.1.2. Household-level structural evidence. A more structured approach recently taken by several researchers combines data from household surveys with estimates of the impact of tariffs and non-tariff barriers on prices and a model of household behaviour. Household survey data can be used to estimate the key relationships between expenditures, incomes and prices. The implications of this approach are sensitive to the underlying assumptions, however, these estimates can then be used to infer the

overall impacts of changes in trade costs on the distribution of net benefits, taking into account the relative changes in income and consumption that occur in response to a change in prices.

The approach builds on the methodology first developed by Deaton (1989) to study the predicted impact on household welfare of changes in the price of rice on rural and urban Thai families. The analysis typically incorporates an equilibrium farm-household production model (Singh et al., 1986), which can allow for income from wage labor, profits or subsistence. Porto (2006) extends the methodology to study both the direct and general equilibrium effects of price changes, resulting from tariff reductions on expenditures and incomes. Using this framework, he finds that the tariff changes that occurred as a result of Mercosur benefit Argentine households across the entire income distribution.⁵ Moreover, he finds that poor households gained more from the reform than middle and high-income households, mainly because Argentine trade policy protected the rich over the poor prior to the reform. Adopting a similar methodology, Borraz et al. (2012) find that the impact of Mercosur was positive in the case of Uruguay, as welfare gains were higher among the poor, but negative in Paraguay as welfare losses prevailed along the entire income distribution.

Nicita (2008) extends Porto's approach by allowing for imperfect pass-through from trade policy to local domestic prices. Applying the framework to the Mexican tariff liberalization during the 1990s, he finds that consumers' prices both for agricultural and manufacturing products were reduced, while there was an increase in the wage gap between skilled and unskilled workers. As a consequence, while all households gained from a less expensive consumption basket, households that were net suppliers of agricultural goods were hurt by lower agricultural prices. While the net gain was positive on average, the benefits were not uniformly distributed with low-income households gaining substantially less, and households living closer to the US border benefitting most. Marchand (2012) revisits the effects of trade liberalization in India using a similar framework that allows the pass-through rates of tariffs to vary across states and across the rural and urban areas of each state. He finds that households at all per capita expenditure levels experienced gains as a result of the trade liberalization and, in contrast to the implications of Topalova (2010), that the average effect was generally pro-poor in India.

Nicita et al. (2014) explore the poverty bias of existing trade policy in Burkina Faso, Cameroon, Côte d'Ivoire, Ethiopia, Gambia and Madagascar, allowing for a more comprehensive set of sources of income heterogeneity than previous papers. Their results suggest that the elimination of tariffs in these countries would lead to

⁵Mercosur is the Southern Common Market created in 1991 consisting of Argentina, Brazil, Paraguay, Uruguay and Venezuela.

increased unskilled wages and decreased skilled wages. As a result, with the exception of Ethiopia, existing domestic trade policy is biased in favor of poor households. Since agricultural sales tend to represent a larger share of poor households' income, the decline in prices associated with the removal of agricultural protection would hurt poor households relatively more than rich households. Fajgelbaum and Khandelwal (2016) develop a related methodology that requires data on aggregate expenditures and parameters estimated from a non-homothetic gravity equation. While their analysis focuses on expenditures only, they are able to study a number of countries using aggregate trade statistics. They find that trade typically favors the poor, who concentrate spending in more traded sectors.

Recently, Artuc et al. (2019) develop a parsimonious version of the structural approach that incorporates some of the extensions detailed above and apply the framework to 54 developing countries. They estimate that the distributional impacts of import tariff reductions would be highly heterogeneous, across both countries and households. They find that unequal net gains arise primarily because trade exacerbates income inequality, while the consumption gains tend to be more evenly spread.⁶

This burgeoning literature on the impacts of trade liberalization is certainly influential and makes use of the growing availability of household survey data. However, there are some important limitations to keep in mind. First, the analysis is static in nature: the underlying model takes the existing productive capacity of the economy as given and does not allow for potential productivity changes in response to changes in the trading environment. Second, the small open economy assumption implies that the world supply of each good is perfectly elastic: as a result there is no role for excess deficits or supplies of key commodities. Finally, the implications depend on key assumptions being maintained regarding competition, pass-through and household behaviour, and sensitivity to these is not typically provided.

