CHAPTER 5

Agrifood Processing in Africa: Status, Challenges, and Opportunities

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Introduction

A shift from agriculture to manufacturing was one of the hallmarks of job creation, poverty reduction, and rapid growth in low-income countries during the latter half of the 20th century. This experience in earlier decades of structural transformation was characterized by labor-absorbing, productivity-increasing manufacturing. Recent structural change in African countries has been markedly different—productivity gains are realized through reallocation of economic activity away from agriculture without the accompanying within-sector productivity growth in nonagriculture, and manufacturing in particular (Diao, McMillan, and Rodrik 2019; Diao et al., 2021; McMillan and Zeufack 2022). This chapter examines the extent to which agrifood processing follows these trends.

Agrifood processing is made up of activities classified as manufacturing that transform agricultural products postharvest. This can include milling grains, drying coffee, and generally adding value to food products—there is a wide range of potential activities that can require different levels of labor and capital. Agrifood processing is a key element in both food system development and industrialization in Africa. In many countries of Africa south of the Sahara (SSA), agri-industries' share of total manufacturing is significant, accounting for 27 percent of employment and 39 percent of output on average in the formal sector (UNIDO 2021).[1]

Semiprocessed and processed foods have also become increasingly dominant in African food systems. Growing populations, incomes, and rates of urbanization have changed demand for food and increased interest in higher-value-added and processed products, which in turn stimulates agrifood processing production and market activity (FAO 2017). The value of processed foods in intra-African trade grew from equal to the value of unprocessed foods in 2003 to twice their value in 2019 (Bouët, Tadesse, and Zaki 2021). Despite this growth in agrifood processing, the continent remains a net importer of food, suggesting there is room for further growth in local production.[2]

Beyond the creation of opportunities directly within agrifood processing, its development relates to the allocation and use of natural resources, input factors, and labor. By increasing the demand for raw agricultural commodities, This is greater than the contribution of agrifood processing to total manufacturing in Asia (19 percent of employment and 22 percent of output) and Europe (19 percent of both employment and output) but slightly lower than the contribution in Latin America and the Caribbean (39 percent of employment and 38 percent of output). agri-industries can increase farmers' incomes and create more demand for agricultural inputs (FAO and UNIDO 2009); agri-industries also generate demand for ancillary agrifood processing inputs needed for packaging and other downstream activities like transport and services provision. But stagnant agricultural productivity, capital intensity of agrifood processing and automation, and climate change all pose risks to agrifood processing.

This chapter considers the trends and prospects for growth in agrifood processing in Africa. We focus on SSA and exclude discussion of the countries of north Africa, in part due to data limitations and in part because we have not worked on these countries. We also focus almost exclusively on the 21st century, the period during which many African countries experienced rapid labor productivity growth (Diao, McMillan, and Rodrik 2019).

We begin with a description of broad trends, drawing on data from UNIDO's Indstat2 database. Indstat2 is organized at the International Standard Industrial Classification (ISIC) 2-digit level and typically covers only formal manufacturing. [3] Overall, we find that formal agrifood processing in Africa is performing well, expanding in both employment and output during 2000–2018, though output growth is more rapid. Because the UNIDO Indstat2 data are organized at the 2-digit level, we are limited to focusing on food processing and beverages manufacturing. To be consistent, therefore, we focus only on these subsectors in the firm-level analyses of agri-industrialization trends in Ethiopia, Tanzania, and Vietnam. Other components of agri-industry that this definition

1 This is greater than the contribution of agrifood processing to total manufacturing in Asia (19 percent of employment and 22 percent of output) and Europe (19 percent of both employment and output) but slightly lower than the contribution in Latin America and the Caribbean (39 percent of employment and 38 percent of output).

2 Just 20.8 percent of processed foods imported by Africa came from intra-Africa trade in 2019, compared to 17.7 percent of semiprocessed foods and just 9.4 percent of unprocessed items (Bouët, Tadesse, and Zaki 2021).

3 The most common sources for UNIDO Indstat2 data are national enterprise or industrial surveys/censuses. These data most often cover firms with 10 or more workers, which is why we refer to it as formal manufacturing, though for some countries/years the cut-off changes.

does not cover include processing sectors such as cotton ginning and leather and hide processing.

The role of the informal sector in agrifood processing can be large and varies between sectors and countries (Wilkinson and Rocha 2008), and for this reason the next section of the chapter focuses on programs to foster productivity growth in small agri-industry firms. There are limited data available to examine trends in small and informal agrifood processing, but we make use of Ethiopia's Small-Scale Industries (SSI) and Tanzania's Census of Industrial Production (CIP) where possible.[4] The following section discusses opportunities for agrifood processing and also considers small firms to the extent allowed by data. This is followed by a section on major challenges and then the conclusion.

TABLE 5.1—SHARE OF AGRICULTURE IN TOTAL EMPLOYMENT AND FORMAL SECTOR IN MANUFACTURING EMPLOYMENT

Country	Year	Agriculture share in total employment	Dominance of agriculture? (majority, <25–50%, low)	Formal manufacturing share of total manufacturing employment	Formal/informal manufacturing dominant?
Botswana	2018	0.32	<25–50%	1.00	Formal
Ethiopia	2015	0.68	Majority	0.09	Informal
Ghana	2015	0.36	<25–50%	0.17	Informal
Kenya	2018	0.44	<25–50%	0.12	Informal
Malawi	2012	0.67	Majority	0.19	Informal
Mauritius	2018	0.06	Low	0.75	Formal
Senegal	2014	0.35	<25–50%	0.04	Informal
South Africa	2018	0.16	Low	0.69	Formal
Tanzania	2018	0.70	Majority	0.22	Informal

Source: Economic Transformation Database (ETD), Indstat2 (UNIDO).

Note: Agriculture share in total employment is calculated from the Economic Transformation Database (ETD), while the formal manufacturing share of total manufacturing employment comes jointly from the ETD (total manufacturing employment) and Indstat2 (formal manufacturing employment).

Broad Patterns of Agrifood Processing in Africa

This section uses UNIDO's Indstat2 data to summarize output, employment, and labor productivity growth in manufacturing subsectors related to agricultural processing. The Indstat2 database generally covers "formal" manufacturing firms, those that are covered in countries' periodic industrial or enterprise surveys. It is organized at the 2-digit ISIC (revision 3) level, and agrifood processing is defined as sector 15, food products and beverages. We relate these broad patterns in agriculture to the subset of countries for which we have data, using the Economic Transformation Database (ETD). The ETD data come primarily from population censuses and labor force surveys, and so they include informal activity (de Vries et al. 2021). However, we are not able to break manufacturing into subsectors and so are unable to identify agrifood processing within the ETD data. Later in the chapter, we do consider the informal agrifood processing to the extent possible using firm-level data.

We focus in this section on a sample of nine countries for which we have relatively complete data from 2000–2018—Botswana, Ethiopia, Ghana, Kenya, Malawi, Mauritius, Senegal, South Africa, and Tanzania.[5] These countries represent different experiences within the African continent with respect to agriculture, industrialization, and agrifood processing. In Table 5.1, we report the share of agriculture in total employment and the share of formal manufacturing in total manufacturing employment. Ethiopia, Malawi, and Tanzania are all dominated by agriculture in terms of employment—the sector accounts for around two-thirds of employment in all three countries. Mauritius and South Africa both have significantly lower shares of agriculture in total employment—6 and 16 percent, respectively. In terms of manufacturing

4 These data sources cover only registered firms, and in the case of Ethiopia SSI cover only firms using power-driven machinery. As such even with these additional data sources, our information does not fully cover the informal sector.

5 The period covered for most countries is 2000–2018. Countries that have slightly different periods covered are Ethiopia (2000–2015), Ghana (2003–2015), Malawi (2004–2012), Senegal (2000–2014), and Tanzania (2003–2018).

