CHAPTER 4

Impact of COVID-19-Related Global Trade Disruptions on African Food Systems

Ismael Fofana, Alhassane Camara, Mariam A. Diallo, and Leysa M. Sall

Introduction

The COVID-19 pandemic is affecting national economies through several channels including global primary commodity trade and market disruptions. Countries have been affected by many of the measures taken to adapt to and control the spread of the disease.[1] Measures enacted in response to the pandemic have had a major impact on both the demand for and the supply of commodities. They have reduced the availability of air cargo and shipping services, induced changes in port and airport operations, and impacted international trade and market access conditions. On the demand side, the net effect is likely to be negative in the short term, with a decrease in the global population's propensity to consume and a decrease in intermediate consumption by firms.

The global economic shock of the COVID-19 pandemic drove most commodity prices down, according to the World Bank's Commodity Markets Outlook report (2021a). Prices of energy and base metal products were much lower in 2020 compared with pre-pandemic projections for the same year. Prices for agricultural and food products were rather mixed, with increases in projected prices for some commodities and decreases for others. In addition, the analysis covered the effects of the changes in trade volumes of the primary commodities. The pandemic has caused a decline in trade volume for all primary commodities (Verschuur, Koks, and Hall 2021). The ultimate impact of global price and trade changes on economies and livelihoods for each country depends on the magnitude of individual commodity price and volume changes and a country's exposure to the global market relative to the composition of the basket of primary commodities it trades internationally.

The structure of external trade shows that African countries mostly export raw materials and import finished products. Exports of most African countries are highly dependent on primary commodities such as energy, metal, and agricultural commodities (DESA/UNSD 2021). Thus, the COVID-19 global trade shock is likely to affect national economies primarily through the export of commodities.

Against this background, the analysis aims to contribute to the understanding of the impacts of external shocks on African food systems and to generate evidence for effective policy responses to future crises. It focuses exclusively on one of the many channels through which the pandemic is impacting national economies: the global trade and market disruptions associated with primary commodities. More specifically, the objective of this chapter is to assess the effects of changes in international prices and traded volumes of primary commodities on the food systems in select African countries.

The term food systems refers to the set of actors—including producers, processors, traders, and consumers—who interact within an institutional framework governing activity with potential environmental and health effects (Béné 2020). African countries are dealing with the immediate consequences of the COVID-19 pandemic while rebuilding for the future. Building a more resilient and sustainable food system is critical not only for better preparedness in future crises, but also for addressing future nutritional, health, and environmental challenges. This is even more compelling for African countries because economic performance in developing countries is more sensitive to the recurrence of natural disasters (droughts, floods, storms, and earthquakes, among others) than in developed countries (Loayza et al. 2012; Panwar and Sen 2019). Thus, the long-term impacts of the COVID-19 pandemic on food systems may be most heavily felt in low- and middle-income countries with fragile health systems and economies (Ali et al. 2020).

To assess the food system, we identify five of its components that are easily measurable through proxies: agricultural production and input use, food processing industries, agricultural and food trade, food consumption, and the macroeconomic environment. The impact assessment of the global trade disruptions on African food systems employs existing single-country computable general equilibrium (CGE) models. For each country, the latest social accounting matrix (SAM), accessible through the database of the African Growth and Development Policy Modeling Consortium (AGRODEP), is used to calibrate the model. The SAM is updated to the latest available year (currently 2019 or 2018, depending on the country) to reflect the recent structure of each country's economy. Data from the World Development Indicators database are used to

1 These measures range from states of emergency to curfews, border closures to changes in border protocols, quarantines, additional travel documentation requirements, and reduced labor due to business closures.

update the macrostructure of the national economies. Data from the United Nations Commodity Trade Statistics Database (UN Comtrade) are used to reflect the most recent trade structure of the economies available for 2019. The analysis focuses on 23 African countries for which a disaggregated SAM allows us to identify the above components of the food system. The impact of the COVID-19 pandemic is assessed by comparing a pre-COVID-19 scenario with a COVID-19 scenario. The former is based on previously existing commodity price forecasts while the latter uses the latest estimates. A commodity-specific price and trade volume scenario is built for every country based on changes in international prices and traded volumes of primary commodities and the composition of its external trade basket. The scenarios are used to assess the impacts of COVID-19-related global trade disruptions on the country's food systems.