3.2. Global Value Chains. As discussed in Section 2, the emergence of GVCs provides a significant opportunity to countries with limited manufacturing or service export bases. Agriculture value chains could play a role in poverty reduction by integrating rural households and smallholder farmers into supply chains, and some recent empirical work attempts to assess these effects. For those farmers that are included in contract schemes and high value export chains, most recent empirical studies find positive effects of GVC participation on food security and household

⁶Overall, they find average gains from import tariff liberalization in 45 countries. In most cases, households benefit throughout the distribution. In 13 of the countries studied, they find that the benefits of such reforms are proportionately larger for the poor than the rich. In 23 countries (including Ethiopia, Tanzania and Uganda) the benefits are proportionately smaller for the poor and in a further 9 countries (including Burundi and Kenya) the poor lose despite there being gains on average.

and farm income in various locations (Minten et al., 2009; Subervie and Vagneron, 2013; Handschuch et al., 2013; Asfaw et al., 2009). The welfare of small producers who are included in high standard value chains typically improves (see Maertens and Swinnen (2009); Rao and Qaim (2011); Rao et al. (2012); Minten et al. (2009). However, where small and medium-sized producers are not well positioned to respond to changes in market structures, they tend to be marginalized (Dolan and Humphrey, 2004; Lee et al., 2012; Maertens et al., 2009).

Thus, whether GVCs can lead to better, self-sustaining economic prospects for the poor requires further scrutiny (Patchell and Hayter, 2013; Neilson et al., 2014). GVC development approaches often make assumptions regarding resources, opportunity costs and risk-absorption capacity that do not reflect the reality of participating communities (Stoian et al., 2012). Furthermore, conforming to the global standards required for participation can be financially risky for small-scale producers and the implicit North-South power structures associated with components of the value chain are often problematic (Dannenberg and Nduru, 2013; Patchell and Hayter, 2013). Regional value chains (RVCs) are increasingly perceived as a possible alternative paradigm for Africa's growth (Yadav and Moore, 2019). Such RVCs could exploit existing complementarities within the region resulting from differences in labor costs and productive capabilities, natural resources or geopolitical features that include maritime access and trade agreements with extra-regional partners.

3.3. Trade and Poverty in East Africa. In January 2020, Oxford Policy Management released the results of a wide-ranging performance evaluation of Trademark East Africa (TMEA) during the first phase of its regional integration activities implemented in East Africa between 2011 and 2017. Two key components of this evaluation are a Trade and Growth Impact Study (TGIS) (Baker et al., 2020) and a Poverty and Gender Impact Study (PGIS) (Allison et al., 2019). Although they form part of the evaluation of TMEA's activities specifically, these studies actually provide potential estimates of the more general impact of the changing trade environment on various outcomes in Kenya, Rwanda, Tanzania and Uganda.

Using a general equilibrium model to measure the impact of transport, and cost reduction models combined with a gravity model to estimate the broader impacts of changes to trade flows, the TGIS finds that between 2010 and 2017 the overall cost reductions and time savings at ports had, at best, only modest positive impacts on imports and exports overall. Instead, they led to a reduction in intra-regional trade, with an increase in imports from other regions such as India, the Middle East, North Africa and China. However, during this same time period the reduced costs and time to transport via overland corridors had larger impacts overall, especially in Kenya and Uganda, though this had a limited impact on extra-regional trade. Although aggregate welfare increased in all countries due to improved ports and cross-border trade, improved trade facilitation led to increased competition from

other countries, leading to a substitution of imports away from regional markets, and reduced output in some sectors.

Using a difference-in-difference approach, the PGIS compares how changes in the average experiences of households with respect to poverty and consumption between the survey years depend on their “exposure to trade”. This exposure is measured in two different ways: (1) their proximity to the trading corridors and (2) whether the household head is employed primarily in tradable or non-tradable sectors. They find that households along the Northern and Central trade corridors in Kenya, Rwanda, and Uganda experienced decreases in the incidence and depth of poverty that exceeded those in areas far from the trade corridors. In Tanzania, however, while overall poverty decreased slightly in areas far from the trade corridor, it increased along the trade corridor.