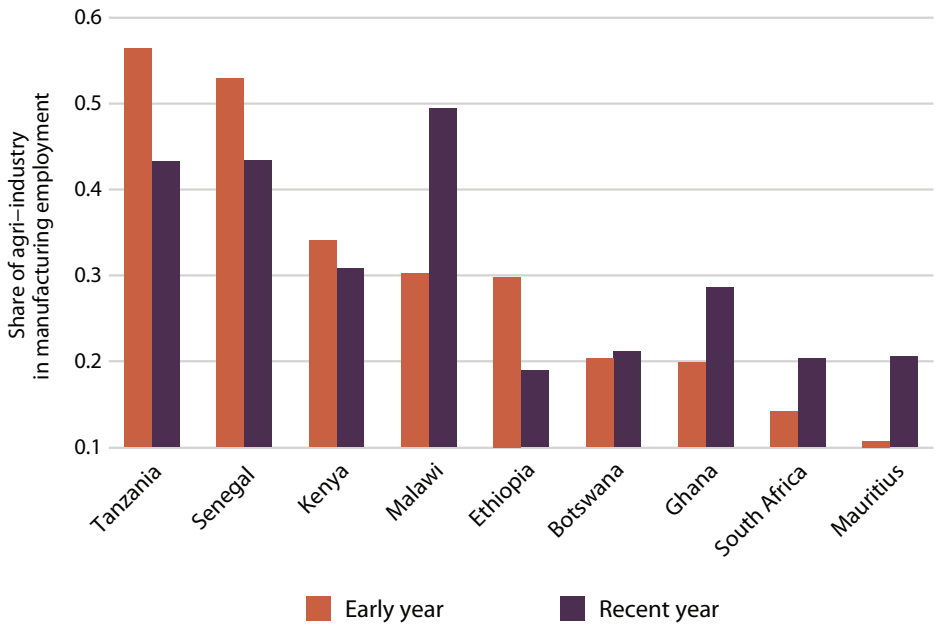
sector formality, Mauritius and South Africa both also have very high rates of formality in manufacturing, along with Botswana. In the other six countries, informal employment dominates manufacturing employment.

Share of Manufacturing Employment in Agri-Processing

In Figure 5.1 we plot the share of agrifood processing employment in total formal manufacturing employment by country, using the first and last years with available data for each country. Ethiopia, Kenya, Senegal, and Tanzania have seen a decline in agrifood processing's share in total manufacturing employment. The declines are likely due to the fact that these four countries had some of the highest initial shares of agrifood processing employment while other subsectors such as textiles have grown. While the share of agrifood processing in total manufacturing employment has declined, in Tanzania and Senegal it remains above 40 percent. Botswana, Ghana, Malawi, Mauritius, and South Africa all had increases in the share of agrifood processing employment—excluding Malawi, these four countries had the lowest initial shares, less than 20 percent.

By 2018, the lowest measured share of agrifood processing in formal manufacturing employment was 19 percent in Ethiopia—overall, in 2018 agrifood processing played a dominant role in formal manufacturing employment in these African countries. Across these nine countries, the share of agrifood processing employment in formal manufacturing employment is positively correlated with agriculture's share in total employment but negatively correlated with the share of formal employment in total manufacturing. Overall, agrifood processing represents a major share of manufacturing employment—31 percent on average.

FIGURE 5.1—SHARE OF AGRI-INDUSTRY EMPLOYMENT IN TOTAL FORMAL MANUFACTURING EMPLOYMENT, OVER TIME BY COUNTRY



Source: UNIDO's (2021) Indstat2.

Note: The period covered for most countries is 2000–2018/2019. Countries that have slightly different periods covered are Ethiopia (2000–2015), Ghana (2003–2015), Malawi (2004–2012), Senegal (2000–2014), and Tanzania (2003–2018).

Growth in Agrifood Processing Employment, Output, and Output Per Worker

In Table 5.2 we report the coefficients from country-industry-level regressions of employment, output, and output per worker (all measured in logs) on a year trend. These coefficients can be interpreted as the continuous growth rate in each variable for each country, over the respective periods covered. The relationship is modeled by the following equation where c denotes country, *s* denotes sector and t year, and y denotes employment and output per worker, respectively, and we control for country-industry fixed effects μ_{cs}:

$$\ln(y_{cst}) = \beta\,(year_t) + \mu_{cs} + \varepsilon_{cst} \quad (1)$$

Employment growth in agrifood processing is positive in all countries except Botswana, where it is close to zero; however, it has been outpaced by output growth in all countries except Ghana and Senegal, resulting in net increases in output per worker in agrifood processing in Botswana, Ethiopia, Kenya, Mauritius, South Africa, and Tanzania. In Senegal employment growth

TABLE 5.2—ESTIMATED GROWTH IN EMPLOYMENT, OUTPUT, AND OUTPUT PER WORKER IN AGRI-INDUSTRY

Country	Employment	Output	Output per worker
Tanzania	0.02	0.09	0.07
Senegal	0.02	0.02	0.00
Kenya	0.01	0.05	0.04
Malawi	0.06	0.13	0.06
Ethiopia	0.07	0.12	0.05
Botswana	0.00	0.05	0.05
Ghana	0.12	–0.01	–0.02
South Africa	0.02	0.04	0.02
Mauritius	0.01	0.02	0.02

Source: Indstat2 (UNIDO).

Note: These estimates of growth come from the UNIDO (2021) Indstat2 database. We regress the log of employment, output, and output per worker on a year trend to get estimates of average long-run growth. The period covered for most countries is 2000–2018/2019. Countries that have slightly different periods covered are Ethiopia (2000–2015), Ghana (2003–2015), Malawi (2004–2012), Senegal (2000–2014), and Tanzania (2003–2018).

is on par with output growth—around 2 percent—resulting in no change in output per worker. Ghana has experienced rapid employment growth in agrifood processing though its output growth has been slightly negative—this is likely due to a rapid expansion of small firms in Ghana's agrifood processing that led to employment growth without much additional output. This is supported by the Indstat2 data, which show an expansion in the number of firms during 2003–2013 from 472 to over 18,000 firms and an associated decline in average employment per firm. The majority-agriculture countries—Ethiopia, Malawi, and Tanzania—reported the highest rates of output growth in agrifood processing, and both Ethiopia and Malawi also report rapid employment growth (7 and 6 percent, respectively). Overall, these results indicate that formal agrifood processing is growing in our nine African countries, albeit from very low bases.

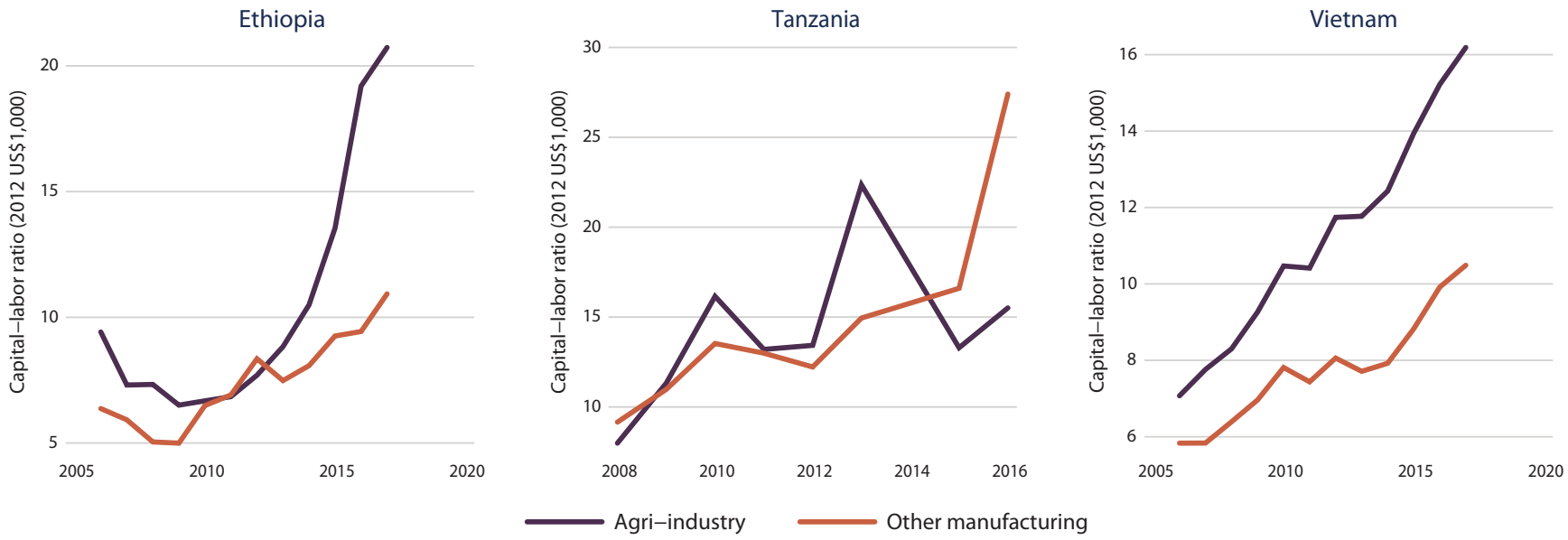
A Closer Look at Agri-industrialization in Ethiopia, Tanzania, and Vietnam

This section will use firm-level manufacturing census data from Ethiopia and Tanzania to assess growth at the level of subsectors in agrifood processing. The Indstat2 database is measured at the 2-digit level, so in the previous section we were not able to break agrifood processing down into its component subsectors. In this section, we use firm-level manufacturing data to examine trends in 4-digit ISIC subsectors of agrifood processing. This analysis will also compare the situation in Ethiopia and Tanzania to that in Vietnam. We begin with a comparison of agrifood processing in the three countries before looking at aggregate agrifood processing trends in capital intensity, which we were not able to measure from the Indstat2 data. We then use the firm-level data to separate 4-digit ISIC subsectors and analyze their growth.