Following this introduction, the second section provides a brief description of African food systems' characteristics and performance. Next, the third section presents the key characteristics of African trade of primary commodities. The fourth section presents the analytical framework, including the data used to carry out this analysis. Then, the fifth section describes the baseline and COVID-19 scenarios built and implemented for each of the selected African countries. The sixth section presents and discusses the results of the COVID-19-related global trade shocks on food systems in the selected African countries. Finally, the seventh section summarizes the chapter and offers policy recommendations.

Overview of African Food Systems

The characteristics and performance of food systems can be assessed in many ways. This section presents relevant macroeconomic indicators to give an aggregated overview of food system drivers. To this end, the analysis critically compares the status of African food systems with the global food system in three main components related to (1) agricultural production and food supply, (2) agricultural and food trade, and (3) food demand and consumption. African food systems can be characterized as having low productivity, exports driven by low-value products, and high levels of food insecurity.

Agriculture represents a sizable share of the economies in Africa, averaging 15.7 percent of the gross domestic product (GDP) compared with a global average of 4.0 percent in 2019 (Table 4.1). This makes agriculture a key sector of the continent's growth strategy. Agricultural production per capita in constant value is estimated at US$243[2] in Africa as compared with a value of $544 at the global level. While the value of agricultural production per capita in Africa is less than half of the global average, the caloric supply per capita in Africa is closer to the global average (2,604 kcal and 2,929 kcal per day, respectively). The relatively low value of the food supply in Africa can be explained by low labor productivity, compared with the rest of the world, and the predominance of high-caloric-content and low-value commodities in the food supply basket. Indeed, agricultural productivity in Africa is less than half that of the world as a whole. Agricultural value added per worker in constant value is estimated at $1,488 in Africa, as compared with a global average of $3,720. The low agricultural productivity on the continent is partially due to the low adoption of agricultural technologies. As the data in Table 4.1 indicate, the average use of inorganic fertilizer per hectare of arable land in Africa is lower than the global average. In addition, the proportion of irrigated land in Africa is three times lower than the global average. The food manufacturing industry is an important segment of the food supply chain, with a share of 2.7 percent of GDP in Africa as compared with a global average of 2.4 percent (Table 4.1). The annual growth rate of the food manufacturing industry in Africa (0.4 percent) is far less than the global average (5.4 percent). On the other hand, the annual growth rate of African agriculture (average of 1.6 percent per capita over the decade from 2009 to 2018) is close to the global average (1.7 percent per capita over the same period).

Agricultural and food trade is also a major driver of food systems because both imports and exports directly influence the level, composition, and cost of domestic food supplies. Trade in food products represents a significant proportion of African external trade, accounting for 12.3 percent of total exports and 11.3 percent of total imports. However, due to the limited quality of transportation infrastructure, international trade in food products remains less than optimal. Indeed, in 2018, Africa scored 2.2 on a scale of 5 in terms of the quality of transport and trade infrastructure, compared with the global average of 2.7 (Table 4.1). Recently, African exports of food and agricultural products have increased more than the global average, driven by the increase in volumes.