In Rwanda and Uganda, wages increased significantly more along the trade corridor than far from it. The reverse was true in Kenya, but income from agricultural sales increased more rapidly along the trade corridor. In Tanzania, no source of earned income (wages, agricultural sales, and non-agricultural sales) increased along the trade corridor. Agriculture in particular makes up a significant portion of employment in this region, however the benefits of trade liberalisation do not seem to have accrued to these households. When the agriculture sector is excluded from the analysis, exposure to the tradable sector through employment contributes to reduced poverty in all countries.⁷ When agriculture is included in the tradable sector, however, these improvements were negated, especially in Tanzania.

In each country, food prices increased more rapidly than prices in general. They increased more slowly along the trade corridor than far away from the corridor in Rwanda and Uganda and, to a lesser extent, in Kenya. In Tanzania, prices far from the corridor converged to the lower price level existing along the trade corridor. The overall conclusion of the PGIS undertaken is that “workers in the agriculture sector seem to be left out of the benefits of trade that accrue to the rest of the tradable sector. Given the very high proportions of the labor forces that work in agriculture in East Africa, this is a significant challenge.”

4. TRADE, REGIONAL INTEGRATION, AND FOOD SECURITY

This section provides an overview of research on the impacts of changes in the trading environment on food security, as well as the many non-trade determinants of food security that moderate the impact that trade regulations can have on food security.

4.1. Measuring Food Security. A significant challenge facing researchers studying the determinants of food security are the multitude of competing definitions,

⁷Some agricultural products are less tradable than others (e.g. fresh foods). However, the survey data does not allow for a finer decomposition of agricultural employment across product types.

indicators, and terms used in the literature. One study by Maxwell et al. (2008) identifies over one hundred definitions of food security used in empirical work. The most commonly used framework conceptualizes food security as including four pillars.⁸ These comprise the availability of food through production or trade, access to food (either through purchases or productive capacity), and utilisation of food within the household or the human body (Maxwell et al., 2008), with stability being the fourth pillar. Under this definition, food insecurity refers to a situation where one or more of these pillars is significantly undermined.⁹ Even using this standard definition, Schmidhuber and Tubiello (2007) find that only availability is routinely studied in the literature.

Much of the literature on food security uses indicators that are more specifically focused on nutrition-related outcomes such as the incidence of wasting/stunting and the prevalence of undernourishment. However, it should be noted that these are essentially subsets of the broader food security pillars. The prevalence of wasting and stunting, for example, are indicators for utilisation, while the prevalence of undernourishment is an indicator for access. Focusing on only these without considering the impact on other pillars, can lead to incomplete assessments of the impact of an intervention or a change in the trade environment on food security overall, as the pillars can be affected differently by the same interventions (Lloyd-Ellis and Nordstrom, 2021).

Nonetheless, nutrition measures are important given the direct relationship between undernourishment and malnutrition on broader health outcomes. Undernourishment, which refers explicitly to the insufficient intake of food (or poor absorption of nutrients from food), can take four broad forms: stunting, wasting, underweight, and nutrient deficiencies, all of which can lead to increased risk of illness, anemia (in women), as well as limited physical and cognitive development that can have both economic and health consequences (Martins et al., 2011; FAO, 2019). Malnutrition is more broadly defined and can include undernourishment, as well as overweight, obesity, and nutrient deficiencies (Food Security Information Network, 2018; FAO, 2019).

4.2. Non-trade Determinants of Food Security. Given the complexity in the relationship between trade and food security, it is important to consider other factors that affect food security outcomes, and may mitigate this relationship. The empirical evidence indicates many specific reasons for the decline in food security.

⁸See Barrett (2010); Porter et al. (2014); Grace et al. (2017); Hadley et al. (2008); Weaver and Hadley (2009); Rena (2005); Chaudhury et al. (2013).

⁹Some experts recommend expanding the standard pillars to instead include five dimensions: food sufficiency, nutrient adequacy, cultural acceptability, safety, and certainty, with stability playing a moderating role (Coates, 2013).