Ethiopia and Tanzania both have high shares of agricultural employment—over two-thirds of the total—and also have high degrees of informality in manufacturing. Ethiopia's formal manufacturing sector accounts for around 9 percent of total manufacturing employment while Tanzania's accounts for around 22 percent, and informality has been increasing over time. Vietnam's case is quite different—agriculture's share in total employment has declined rapidly, from a level similar to Tanzania's and Ethiopia's in 2000 down to 38 percent in 2015. Meanwhile the share of formal employment in manufacturing is high, slightly above 75 percent, and has been rising since 2000. The share of manufacturing employment in agrifood processing is significantly lower in Vietnam, around 8 percent in 2016, down from 16 percent in 2000. This is a more rapid decline than Tanzania or Ethiopia experienced. These differences are consistent with what we expect from our comparison of the nine African countries—the share of agrifood processing employment in formal manufacturing is positively correlated with agriculture's share of total employment and negatively correlated with the rate of formal employment in manufacturing.

In Figure 5.2 we plot agrifood processing and aggregate manufacturing capital intensity, measured as the value of the capital stock per person engaged. Capital intensity has grown in all three countries over time, and the aggregate pattern in agrifood processing has been relatively similar to that of other manufacturing. Though the trend is more variable in Tanzania, this is mostly due to the lower number of firms in each sector. This is consistent with the idea that technology has been evolving in a way that makes agrifood processing more capital intensive. In Ethiopia and Vietnam, agrifood processing is more capital intensive than is aggregate manufacturing. This has implications for the employment generation capacity of the sector.

FIGURE 5.2—CAPITAL INTENSITY IN AGRI-INDUSTRY VERSUS OTHER SECTORS, GROWTH AT AGGREGATE AND FIRM LEVEL, BY COUNTRY



Source: Ethiopia Survey of Large and Medium Scale Manufacturing Industries (2006–2017), Tanzania Annual Survey of Industrial Production (2008–2016), Vietnam Enterprise Survey (2006–2017).

Note: Capital-labor ratio is measured in 2012 US$1,000s. The period covered by Tanzania is 2008–2016, while for Ethiopia and Vietnam it is 2006–2017. Vietnam has capital data only from 2006 onward, and we limit Ethiopia to the same period for consistency. The line graphs plot the total capital-labor ratio for agri-industry in each of the three countries, compared to the capital-labor ratio for all other manufacturing industries.

Employment, Productivity, and Capital-Intensity Growth by ISIC 4-digit Subsector

In both Ethiopia and Tanzania, we use the firm-level data to identify the 4-digit ISIC subsectors of agrifood processing that make up a majority of sales, employment, and capital stock. In Ethiopia, five subsectors account for 80 percent of sales, 75 percent of employment, and 79 percent of capital stock in agricultural processing—grain mill products (1061), bakery products (1071), sugar (1072), malt liquors and malt (1103), and soft drinks and water (1104). In Tanzania there are seven subsectors—fish, crustaceans, and mollusks (1020); vegetable and animal oils and fats (1040); grain mill products (1061); sugar (1072); other food products (1079); malt liquors and malt (1103); and soft drinks and water (1104). These account for 84 percent of sales, 84 percent of employment, and 85 percent of capital stock in Tanzania.

The larger subsectors that Tanzania and Ethiopia have in common are grain mill products, sugar, malt liquors and malt, and soft drinks and water. In Vietnam the sector breakdown is quite different. The largest sectors by a significant margin are (1) fish, crustaceans, and mollusks (1020); (2) fruit and vegetables (1030); and (3) prepared animal feeds (1080). These subsectors account for 60 percent of sales, 65 percent of employment, and 46 percent of capital stock. However, the two beverage subsectors (1103 and 1104) do account for 19 percent of capital stock.

We estimate growth in employment, value added per worker, and capital intensity at the sector level by regressing the natural log of each variable on a

year trend. The resulting estimated coefficients are interpreted as the continuous growth rate of the variable, and these coefficients are plotted in Figures 5.3 through 5.5. Figure 5.3 plots the estimated sector-level employment growth for these key subsectors—overall, employment growth is mostly positive in Ethiopia, while in Tanzania and Vietnam there is more variation between subsectors. Figure 5.4 plots the labor productivity growth rates, and Figure 5.5 plots the growth of capital intensity.

In Ethiopia, both beverages subsectors have a continuous employment growth rate above 5 percent, labor productivity growth between 3 and 5 percent, and the fastest rates of growth in capital intensity (near 5 percent). The trend for these subsectors in Tanzania is slightly different—though the malt and malt liquors sectors have positive employment growth—like Ethiopia—soft drinks and water have slightly negative employment growth. Soft drinks and water have positive labor productivity growth, while in malt and malt liquors it is close to zero, but like in Ethiopia, both subsectors have growth in capital intensity.

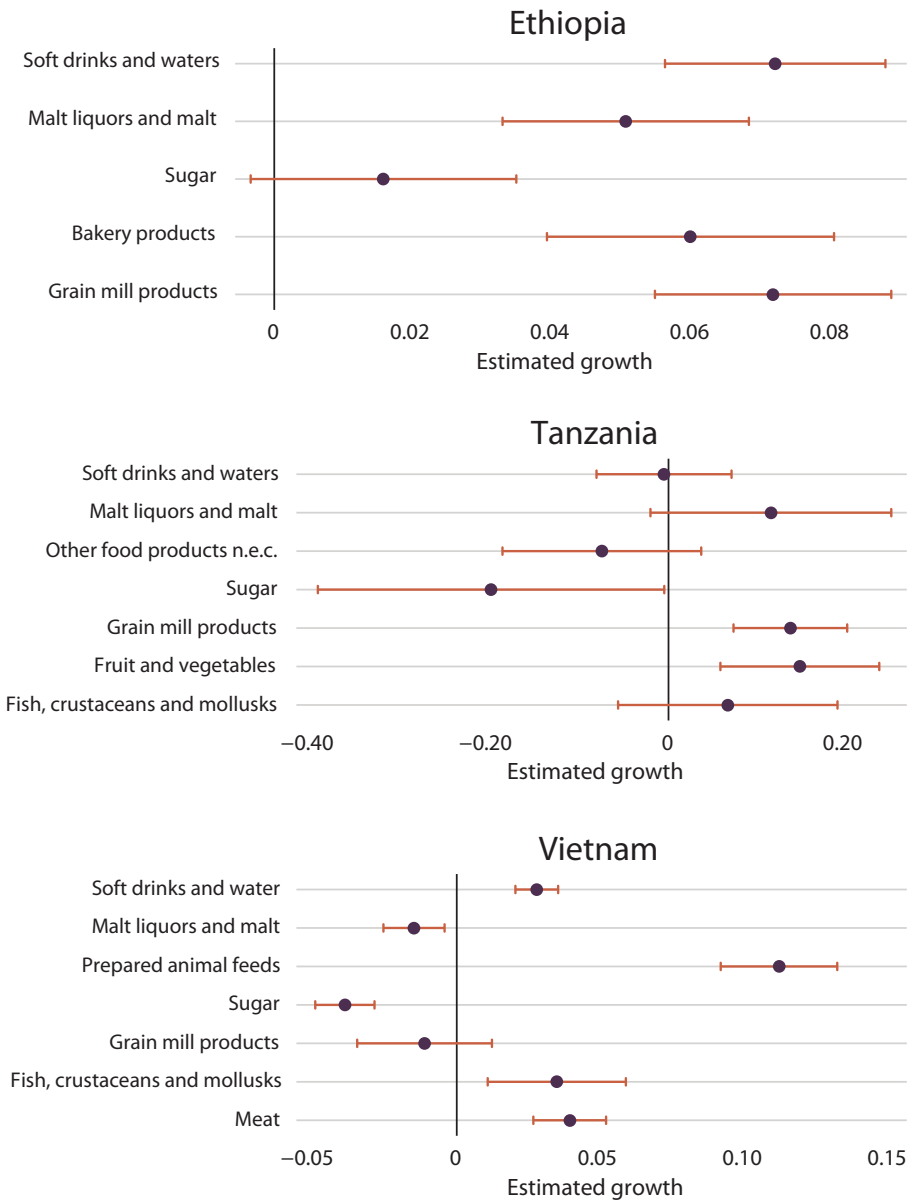
Sugar has the lowest employment growth of Ethiopia's five subsectors, slightly negative labor productivity growth, and the lowest growth in capital intensity—negative 10 percent. Its performance in Tanzania is also somewhat poor—sugar has negative employment growth, close to zero labor productivity growth, and close to zero capital-intensity growth. The final major activity common to both countries, grain mill products, has strong employment and labor productivity growth, but negative growth in capital intensity, in both countries.