2 All dollar figures in this chapter refer to US dollars.

TABLE 4.1—OVERVIEW OF AFRICAN FOOD SYSTEMS, COMPARING VALUES FOR AFRICA AND THE WORLD

	Indicator	Africa	World
Agricultural production and food supply	Value-added agriculture, forestry, and fishing – share of GDP (%)	15.7	4
	Value-added agriculture, forestry, and fishing per capita – annual growth 2009–2018 (%)	1.6	1.7
	Value-added manufacture of food, beverages, and tobacco products – share of GDP (%) (b)	2.7	2.4
	Value-added manufacture of food, beverages, and tobacco products per capita – annual growth 2009–2018 (%)	0.4	5.4
	Agriculture gross production value per capita (constant 2014–2016 $) (b)	242.8	543.7
	Food supply (kcal/capita/day) (b)	2,604	2,929
	Agriculture, forestry, and fishing, value-added per worker (constant 2010 $) (a)	1,488.1	3,720.1
	Fertilizer use, nutrient nitrogen (N) use (kg/ha)	15.9	69.8
	Fertilizer use, nutrient phosphate (P2O5) use (kg/ha)	6.4	28
	Fertilizer use, nutrient potash (K2O) use (kg/ha)	3.7	24.2
	Arable land area equipped for irrigation (%)	6.9	24.7
Food trade	Food imports (% of merchandise imports) (a)	11.3	8.1
	Food exports (% of merchandise exports) (a)	12.3	8.6
	Logistics performance index: Quality of trade- and transport-related infrastructure (1=low to 5=high) (a)(b)	2.2	2.7
	Agricultural export value index (2014–2016 = 100)	109	107
	Agricultural export unit/value index (2014–2016 = 100)	82	98
	Agricultural export quantity index (2014–2016 = 100)	134	109
	Agricultural import value index (2014–2016 = 100)	102	107
	Agricultural import unit/value index (2014–2016 = 100)	92	96
	Agricultural import quantity index (2014–2016 = 100)	111	112
Food demand and consumption	Rural population (% of total population) (a)	59.3	44.3
	Total population growth (annual %) (a)	2.7	1.1
	Rural population growth (annual %) (a)	1.7	0.1
	Urban population growth (annual %) (a)	3.7	1.9
	Gross national income, value $ per capita	1,819.70	11,291.90
	Households and NPISHs final consumption expenditure (% of GDP) (a)	67.1	57.6
	Households' final consumption expenditure (annual % growth) (a)	1.4	2.4
	Consumer prices, general indices (2015 = 100)	150.8	113
	Consumer prices, food indices (2015 = 100)	154.7	111.6
	Food price inflation (annual %)	8.2	4.4

Source: FAO (2021) ; World Bank (2021b).

Note: NPISHs = nonprofit institution–serving households; (a) = Africa south of the Sahara for 2019 from the World Development Indicators (World Bank 2021b); (b) = 2018 values from the same source.

Indeed, the unit value index of African exports has recently declined while the quantity index has increased over the same period. The opposite has been observed in the rest of the world, where imports have increased more than in Africa, driven by increases in both value and quantity.

Household final consumption expenditures represent a significant share of GDP in Africa—67.1 percent, compared with the global average of 57.6 percent (Table 4.1). In Africa, food purchases exceed 50 percent of the total household final consumption expenditure in general, and food ranks as the top category of household expenditures; for example, in 2016, the household food budget was estimated at 58.9 percent in Nigeria and 52.2 percent in Kenya (USDA 2021). In contrast, households in most industrialized countries spend less than 20 percent of their total consumption budget on food and nonalcoholic beverages (for example, 6.3 percent in the United States and 10.6 percent in Germany). According to Smith and Subandoro (2007), households spending between 50 and 65 percent of their income on food are considered to have medium levels of food insecurity and those spending between 65 and 75 percent and more than 75 percent are considered highly and very highly food insecure, respectively. The cost of food is relatively higher and increases faster in Africa than elsewhere, with a food consumer price index of 154.7, compared with 111.6 for the global average. Considering the average household consumption expenditure growth (1.4 percent for Africa and 2.4 percent for the world) and population growth (2.7 percent for Africa and 1.1 percent for the world), consumer expenditure growth is primarily driven by population growth in Africa and by income growth in the rest of the world. Several studies show that globalization, trade facilitations, and rapid urbanization have led to major shifts in the availability, affordability, and acceptability of different types of food, all of which is changing food systems rapidly (Kennedy, Nantel, and Shetty 2004; Gillespie and van den Bold 2017).