4.2.1. *Political Institutions and Conflict.* In 2018, analyses by the Food Security Information Network (FSIN) found that conflict was the most significant contributor to acute food insecurity around the world, followed by climate shocks and economic shocks (Food Security Information Network, 2018). The FAO's 2017 report on food security and nutrition around the world also highlighted that conflict is a significant driver of food insecurity around the world, noting that the majority of people who were food insecure or malnourished are in conflict-affected areas and that conflict (FAO et al., 2017). It is important to note that there is a well-established bidirectional causal relationship between conflict and food security. Conflict can weaken all four of the food security pillars through the destruction of assets or resources, limiting access to services and safety nets, and the increased difficulty associated with producing and distributing food (d'Errico and Di Giuseppe, 2018). At the same time, food insecurity can also worsen or fuel conflict within a region by increasing tensions and grievances within a region (Hendrix and Brinkman, 2013), though Buhaug et al. (2015) do not find consistent evidence that decreases in agricultural productivity specifically contribute to violent conflict when they look at violence in Sub-Saharan Africa specifically.

The relationship between conflict and food security is moderated by the political institutional capacity in a region. Weaker institutions make it more difficult for governments to respond to shocks (from violence or otherwise), and make governments more vulnerable to both conflict and violence (FAO et al., 2017). This type of fragility also increases the expected length and severity of the adverse effects on citizens in the region (FAO et al., 2017). Instability within governments makes it more difficult for policy makers to respond quickly and effectively during times of food shortages and limits the development and implementation of long-term policies intended to address structural factors that lead to food insecurity.

4.2.2. *Agricultural Productivity and Climate Change.* A significant volume of work studies the role that climate change will have on food security and agricultural productivity in the region. Increases in atmospheric carbon dioxide concentrations and global temperature, in combination with shifting precipitation patterns and extreme weather events, will drive decreases in food quality, nutritional availability, and crop yields, as well as increases in vulnerability to food and water shortages (Brown et al., 2015; Hoegh-Guldberg et al., 2019). The combination of these factors will affect global, regional, and local food security by disrupting food systems, decreasing access to food, and rendering food utilisation more difficult; risks that are only likely to increase along with the magnitude of climate change.

As awareness of climate change grows, an increasing segment of the literature has focused on its role in driving development. Deteriorating climate conditions negatively impact food security by affecting its four underlying components: food availability, access, utilisation and stability (Porter et al., 2014; Brown et al., 2015;

Hoegh-Guldberg et al., 2019). Climate change is predicted to reduce agricultural productivity and the overall availability of food by increasing overall rainfall in some areas (Osima et al., 2018) while decreasing it in others (Diedhiou et al., 2018). This effectively shortens the potential growing season, which can contribute to decreased food availability. The amount of arable land available globally for food production is also expected to shrink in response to climate change (Premanandh, 2011; Schmidhuber and Tubiello, 2007).

The impact on household's access to food varies depending on whether the household is a net buyer or producer, and whether income or price effects dominate. The current expectation is that the biggest impact of climate change on access to food will be through rising prices (Campbell et al., 2016).

4.2.3. Economic Shocks. Households in richer countries spend relatively low proportions of total income on food, which provides a "buffer" in the event that food prices increase significantly (Timmer, 2000). Food prices are particularly volatile, possibly owing to the highly concentrated export markets for staple commodities. Low and middle income countries are well-integrated into the world economy, but households do not have a similar buffer, which makes these areas particularly vulnerable to extreme changes in food prices and demand for food commodities. Indeed, economic slowdowns or downturns had taken place in 84% of the countries that experienced an increase in the prevalence of undernourishment between 2011 and 2017 (FAO, 2019). As many of these countries' economies are highly dependent on agricultural commodities, this can contribute to food insecurity both directly and indirectly through each of the food security pillars.

4.2.4. Population Factors. Historically, during periods where growth in food production has not kept up with population growth in the region, the food deficit has increased (GRAIN, 2019). As Godfray et al. (2010) highlight in their review, population growth puts greater demand on the inputs required for food production making food insecurity more likely, particularly for vulnerable groups. Income and gender inequalities, as well as inequalities within rural communities (compared to urban counterparts) also increase the risk of poorer food security outcomes as these groups are generally more vulnerable to economic and other shocks that impact food security (FAO, 2019).