Vietnam is quite different in terms of its performance—in its three biggest sectors, employment, labor productivity, and capital-intensity growth are all positive. Moreover, labor productivity and capital-intensity growth are positive in the four subsectors common to Tanzania and Ethiopia—soft drinks and water, malt and malt liquors, sugar, and grain mill products. However, employment growth is negative in malt liquors and malt, sugar, and grain mill products, on average.

Raising Productivity in Small Agrifood Processing Firms

Small and informal firms account for the bulk of agrifood processing firms in African countries (Diao et al. 2021; McMillan and Zeufack 2022). In Ethiopia we have small-firm data available for 2002, 2006, 2008, 2011, and 2014 from the SSI survey, and in Tanzania we have one year of data from its 2013 CIP. From these

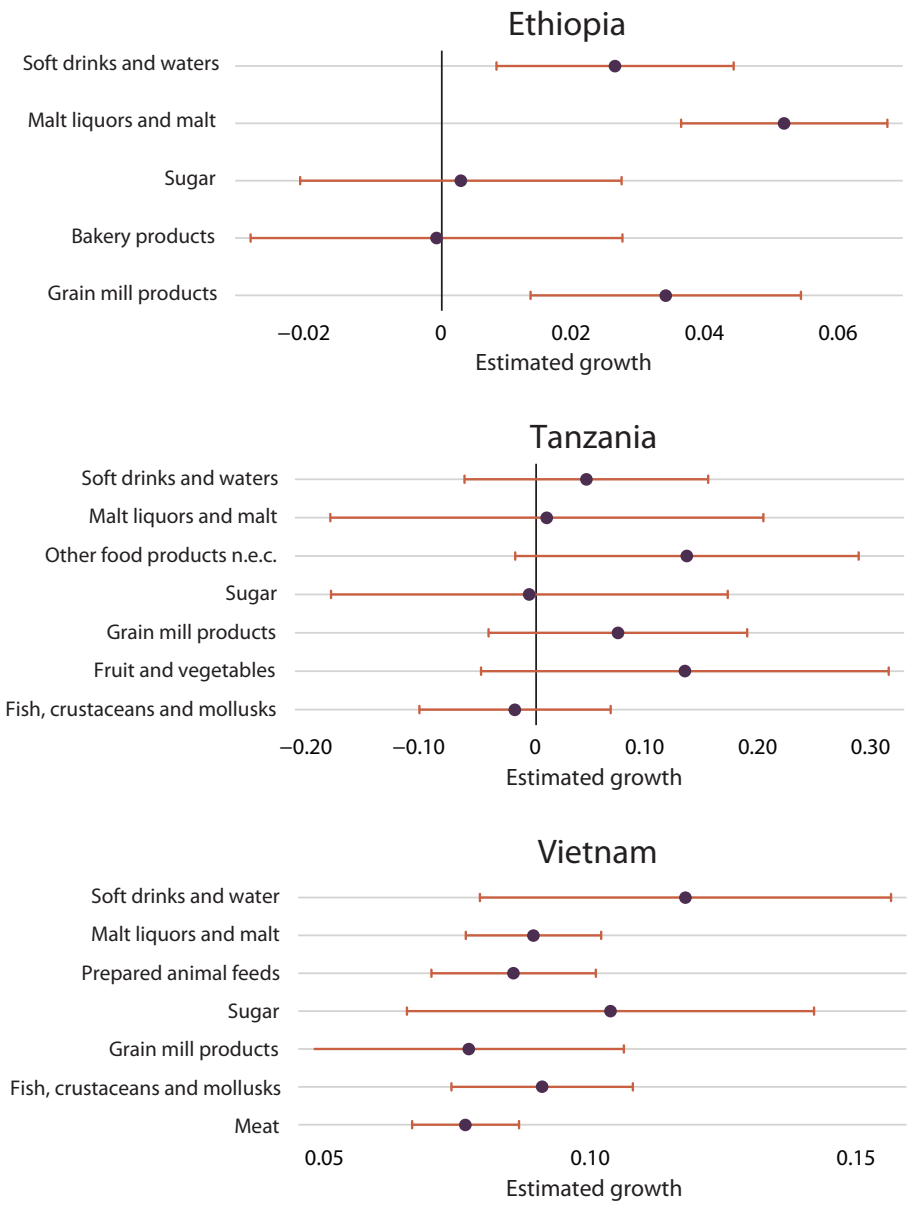
FIGURE 5.3—SECTOR-LEVEL EMPLOYMENT GROWTH, BY COUNTRY



Source: Ethiopia Survey of Large and Medium Scale Manufacturing Industries (1996–2017), Tanzania Annual Survey of Industrial Production (2008–2016), Vietnam Enterprise Survey (2006–2017).

Note: These estimates come from regressions of ln(employment) on a year trend, at the country and 4-digit International Standard Industrial Classification (ISIC) level, with country-industry fixed effects. n.e.c. = not elsewhere classified.