Africa's Primary Commodity Trade

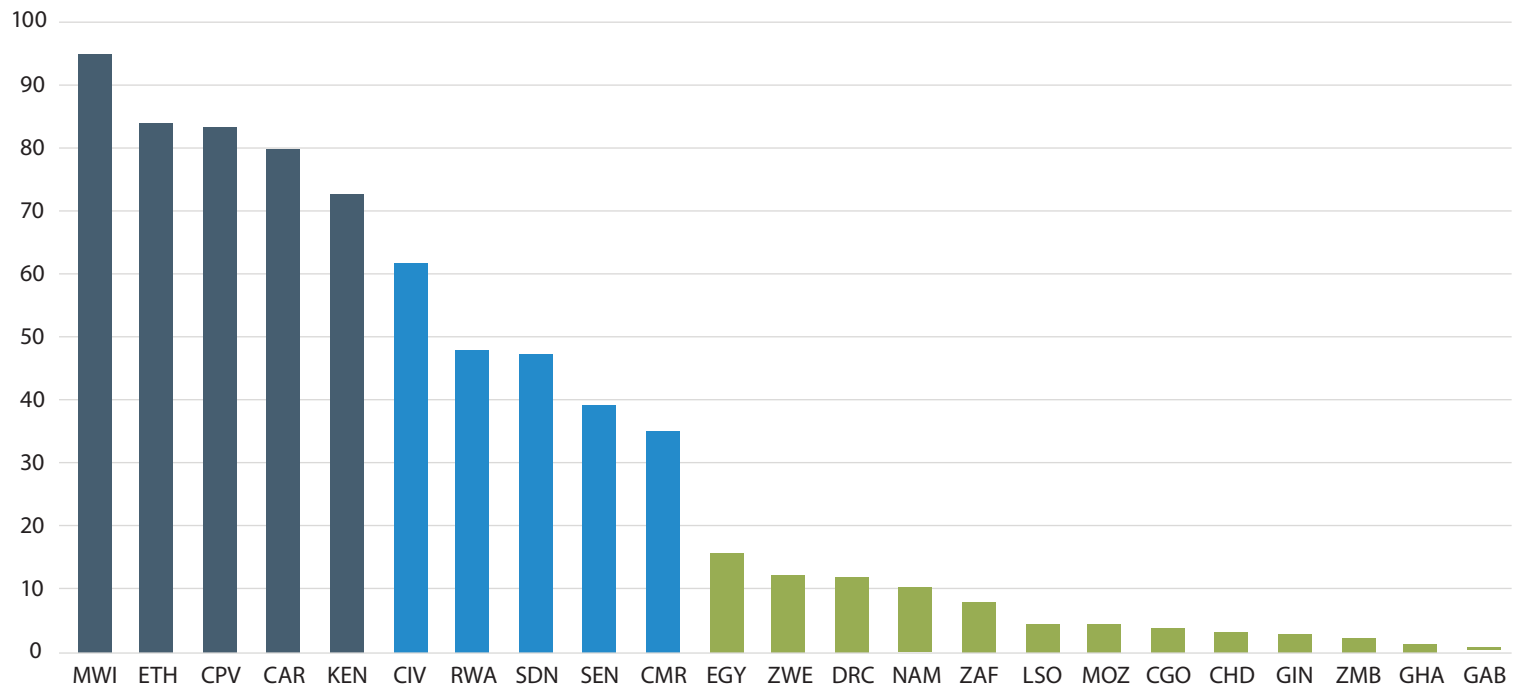
African countries mostly export raw materials and import finished products.[3] Exports of most African countries are highly dependent on primary commodities such as energy, metal, and agricultural products. Primary commodities account for more than 50 percent of total exports in most African countries, according to data retrieved from UN Comtrade (Figure 4A.1). In contrast, primary commodities contribute less than 50 percent of total imports in most African countries (Figure 4A.2). Thus, the COVID-19-related global trade shock is likely to affect national economies primarily through the export of commodities.

The composition of the primary commodity export basket is computed using data from UN Comtrade. Figure 4.1 indicates a low contribution of agricultural commodities in the primary commodity export baskets of most of the selected African countries. Among the 23 countries, only 5 can be identified as agriculture-dominated exporting countries (Cabo Verde, Central African Republic, Ethiopia, Kenya, and Malawi). In these countries, agricultural commodities contribute more than 70 percent of the total exports of primary commodities. Conversely, 13 countries are identified as energy- and mineral-dominated exporting countries (Chad, Congo, Democratic Republic of the Congo, Egypt, Gabon, Ghana, Guinea, Lesotho, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe). In these countries, agricultural commodities account for less than 20 percent of the total export of primary commodities. The remaining countries are considered mixed agriculture- and nonagriculture-exporting countries (Cameroon, Côte d'Ivoire, Rwanda, and Senegal). These countries are exporting large proportions of both agricultural and nonagricultural commodities.

Figure 4A.3 shows the most important commodities exported by the selected countries with their relative contributions to total exports of primary commodities. The figure displays countries according to the grouping discussed above, from agriculture-dominated exporting countries on the left to energy- and mineral-dominated exporting countries on the right. It indicates a mix of agricultural, energy, and mineral commodities in the primary export baskets of the selected African countries. The export baskets are dominated by a limited number of commodities, reflecting low diversification of the primary commodity export baskets. Exports are concentrated in a few commodities, making countries more vulnerable to market disruptions and international shocks. For instance, a single commodity makes up two-thirds of the total exports of primary commodities in Cabo Verde (fish), Central African Republic (wood), Chad (petroleum), Congo (petroleum), Gabon (petroleum), Malawi (tobacco), and Zambia (copper).