4.2.5. Food Assistance and Food Security. Within the food security literature, numerous studies have been conducted on the impact that different types of food security assistance have had on food security outcomes. The efficacy of this kind of assistance is largely dependent on the type of food security assistance being considered (Awokuse, 2011; Mary, 2019). Program aid (which refers to transfers between governments to be sold in local markets) has been found to have a negative impact on domestic agricultural productivity due to a negative impact on domestic prices

(Awokuse, 2011). Looking at the impact of project aid (which refers to food assistance allocated for specific projects), there is mixed evidence about the impact that food security assistance has on nutrition outcomes possibly owing to differences in the timeline and contexts analysed, and the type of assistance considered (Brück et al., 2019; Mary, 2019). However, addressing the root causes of food insecurity is more effective than the provision of food security assistance on its own (Barrett, 2010; Brück et al., 2019). This may reflect the fact that while humanitarian aid does address immediate availability and access concerns, it generally does not invest in the capacities that are required for strengthening resilience.¹⁰

4.3. Evidence on Trade, Agricultural Productivity, and Food Security. In contrast with the work on the effects of trade on growth, poverty and inequality, there is relatively little empirical evidence on the impacts of changes in the trading environment on measures of food security explicitly. A few case studies find links between trade and nutrition, but these qualitative analyses cannot parse out the effects of trade from other changes (Madeley and JADOT, 2001; Thomas, 2006; Thow and Hawkes, 2009). There is also inconsistent messaging from NGOs and government agencies about whether trade liberalization is good or bad for food security, that often overlook findings that show the relationship is more nuanced and that there are mixed impacts of trade liberalization efforts (Swinnen and Squicciarini, 2012). Looking at agricultural trade liberalization specifically, McCorriston et al. (2013) find little consensus in the literature that this type of liberalization effort has a positive impact on food security.

Theoretically, trade has the potential to affect each of the food security pillars in different ways, as outlined by Clapp (2016):

- **Access:** If trade leads to improved income to producers either through increased exports or growth nationally, this may improve overall access to food within an economy. At the same time, if the gains from trade are not distributed equally, this may lead to worsened food access for some in the population.¹¹
- **Availability:** Increased imports can increase the amount of food within a country, increasing food availability. However, this may not be a uniform effect across all countries if the gains from trade are not distributed equally.
- **Utilisation:** Imports can potentially increase the overall diversity of food available, which can improve nutritional outcomes and utilisation of available

¹⁰Most work on access resorts to pricing as a proxy, which is not a thorough view of “access” (Brown et al., 2015).

¹¹This is consistent with the observations of the recent Poverty and Gender Impact Study conducted as part of a review of Trademark East Africa, which found that food prices increased more rapidly than prices overall, and increased more slowly in regions further from trade corridors (Allison et al., 2019).

food. However, the importation of more processed foods may lead to poorer nutrition content in food overall, and often does not reach all households equally.

- **Stability:** Open food trade policies may allow domestic food surpluses or deficits to be smoothed out, which can stabilize both availability and prices. However, if this leads to a dependency on food imports, this could increase the risk of severe price and supply volatility if there are disruptions to these imports.

Since trade has the potential to impact each of these pillars differently, and since each of these pillars is essential for ensuring overall food security, it is important to consider all four pillars in an analysis of food security. However, this is often not considered in the existing empirical work.

4.3.1. *Cross-Country Estimates.* More recent studies have made use of increasingly available country-level data sets to specify and estimate cross-country dynamic panel models (Dithmer and Abdulai, 2017; Mary, 2019). These empirical approaches potentially allow researchers to account for unobserved heterogeneity, correlated individual effects and bidirectional relationships between trade and food security. So far these studies have yielded somewhat conflicting results, depending on the measures of food security and trade openness used, the sample of countries and time period included, and the empirical methodology. Dithmer and Abdulai (2017) conclude that the adoption of more open trade policies contributes to dietary energy consumption, and to improvements in dietary diversity. In contrast, Mary (2019) finds robust evidence that food trade openness causes undernutrition in developing countries. These effects on hunger are driven by decreased per capita GDP in the food sector and decreased agricultural producer prices despite gains in the food supply.