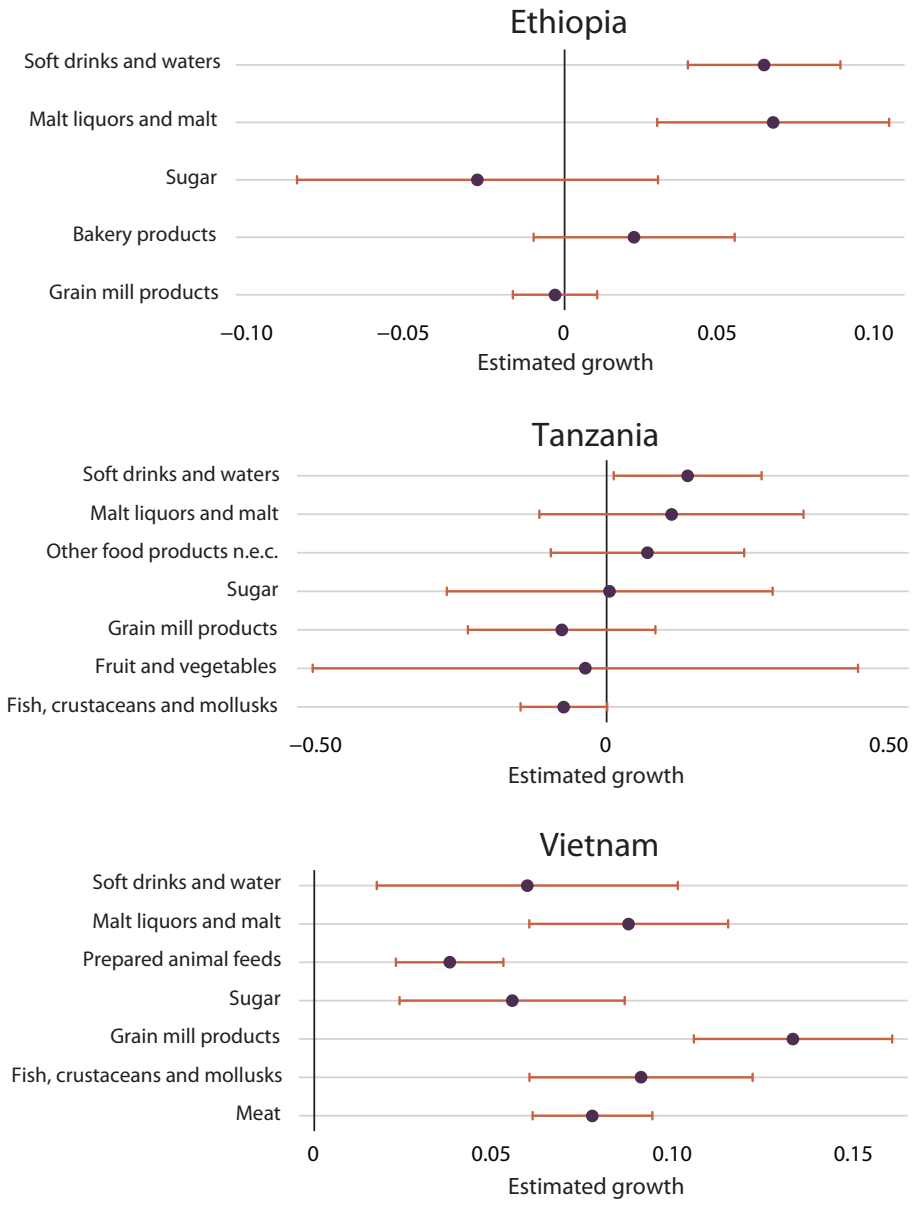
FIGURE 5.4—SECTOR-LEVEL LABOR PRODUCTIVITY GROWTH, BY COUNTRY



Source: Ethiopia Survey of Large and Medium Scale Manufacturing Industries (1996–2017), Tanzania Annual Survey of Industrial Production (2008–2016), Vietnam Enterprise Survey (2006–2017).

Note: These estimates come from regressions of ln(value added per worker) on a year trend, at the country and 4-digit International Standard Industrial Classification (ISIC) level, with country-industry fixed effects. n.e.c. = not elsewhere classified.

FIGURE 5.5—SECTOR-LEVEL CAPITAL-LABOR RATIO GROWTH, BY COUNTRY



Source: Ethiopia Survey of Large and Medium Scale Manufacturing Industries (1996–2017), Tanzania Annual Survey of Industrial Production (2008–2016), Vietnam Enterprise Survey (2006–2017).

Note: These estimates come from regressions of ln(capital/worker) on a year trend, at the country and 4-digit International Standard Industrial Classification (ISIC) level, with country-industry fixed effects. n.e.c. = not elsewhere classified.

data we confirm that total employment in agri-processing is greater in small firms than in the large firms covered by each country's manufacturing census; with the addition of "cottage" firms not covered by the SSI or CIP, a greater majority of total employment is accounted for by the informal sector.

These smaller firms provide employment and supplemental income to the owners of these enterprises, but the evidence to date suggests that productivity in these enterprises is very low. Finding ways to increase the productivity of these enterprises would be a boon to the owners of these businesses and to the economies in which they reside. In this section we describe some of the strategies currently under way for raising productivity in small agrifood processing firms in Africa and beyond.

Small and Medium Enterprise Incubator Program in Ghana

In early 2021, the African Center for Economic Transformation (ACET) launched an incubator program designed to integrate small and medium enterprises (SMEs) in the manufacturing space into local, regional, and global value chains (GVCs). The incubator phase of the program assists firms in all aspects of business from input sourcing to management training; ACET has partnered with firms such as Price Waterhouse Coopers and EVC Africa Ltd to provide this assistance (https://acetforafrica.org/psd/acet-business-transform/). ACET is currently piloting the incubator program with 10 businesses in Ghana with plans to expand (also to other countries) if the pilot is successful. The 10 firms range in size from about 6 to 46 employees and operate in agrifood processing, cosmetics, construction, electric vehicles, and plastic waste recycling (Brown and Odoom 2021). The hope is that by providing intensive technical assistance to these small firms, they will eventually be attractive to equity investors and this type of investment will allow these firms to grow the number of employees they engage and at the same time raise their productivity.

Match Maker Group, Tanzania

Match Maker Group (MMG) is a small private firm located in Arusha, Tanzania. The group has two teams working with small- and medium-size agribusinesses—Business Development Services (BDS) and the SME impact fund. According to MMG, the SME impact fund serves SMEs that are too large to access microloans but have limited access to the formal banking sector. The fund currently has around 40 businesses in its investment portfolio across Tanzania. Almost all these firms operate in 12 different agrifood processing subsectors: maize, rice, meat, baked goods, coffee, spices, nuts, seeds, banana wine, groundnuts, cashew nuts, and dairy.

An important part of the work done by MMG is the business development services it offers to SMEs. These services are designed to enhance the management capabilities of the SMEs in order to make them investment ready. The services offered include

- analyzing the past performance of the company,
- setting up (tailor-made) basic books of accounts,
- developing a medium-term business plan,
- projecting multiannual profit and loss account and balance sheets,
- collecting impact baseline data and agreeing on benchmarks, and
- supporting compliance of the business with Tanzanian laws and regulations.

The BDS business consultants spend time at the premises of the SMEs, working closely with the SME owners for several days to gain firsthand knowledge of the business operations. This work is followed by intensive coaching by phone and email as well as follow up visits.

Impact of Business Consulting Services on Small Firm Outcomes

Recognition of the role of management practices in firm outcomes has grown over the last several decades (Bloom et al. 2014). The prevalence of practices such as monitoring, targets, and incentives has been linked to organizational performance across disparate sectors. For example, Bloom, Sadun, and Van Reenen (2016) find a positive relationship between management and total factor productivity, while Meagher and Strachan (2013) suggest that there is complementarity between multiple managerial practices. Additionally, evidence from randomized controlled trials (RCTs) reveals a causal impact of management on productivity; Bloom et al. (2013) provided free management consulting to textile plants in Mumbai and found that adoption of the management practices led to large increases in productivity over a period of several months.

However, the evidence on the role of management and management training in small firms is somewhat more ambiguous (Bloom et al. 2014; Karlan, Knight, and Udry 2012). Some studies find positive effects of management practices on profits in SSA (Mano et al. 2012), Peru (Valdivia 2015), and Mexico (Bruhn, Karlan, and Schoar 2018; Calderon, Cunha, and De Giorgi 2020). Others find negative effects, including Giné and Mansuri (2014) and Drexler, Fisher, and Schoar (2014).

The ACET initiative is in its infancy, and it is therefore too early to assess its effectiveness; designed as a pilot, if its approach is efficacious then it may be scaled at a later stage. As far as we know, the MMG initiative has not been evaluated for its effectiveness. Moreover, the small number of firms served by MMG make a meaningful impact evaluation difficult. It is clear though that both approaches are costly due to the time- and labor-intensive nature of the services provided and the relatively poor management practices of the small firms being served. To assess the impact and cost-effectiveness of this type of service we turn instead to two recent randomized controlled trials that assess the impact of business consulting services in Mexico and Colombia.

The first intervention described in Bruhn, Karlan, and Schoar (2018) took place in Mexico. A total of 432 SMEs participated in a study where access to business consulting designed to improve management practices was randomized. The authors find that one year of management consulting services raised total factor productivity, return on assets, and "entrepreneurial spirit" where entrepreneurial spirit is an index that measures entrepreneurial confidence and goal setting. Using Mexican social security data, the authors also find a persistent and large increase of the treatment on the number of employees and the total wage bill five years postintervention. Finally, they document significant heterogeneity in the specific managerial practices that improved as a result of the consulting, with the most prominent being marketing, financial accounting, and long-term business planning. However, this management consulting was costly at a little under US$12,000 for a year of services. While the authors' calculations indicate that the benefits outweigh the costs for the treated firms, this does raise questions about the widespread use of this type of intervention in much poorer countries.