3 According to our computation of data from UN Comtrade (DESA/UNSD 2021).

FIGURE 4.1—PERCENTAGE SHARE OF AGRICULTURE IN TOTAL EXPORTS OF PRIMARY COMMODITIES



Source: Authors, based on data from DESA/UNSD (2021).

Note: MWI = Malawi; ETH = Ethiopia; CPV = Cabo Verde; CAR = Central African Republic; KEN = Kenya; CIV = Côte d'Ivoire; RWA = Rwanda; SDN = Sudan; SEN = Senegal; CMR = Cameroon; EGY = Egypt; ZWE = Zimbabwe; DRC = Democratic Republic of the Congo; NAM = Namibia; ZAF = South Africa; LSO = Lesotho; MOZ = Mozambique; CGO = Congo; CHD = Chad; GIN = Guinea; ZMB = Zambia; GHA = Ghana; GAB = Gabon.

Analytical Framework

The impact of COVID-19-related disruptions of the primary commodity trade and markets on African food systems is assessed in 23 African countries using single-country CGE models.[4] Countries are selected based on the availability and accessibility of a recent SAM that captures several segments of the food supply chain: production, processing, trade, and consumption. Based on these criteria, the following countries are covered by the analysis: Cabo Verde, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Egypt, Ethiopia, Gabon, Ghana, Guinea, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, Senegal, Sudan, South Africa, Zambia, and Zimbabwe.

As with most CGE models, the model developed to assess the impact of COVID-19-related trade disruptions on African food systems is grounded in the Walrasian small open economy framework. Individual national economies are interconnected to the global economy through the international trade of products and the flows of revenue and capital.

4 The single-country CGE models were developed under the African Union's Comprehensive Africa Agriculture Development Programme (CAADP).

The constant elasticity of transformation relationship specifies the trade-off between the national and international markets for exported commodities. The Armington assumption is used to model imported products as imperfect substitutes for locally produced goods and services. Finite elasticity is assumed for export supply, meaning that the export supply curve describes an upward slope that entails an endogenous export free on board price effect in addition to the quantity effect. In the same vein, we introduce a finite elasticity for import demand to capture the endogenous import cost, insurance, and freight and quantity effects. However, the international price remains exogenous for any given product; that is, we make the small country assumption.

An extended linear expenditure system represents consumption and saving behaviors. The function depicts a nondiscretionary expenditure component related to autonomous (or exogenous) consumption and a discretionary expenditure component associated with induced (or endogenous) consumption. The production technology is represented by a multilevel nested constant elasticity of substitution function combining production factors (labor and capital) and intermediate inputs.

The labor market is segmented according to the categorization of laborers in each SAM. To reflect the massive layoffs that suddenly occurred with the COVID-19 lockdown and the substantial increase in unemployed people, the imperfect labor markets are set to be demand driven while real wage rates are held fixed. The government budget is balanced through changes in its primary savings, or its gross revenue net of its current expenses. The provision of public services and public transfers increases at exogenous rates according to the country's precrisis fiscal policy. Public expenses remain endogenous through the prices of factors and inputs used in the delivery of these services. The external current account balance is held fixed while the exchange rate equilibrates revenues and expenses. The model is savings driven, and the weighted average market equilibrium price for goods and services—the economywide price index—is set as the numeraire, or reference price.

The SAMs are updated with data through the year 2019 to reflect the recent structure of the economies. Data from the World Development Indicators database are used to update the macroeconomic structure of the economies. Data from UN Comtrade are used to reflect the most recent trade structure of the economies. The updated SAMs are used to calibrate the CGE models. This requires the use of additional economic and demographic data and elasticities parameters available through the ReSAKSS Toolbox (AU and NEPAD 2018).

To address the impact of the COVID-19-related global trade shock on the food system, five components of the system based on the characterization suggested by Béné (2020) are used: agricultural production and input use, food processing industries, agricultural and food trade, food consumption, and the macroeconomic environment.

The impact on agricultural and food production and processing is captured through the volume of production, cost of inputs, value addition, and job creation (Table 4A.1). For every indicator, an aggregate value is computed for activities and entities throughout the food supply chain, including agricultural production, food processing industries, and food services and distribution.