4.3.2. *Agricultural Technology Adoption and Trade.* A few quantitative analyses specifically focus on measuring the potential impacts of reduced trade barriers on agricultural productivity in Africa. One potential source of these productivity gains comes from the impact on the incentives to adopt new technologies and better, more productive practices, affecting the intensive margin (Shu and Steinwender, 2019). Reducing trade costs can affect these incentives by raising output prices in net exporting regions and reducing them in net importing regions. It also decreases the price of inputs, many of which, like fertilizer, are almost entirely imported from outside of Africa (Porteous, 2020). Another potential source of productivity gains due to reduced trade costs comes from the reallocation of production from less to more productive farmers or regions, which affect the extensive margin.

While there is a large literature on the impact of reduced trade barriers on manufacturing firms' incentives to adopt new technologies and practices, there is very little

analysis or evidence related to the agricultural sector (Brown et al., 2018). Distance to market and poor infrastructure are major contributors to higher input prices and lower product prices for net sellers, which in turn act as a tax that discourages the adoption of innovations. For example, in their detailed study of prices, travel costs and market access in Northern Tanzania, Aggarwal et al. (2018) find that input usage in the most remote villages is only a third of that in the least remote villages, while maize sales are only 45 percent as high. In an analysis of multiple hub markets throughout Africa, Porteous (2020) finds that when trade costs are high, farmers in local markets would lose from the lower prices induced by widespread adoption of improved fertilizers, but that this implication is reversed when trade costs are low. In this sense, there is an important potential complementarity between supply-side interventions (e.g. fertilizer subsidies) and demand-side interventions, such as reductions in the costs of trade: the effectiveness of each may be enhanced by the other (de Janvry and Sadoulet, 2019).

4.3.3. *Risk Sharing.* Many important theoretical and empirical questions relate to the potential role of international trade and trade policy in mitigating the effects of domestic shocks or exposing countries to more external price shocks. Empirical evidence on the impact of international trade on the stability of prices and the availability of key agricultural commodities from year to year is still quite limited. Some results suggest that trade is more important than storage in mitigating the impact of domestic production shocks (Negi and Ramaswami, 2016). But the food price crisis of 2007–2008 led many to doubt the reliability of world commodity markets in times of need (Clapp, 2016). The empirical evidence suggests that endogenous changes in trade restrictions (i.e. reductions in import protection or increases in export restraints) added substantially to the spike in international prices for rice, wheat, maize, and oilseeds (Headey and Fan, 2008). Consequently, although domestic prices rose less than they would have without these insulating policies in some developing countries, in many others they rose more (Anderson et al., 2013). Overall, quantitative analyses using CGE models suggests that the actual impact of insulating trade policies ends up being small.¹² Moreover, these induced policy responses severely limit the possibility of substantial consumption-smoothing through trade (Jha et al., 2013).

Recently, there has been renewed interest in combining regional food reserves with trade to reduce fluctuations in food consumption. Kornher and Kalkuhl (2016) argue that while trade integration amongst the Economic Community of West African States members is generally more effective than storage in smoothing supply, regional storage is required to dampen extreme supply shortfalls. Moreover, they find greater

¹²Rutten et al. (2013) and Jensen and Anderson (2017) study these issues in the context of the Global Trade Analysis Project model (Corong et al., 2017).

potential for storage cooperation with regard to an emergency reserve and less with regard to a stabilization reserve.

4.3.4. *Trade, Regional Balance, and Stability.* It is widely believed that reduced trade costs are an important factor in achieving food security (Swinnen and Squicciarini, 2012). The idea is that without stable, predictable markets for output, farmers have little incentive to provide the effort and resources required to make the changes needed to ensure the effectiveness of other supply-side interventions (e.g. fertilizer subsidies, extension services). However, this depends on a credible regional food balance sheet (RFBS) to serve as a reference point for both the public and private sector. The need for accurate and up-to-date national and regional food balance sheets has been emphasized by the East African Community (EAC) for many years but there are significant challenges. In principle, an RFBS should support cross-border trade and food security by improving the predictability of government policies.