A second intervention—in Colombia (Iacovone, Maloney, and McKenzie 2022)—targeted at auto parts firms takes the issue of cost seriously and adds a treatment arm in which management consulting is provided to small groups of firms at roughly one-third the cost of individual consulting. Specifically, the study tests two different approaches to improving management in Colombian auto parts firms. The first approach uses intensive and "expensive" one-on-one consulting, while according to the authors, the second approach draws on agricultural extension approaches to provide consulting to small groups of firms. Both interventions lead to an 8 to 10 percentage point improvement in management practices. The group-based approach seems to lead to significant improvements in firm performance, although the one-on-one results appear stronger. The authors interpret this evidence as suggestive of the potential for group-based approaches as a pathway to scaling up interventions that improve management improvements.

Opportunities

Intra-African Trade

Global agrifood trade reached almost 10 percent of total global trade in 2020, and exports to the Global North often receive focus as a source of big opportunity for agrifood processing exports (Mizik 2021). To date, however, African exports make up a small share of this trade (Bouët, Tadesse, and Zaki 2021). Notably, the share of African agrifood exports to the European Union declined during 2005–2018, but exports to economies such as Brazil, China, India, and Russia grew. Technical barriers to trade and quality standards imposed by importing countries as well as customs procedures within the continent and poor infrastructure limit African countries' ability to further break into the global agrifood market. The African Continental Free Trade Area may help address some of these barriers for trade within the continent, and in this section we therefore focus on the potential of intraregional trade.

Intra-African trade in processed agricultural products has almost tripled in value over the last two decades and rapidly increased its share in total intra-African agricultural trade (Bouët, Tadesse, and Zaki 2021). The African Continental Free Trade Area was founded as a free trade area in 2018 with 54 of the 55 African Union nations as signatories (the exception being Eritrea). To date, 36 states have ratified the agreement, and trade under the agreement officially commenced at the start of 2021. Its key functions include progressively eliminating tariffs on intra-African trade (with alternate timelines for implementation based on countries' income status); implementing rules of origin; monitoring and eliminating nontariff barriers; and establishing an online

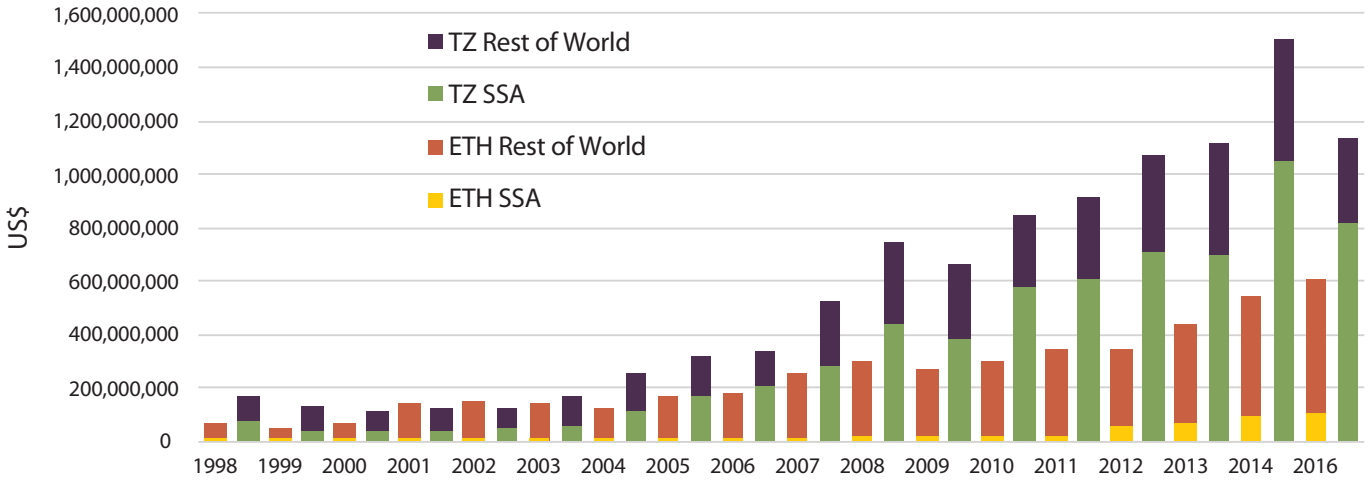
negotiating forum, the digital Pan-African Payments and Settlements System (launched in January 2022), and the African Trade Observatory. Arguably, the largest potential gains of the African Continental Free Trade Area are dynamic and arise mainly from access to larger markets and economies of scale in production. Another less tangible but potentially important benefit of the agreement is political. Most of Africa's economies are relatively small; this limits their bargaining power vis-à-vis the rest of the world in international forums such as the World Trade Organization. Regional integration has the potential to change this dynamic.

To what extent might the African Continental Free Trade Area catalyze the development of agrifood processing in Africa? A comparison between Ethiopia and Tanzania is instructive (based on Diao and McMillan 2019). Figure 5.6 shows that both countries experienced a steady upward trend in the value of exports in the two decades leading up to the pandemic. However, Ethiopia's exports go almost exclusively to countries outside of Africa, which is consistent with what we know about the Ethiopian government's push to include Ethiopia in GVCs. By contrast, a large majority of Tanzania's manufacturing exports go to other countries in Africa.

What is perhaps surprising is that Tanzania's export volume and growth from 1998 through 2017 are more than double those of Ethiopia. After all, the government of Ethiopia has aggressively incentivized manufacturing for export with its industrial parks and tax incentives, while as far as we can tell, the Tanzanian government has been much more laissez-faire.

One reason for the differential export performance is that exports from Ethiopia and Tanzania are very different. The top 50 products exported from Ethiopia account for 65 percent of Ethiopia's manufacturing exports; 84 percent of the top 50 products are classified as textiles including leather and footwear. In Tanzania, 85 percent of the country's export products are resource intensive, with 50 percent classified as agri-processed goods and another 35 percent classified as material-intensive products. The agri-processed goods consist of items like bottled juices, cooking oils, and packaged flour, while the resource-intensive products consist of items such as wood products and furniture; household articles made from plastic materials such as buckets, washbasins, chairs, and clothing hangers; and construction materials such as cement, glass, and ceramic products. In sum, agri-processed and resource-intensive goods account for 68 percent of total manufacturing exports from Tanzania (Diao and McMillan 2019). Intra-African trade in manufactured exports, like that occurring in Tanzania, has also been documented elsewhere (Hallward-Driemeier and Nayyar 2017). In many ways, this trend bodes well for the African free trade area. African countries still import much of their food;

FIGURE 5.6—GLOBAL VALUE CHAINS VERSUS INTRA-AFRICAN TRADE



Source: Diao and McMillan (2019).
Note: TZ = Tanzania; SSA = Africa south of the Sahara; ETH = Ethiopia.

the evidence from Tanzania suggests that some of this demand could be met by Africa-based agri-processors.

But while Tanzania's export performance is impressive, there has been little employment growth in Tanzania's formal manufacturing sector. One issue is the high capital intensity of resource-based manufacturing. Nonetheless, agri-processing has the potential to create jobs and wealth indirectly for logistics and packaging companies, restaurants and hotels, agricultural input suppliers, and so on (Sexton, Azura, and Saitone 2015).