The effects of the COVID-19-related global trade shock on agricultural and food trade are assessed through changes in export and import volumes for agricultural and food products and services. Similar to the production and processing component of the supply chain, an indicator for the overall trade in agricultural and food products and services is considered as well as the individual components. Increasing exports of the overall agricultural and food goods and services is likely to strengthen the trade component of the food systems. On the other hand, increasing imports of the overall agricultural and food commodities does not necessarily improve the performance of the food systems because of the adverse effects of increased competition with local producers and reduced availability of foreign currencies for nonfood imports.

The consumption component of the systems is captured by the food expenditures in constant value and the food consumption price for agricultural products, processed food, and food services. Because of data limitations, the analysis does not include other aspects of the consumption component of the food systems.

In addition, household income, economywide job creation, consumer price index, and GDP are considered in assessing the macroeconomic impact of the COVID-19-related global trade shock. The first three indicators are computed at the national level as well as disaggregated for urban and rural areas. In total, 41 indicators are used to assess the effects of COVID-19-related global trade disruptions on African food systems (Table 4A.1).

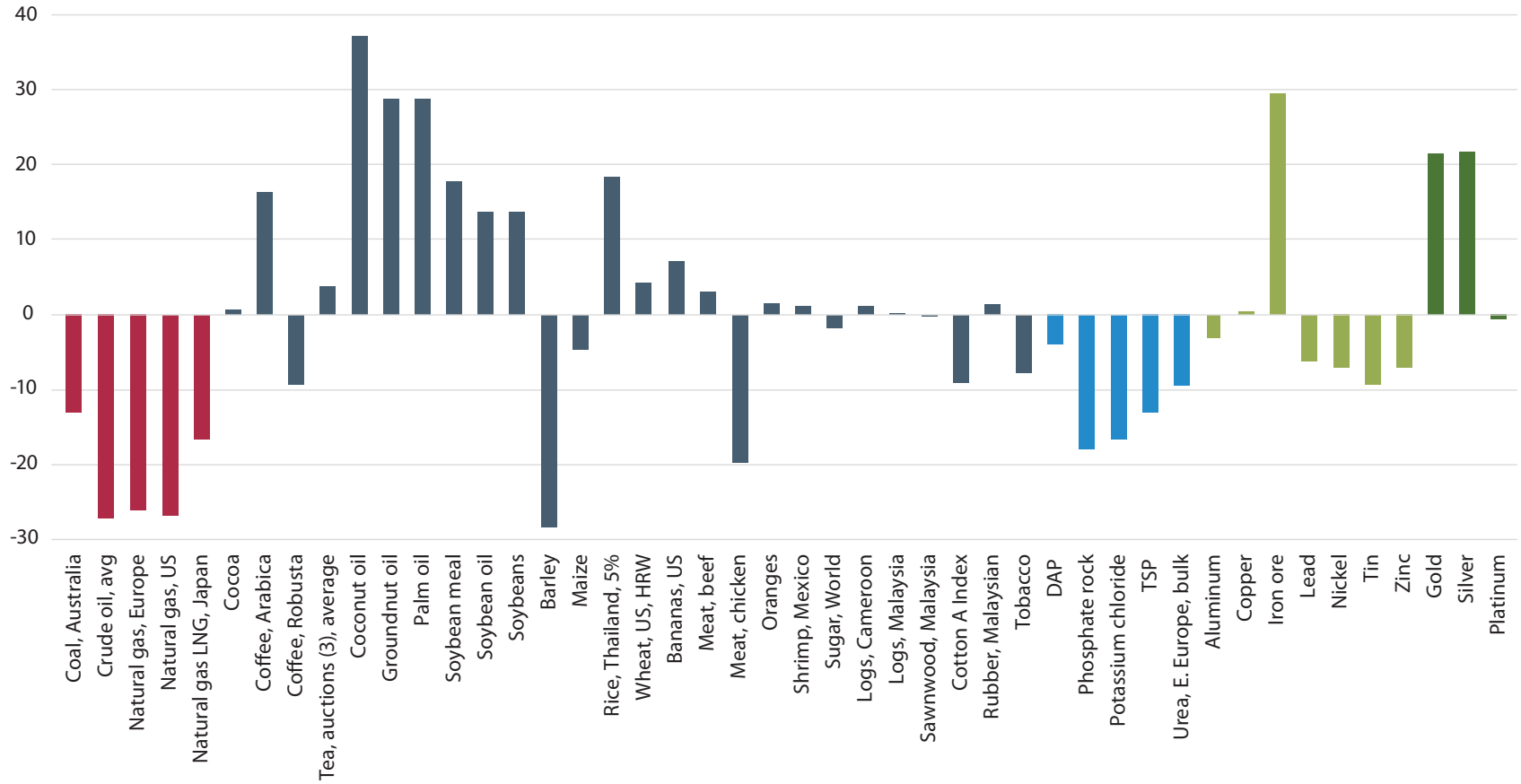
Because this assessment framework identifies several indicators, we compute a score to appreciate the impact of the COVID-19-related global trade shock on African food systems. The score measures the proportion of indicators adversely