In 2012, the EAC in collaboration with USAID's East Africa Trade and Innovation Hub and the East African Grain Council, established National Food Balance Sheet Committees in each of the member nations, tasked with collecting and aggregating country-level data. This involves measuring production (e.g. satellite data) and consumption (e.g. surveys), and looking at export and import levels. Pulling all this data together requires significant financial and human resources and the RFBS portal remains incomplete as of May, 2021.

4.3.5. *Predictability and Productivity.* Farmers need to know that there will be a profitable market for their crops after harvest and that they will be able to purchase the food items that their families need at an affordable price. The potential gains from complementarities between reduced trade costs, market stability and productivity-enhancing investments, depend on many other institutional factors. These can include the formation of farmer's cooperatives to achieve economies of scale in contracting with off-takers, improved storage and warehousing infrastructure, effective marketing (especially of non-traditional crops) to consumers in other countries, and further development of information systems to match buyers and sellers at known prices. While these factors are intuitively expected to play an important role, there is limited evidence on their effects and their interactions with trade.

5. CONCLUSION AND DISCUSSION

In the past century, participation in international trade has become more widespread and the value of goods and services traded has grown by more than growth in global GDP. In 2011, the World Trade Organization recorded nearly 200 preferential trade agreements being in force, with the majority existing between developing

countries (Bacchetta et al., 2011). Indeed, since 1990, most of the growth in the number of preferential trade agreements came from agreements amongst developing countries, highlighting the growing interest that they have shown in expanding trade and regional integration. This is evident within East Africa, which already has several regional economic communities and trade agreements in place, and has lately experienced more ambitious trade liberalization efforts under agreements like the African Continental Free Trade Area and the Tripartite Free Trade Area.

The findings of this review show that this interest is warranted. It is well understood that regional integration can promote specialization in the production of goods and services in order to experience the benefits of economies of scale, which can be enhanced by promoting free movement of people across borders. Regional integration also offers opportunities for countries with limited manufacturing or service sectors (like those in East Africa) to specialize in specific segments of global production value chains, and incentivizes the adoption of more efficient technologies and production practices. In addition to these productivity benefits, trade reforms have been shown to decrease poverty and increase earnings, though the effects of these reforms are rarely equal due to limited resource allocation and other frictions. The distribution of these impacts depends on how well resources can be reallocated, as well as how concentrated households are in the sectors that benefit from regional integration.

While the relationships between trade, growth, poverty, and inequality are relatively well established in the literature, the relationships between the trade environment and food security are less well understood. Although there are many other factors involved (e.g. economic shocks, agricultural productivity, and climate change), regional integration and trade reforms have the potential to impact each of the four food security pillars. Empirical cross-country studies find conflicting evidence depending on the types of food security and trade measures that are used; the countries included in the studies; and the empirical methodologies employed. Given the varied impacts that trade can have on each of the food security pillars, further study of the relationship between trade and food security, looking at all food security pillars, is needed. The theoretical and empirical evidence indicates that there is a dynamic relationship between food security and resilience but there is little evidence to show how these kinds of efforts and investments (or other policy interventions) affect this relationship.

There are several other related areas that warrant future empirical study. These include developing an understanding of the impact that trade barriers have on technology adoption in the agricultural sector (Brown et al., 2018), to the extent done so by the more robust literature on manufacturing firms. Although this relationship between technology adoption and trade is naturally complex, it has important policy implications due to its significant impact on agricultural productivity and food

security. Related to this, there is also limited evidence on the role that trade reforms have for specific commodities, which is an important consideration for policy makers focused on particular regions.

International trade offers many countries with an option to improve the livelihoods of its citizens and enhance food security. This is true within East Africa, where regional integration efforts would be expected to facilitate many of the benefits associated with trade openness, including poverty alleviation and increased food security. But careful research is still needed to make sure that trade interventions are implemented in a way that benefits as many people as possible. This requires a good understanding of the constraints faced by households and producers, the difficulties of implementation and the interactions with other policy interventions and institutional arrangements. With respect to the impacts on food security in the horn of Africa, there is an urgent need to identify what dimensions can be improved through cross-border food trade and how this can be best managed to encourage greater agricultural productivity and limit the consequences of economic, political and climatic shocks.

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