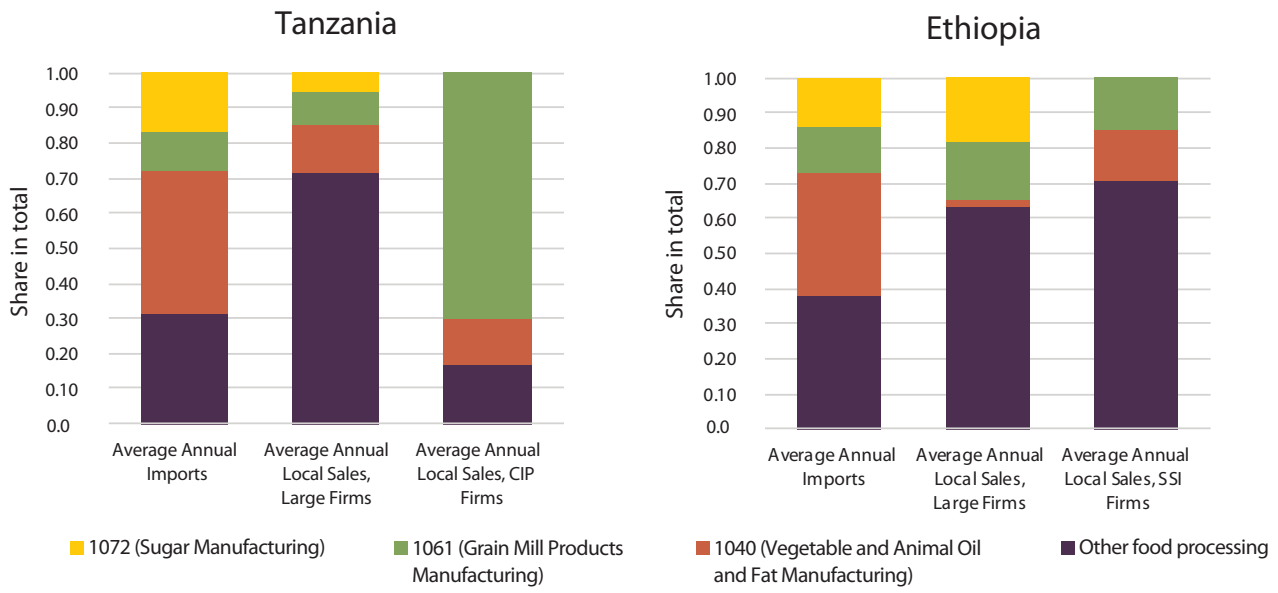
Scope for Import Substitution

This section compares the growth of processed food imports and local processed food manufacturing. For imports, we analyzed the size and growth of different processed food categories using Broad Economic Categories (BEC) trade data from the Database for International Trade Analysis, known as the Base pour l'Analyse du Commerce International (BACI) dataset. This involved mapping HS6 categories to ISIC 4-digit groups before collapsing the data to the ISIC 4-digit level. Sales come from our firm-level manufacturing censuses. Note that the data for local production numbers comprise only large, formal-sector firms, and annual import data are available from 1998 to 2018 for both countries. Therefore, we consider 2008–2016 for Tanzania and 1998–2017 for Ethiopia, the years for which we have both census and BACI data.

The firm census data in Ethiopia and Tanzania cover only firms with 10 or more workers; data availability is more limited for firms with fewer than 10 workers, but we have Ethiopia's SSI survey for 2002, 2006, 2008, 2011, and 2014 and Tanzania's 2013 CIP. We use these sources in this section to measure small-firm activity; because there is only one year for the Tanzania CIP, we are not able to use those data to look at changes over time.

Figure 5.7 breaks down the shares of processed agricultural imports accounted for by the biggest subsectors, compared with the share of local sales. For local sales, we show the breakdown for large firms (10 or more workers) using the census data and for small firms (fewer than 10 workers) using the small-scale data. The three biggest import categories in terms of processed foods in both countries are (1) vegetable and animal oils and fats (ISIC 1040), (2) grain mill products (ISIC 1061), and (3) sugar (ISIC 1072). By examining these three categories in terms of local production, we seek to ascertain whether there is potential for domestic growth in these industries.

FIGURE 5.7—AVERAGE ANNUAL IMPORTS VERSUS AVERAGE LOCAL SALES, ETHIOPIA AND TANZANIA



Source: Base pour l'Analyse du Commerce International (BACI) (1998–2017), Ethiopia Survey of Large and Medium Scale Manufacturing Industries (1998–2017), Ethiopia SSI (2002–2014), Tanzania Annual Survey of Industrial Production (2008–2016), Tanzania CIP (2013).

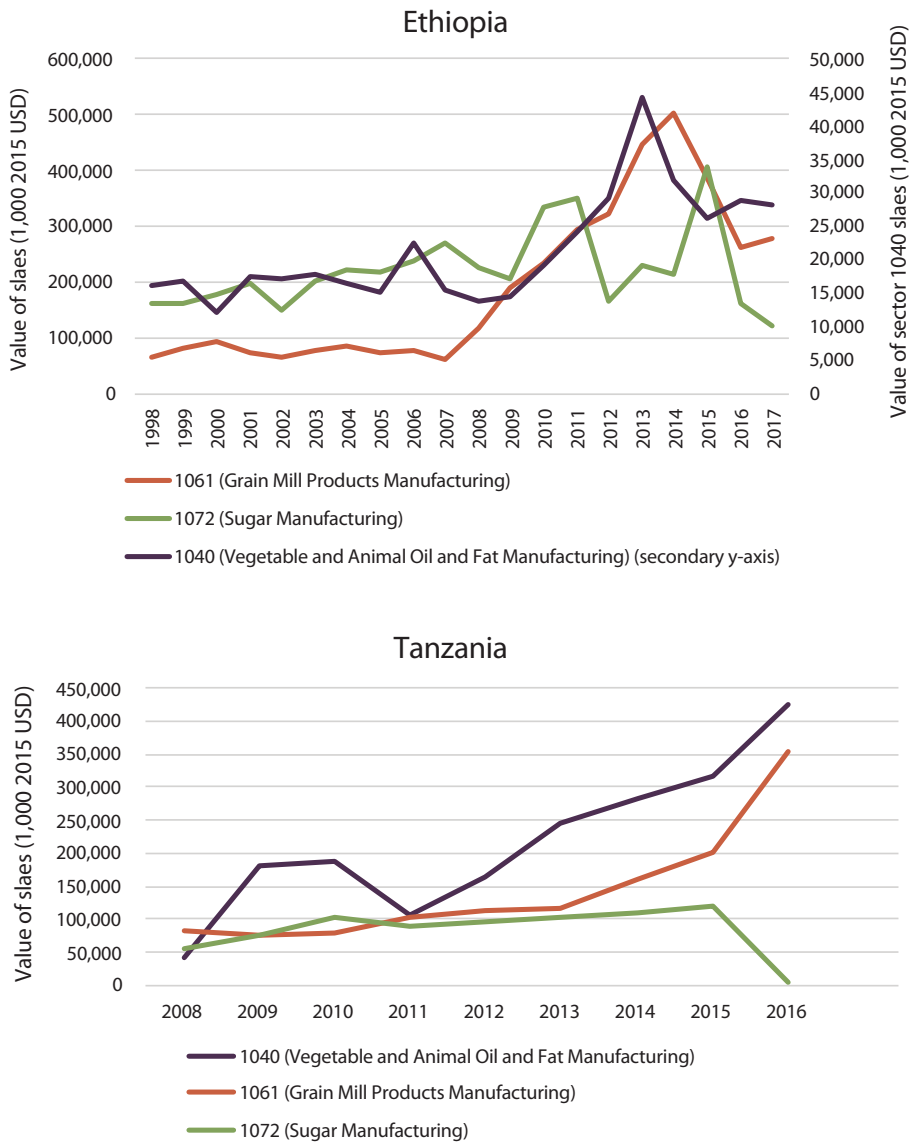
Note: These figures display the breakdown of agri-processing imports and local sales by share into the three biggest import subsectors. We break down local sales for large firms (10 or more workers) and small firms (fewer than 10 workers). CIP = Census of Industrial Production; SSI = Small-Scale Industries.

In Tanzania these product categories account for 65 percent of the value of processed agricultural imports, and in Ethiopia 62 percent. In both countries, vegetable and animal oils and fats are the biggest category, accounting for 47 and 35 percent of imports in Tanzania and Ethiopia, respectively. Sugar imports make up a slightly larger share than grain mill products in both countries as well, accounting for 17 and 11 percent of imports in Tanzania and 15 and 13 percent in Ethiopia.

These three categories do not represent a majority of local sales from domestic production, and they do not follow similar patterns in the two countries either. In Tanzania vegetable and animal oils and fats represent 14 percent of local sales, while grain mill products account for 9 percent and sugar just 5 percent. Among firms with fewer than 10 workers, however, grain mills account for 70 percent of sales in 2013—the share accounted for by vegetable and animal oils and fats is similar to large firms at 13 percent, while there is no measured activity in sugar. In Ethiopia grain mills and sugar are larger sectors, representing 16 and 19 percent of local sales, respectively, while vegetable and animal oils and fats make up just 2 percent. At the small-scale level, grain mill activity makes up about 15 percent of sales (similar to large firms), while vegetable and animal oils and fats is relatively larger at 14 percent, and similar to Tanzania, there is no measured activity in sugar processing among small firms.