impacted by the shock. An indicator is adversely impacted by the COVID-19-related global trade shock when the changes observed under the COVID-19 scenario are less than those observed under the baseline. Thus, the higher the score, the higher the adverse effects of the pandemic on the food systems, and vice versa.

Simulation Scenarios

The COVID-19-related global trade and market disruptions associated with primary commodities are simulated through two scenarios: the baseline scenario and the COVID-19 scenario. These scenarios are built around the changes in the

FIGURE 4.2—CHANGES IN PRIMARY COMMODITY PRICES BETWEEN 2019 AND 2020, PERCENTAGE POINT DIFFERENCE BETWEEN ESTIMATED AND PREDICTED PRICES FOR 2020



Source: World Bank (2021a).

Note: LNG indicates liquefied natural gas; Tea, auctions (3) indicates tea, average 3 auctions; HRW indicates Hard Red Winter; DAP indicates diammonium phosphate; TSP indicates triple superphosphate.

international prices and traded volumes of primary commodities. To build the scenarios, we identify key primary commodities exported and imported by the selected countries.

International Price Shock

The baseline scenario uses the predicted prices for 2020 from the World Bank as of October 2019, before the onset of the COVID-19 pandemic (World Bank 2021a). The COVID-19 scenario is based on the estimated prices for 2020, also made available by the World Bank. In both scenarios, the changes in international prices are computed by comparing the 2020 prices with the 2019 prices.

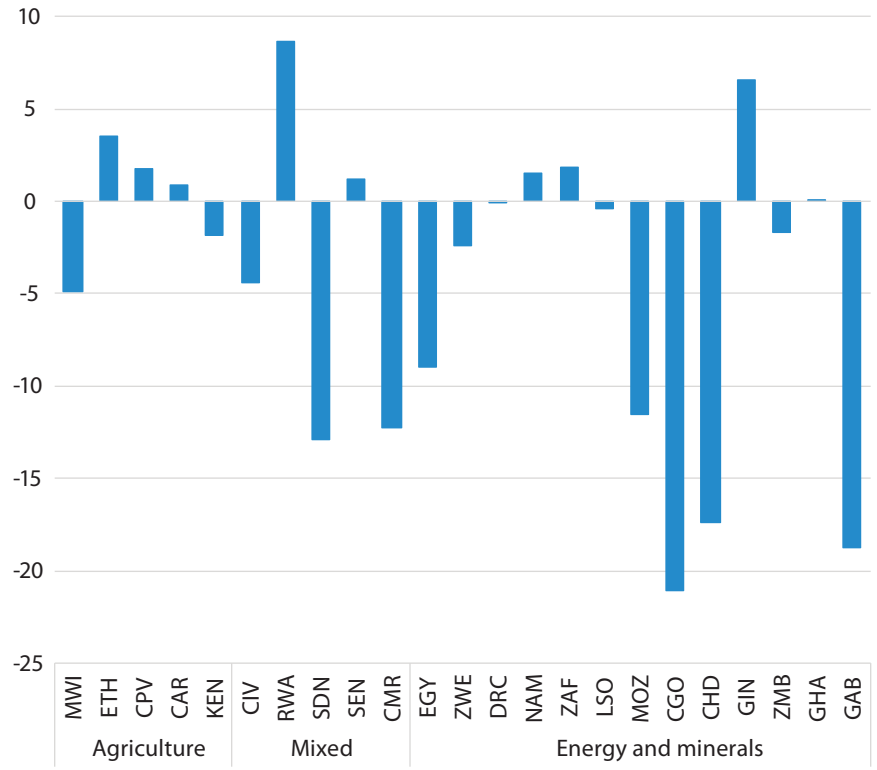
The global economic shock of the COVID-19 pandemic drove most commodity prices down, according to the World Bank's Commodity Markets Outlook report (Figure 4.2) (World Bank 2021a). Prices of energy and base metal products were much lower in 2020 compared with pre-pandemic projections for the same year. Energy product prices declined by as much as 27.3 percentage points (pp) for petroleum products and 16.6 pp for natural gas. In contrast, prices for agricultural and food products were rather mixed, with, for example, increases in projected prices for commodities like coconut oil (37.3 pp), palm oil (28.9 pp), groundnut oil (28.7 pp), or rice (18.4 pp), and a decrease for barley (28.3 pp). International prices for precious metal products were forecast to rise by close to 21.8 pp for silver and 21.6 pp for gold.