Deviation in local sales proportions between the three categories can be attributed to differences in resources and manufacturing infrastructure between the two countries. However, if we consider that their share of imports in these three categories is remarkably similar, there might be an avenue for exploration regarding at least one of these nations having underutilized potential for growth domestically in one such industry. To explore this idea further, we can examine local trends in production for the three categories, which are shown in Figure 5.8, while Figure 5.9 shows the same results for firms with fewer than 10 workers in Ethiopia, using the SSI data. In both countries (and in Ethiopia, for both small and large firms), we find that the value of local sales has been growing consistently in both vegetable and animal oil and fats and grain mill products, while growth in sugar processing has seen comparatively little growth. This may indicate that there is greater scope for growth in sugar processing in the future.

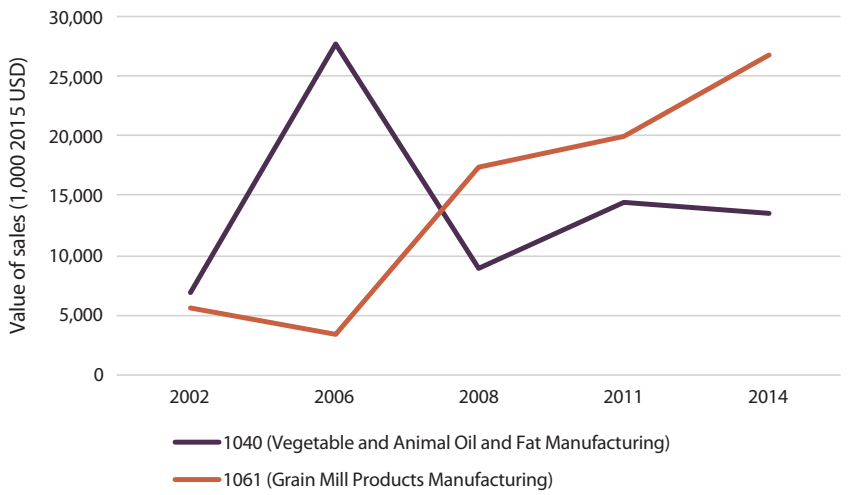
FIGURE 5.8—TRENDS IN LOCAL PRODUCTION, ETHIOPIA AND TANZANIA



Source: Ethiopia Survey of Large and Medium Scale Manufacturing Industries (1998–2017), Tanzania Annual Survey of Industrial Production (2008–2016).

Note: These figures display trends in the value of local sales of the three biggest import subsectors for both Ethiopia and Tanzania.

FIGURE 5.9—TRENDS IN LOCAL PRODUCTION, ETHIOPIA SMALL FIRMS (2002–2014)



Source: Ethiopia Small Scale Industries (SSI) (2002–2014).

Note: These figures display trends in the value of local sales of the two biggest import subsectors for Ethiopia—sector 1072 (sugar) is not included because there is no activity among SSI firms in that sector.

Challenges

Capital Intensity of Agrifood Processing

We have a lot of evidence indicating that technological innovation in manufacturing has favored capital over labor. At the same time, the spread of GVCs and increased openness to trade have had the effect of homogenizing technology around the world (Rodrik 2018). Sen (2019) reports that trade integration reduces the employment intensity of manufacturing production in developing countries. Pahl and Timmer (2020) find that participation in GVCs tends to increase labor productivity but not employment. And Pahl et al. (2019) show that technological change in formal manufacturing has led to employment declines in Kenya, Senegal, and South Africa. This confluence of events makes it more difficult for low-income African countries to gain a foothold in formal manufacturing—even for domestic markets.

Using firm-level data, Diao et al. (2021) show that the capital intensity of formal manufacturing in both Ethiopia and Tanzania far exceeds economywide capital intensity. This is especially true of the larger, most productive firms, where capital intensity approaches (or exceeds) levels observed in the Czech Republic, a country that is around 20 times richer. High levels of capital intensity (and possibly of skill intensity as well, though they do not measure that) appear to be an important reason behind the poor employment performance of larger formal-sector firms. They argue that unlike earlier waves of developing nations, Tanzania and Ethiopia joined the world economy at a point where technical change and globalization were already established trends. Like many low-income countries in Africa, Ethiopia and Tanzania are still poor and have very low relative capital endowments. This creates a conundrum: competing with established producers on world markets is possible only by adopting technologies that make it harder to generate significant employment.

Formal-sector agrifood processing is not an exception. As we showed in the firm-level analyses, capital-labor ratios in this sector are greater than those in manufacturing as a whole in Ethiopia and on par with manufacturing as a whole in Tanzania. This raises an important question about the employment potential of agrifood processing in Africa. It is clear that agrifood processing creates jobs indirectly through its strong backward linkages to agriculture, but as far as we know, we do not have good evidence for this potential in the African context. Instead, we rely on evidence from California in the United States presented in McMillan and Zeufack (2022) to make this argument.

Agrifood processing has the potential to create jobs and wealth indirectly for logistics and packaging companies, restaurants and hotels, agricultural input suppliers, and so on. For perspective, Sexton, Azura, and Saitone (2015) estimate using input-output tables that in 2012, California's food and beverage processing sector directly accounted for around $25 billion in value added and 198,000 jobs. However, the indirect benefits associated with the food and beverage industry were far greater and include an additional $57 billion in value added and another 562,000 jobs. The extent to which these sorts of linkages can generate large-scale job creation in Africa is an open question.

Agricultural Productivity

The productivity of the agricultural sector is key to the performance of agrifood processing in African countries. According to Jayne and Sanchez (2021), over the last 20 years countries in SSA experienced the most rapid agricultural production growth rate of any region of the world. Jayne and Sanchez argue that these trends

reflect positive changes for SSA, but they caution that many challenges remain. Among the most important of these challenges, Jayne and Sanchez argue, is the need for more rapid agricultural productivity growth. In particular, they show that increases in agricultural production have been driven by the expansion of cultivated land, not by improvements to productivity. They argue that mounting land pressures and environmental damage caused by continued agricultural area expansion underscore the urgent need for increasing the productivity of the region's land already under cultivation.

The need for raising yields in agriculture is echoed in Suri and Udry (2022). They discuss recent trends in agricultural productivity in Africa and highlight how technological progress in agriculture has stagnated on the continent. They review the literature that tries to explain this stagnation through the lens of constraints to technology adoption and find that on their own, these constraints cannot explain the stagnation in yields across Africa. They showcase new research that highlights pervasive heterogeneity in the gross and net returns to agricultural technologies across Africa. They argue that this heterogeneity makes the adoption process more challenging, limits the scope of many innovations, and contributes to the stagnation in technology use.

Although neither of these articles explicitly examines agrifood processing, it is clear from the evidence presented in both pieces that raising yields in African agriculture is critical for the success of the agrifood processing industry. As pointed out by Suri and Udry (2022), doing this is complicated and context specific. Both sets of authors allude to the idea that encouraging private investment in agrifood processing may be part of the answer. Suri and Udry (2022) conclude their piece by asking what it will take to raise yields in African agriculture. Like us, they note that a lot of urban food production comes from imports, so there may be a role for the demand side and better market integration in driving technology adoption to replace these imports with locally produced goods (for a review, see de Janvry and Sadoulet 2020). Creating market incentives that remunerate quality, especially for high-value crops, may be one step toward sparking this demand side (Bernard et al. 2017).

Infrastructure development is also likely to play an important role in agricultural productivity growth (Llanto 2012). For some crops, transport from the farm to processing centers is time or climate sensitive. Electrical grid reliability may have an impact on many processing sectors. Bureaucratic and institutional infrastructure also matters; for example, there may be quality constraints such as a lack of a trusted food safety system that push consumers to look for higher quality products from foreign producers.

Conclusion

Agri-processing accounts for a large share of employment and value added in African countries' formal manufacturing sectors. Overall, the performance of formal firms in the agri-business sector appears strong, with both employment and labor productivity growing. At the same time, African countries import considerable (and growing) amounts of processed food. The evidence presented here indicates that some of that food could be produced domestically. Moreover, the case of Tanzania shows that there is a strong and growing market for food processed in Africa and that this intraregional trade can be a source of growth for agrifood processing. There is also a very large share of informal-sector employment engaged in agri-processing across much of Africa. Finding ways to increase the productivity of these small businesses could have large payoffs.