The composition of primary commodity export and import baskets ultimately determines the magnitude of the global price and volume shocks that affect individual countries. Figures 4.3 and 4.4 show the price shocks affecting individual countries. Countries are displayed according to the grouping discussed above, from agriculture-dominated exporting countries on the left to energy- and mineral-dominated exporting countries on the right. In the agriculture-dominated exporting countries, the changes in the average export price of primary commodities are closely linked to the changes in the average export price of agricultural commodities, except in the Central African Republic. The energy-dominated exporting countries—Chad, Congo, Gabon, and Mozambique—experienced a greater fall in average export prices of primary commodities than did the other group of countries. Overall, the changes in primary commodity prices are less important for agriculture-dominated exporting countries than for energy- and mineral-dominated exporting countries.

Trade Volume Shock

In addition to the global price shock, the analysis captures the effects of changes in trade volumes of primary commodities as a consequence of the COVID-19 pandemic. High-frequency shipping data are used to measure the impact of the COVID-19 pandemic on trade volumes (Verschuur, Koks, and Hall 2021).

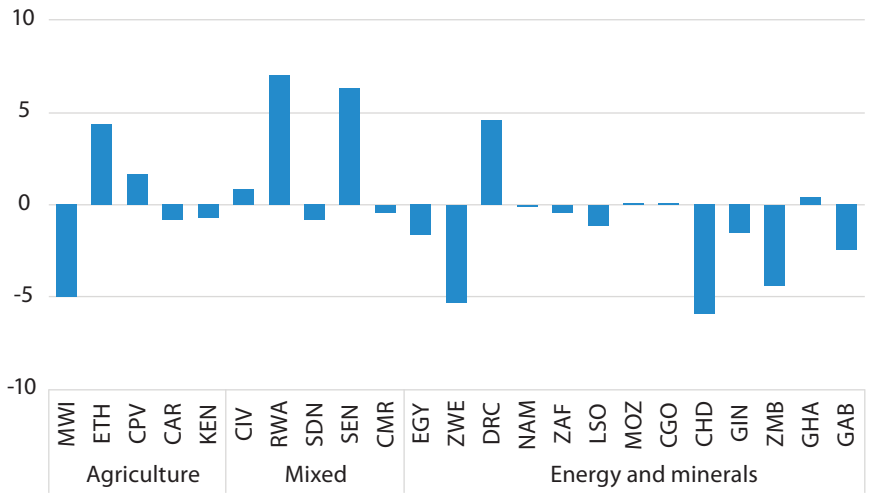
FIGURE 4.3—CHANGES IN AVERAGE EXPORT PRICES OF PRIMARY COMMODITIES BETWEEN 2019 AND 2020 FOR SELECTED AFRICAN COUNTRIES (PERCENTAGE)



Source: Authors' computation from World Bank (2021a).

Note: Percentage point variation between October 2019 and April 2021 forecasts by the World Bank. MWI = Malawi; ETH = Ethiopia; CPV = Cabo Verde; CAR = Central African Republic; KEN = Kenya; CIV = Côte d'Ivoire; RWA = Rwanda; SDN = Sudan; SEN = Senegal; CMR = Cameroon; EGY = Egypt; ZWE = Zimbabwe; DRC = Democratic Republic of the Congo; NAM = Namibia; ZAF = South Africa; LSO = Lesotho; MOZ = Mozambique; CGO = Congo; CHD = Chad; GIN = Guinea; ZMB = Zambia; GHA = Ghana; GAB = Gabon. Countries are grouped into agriculture-dominated exporting countries, energy- and mineral-dominated exporting countries, and mixed agricultural and nonagricultural exporting countries.

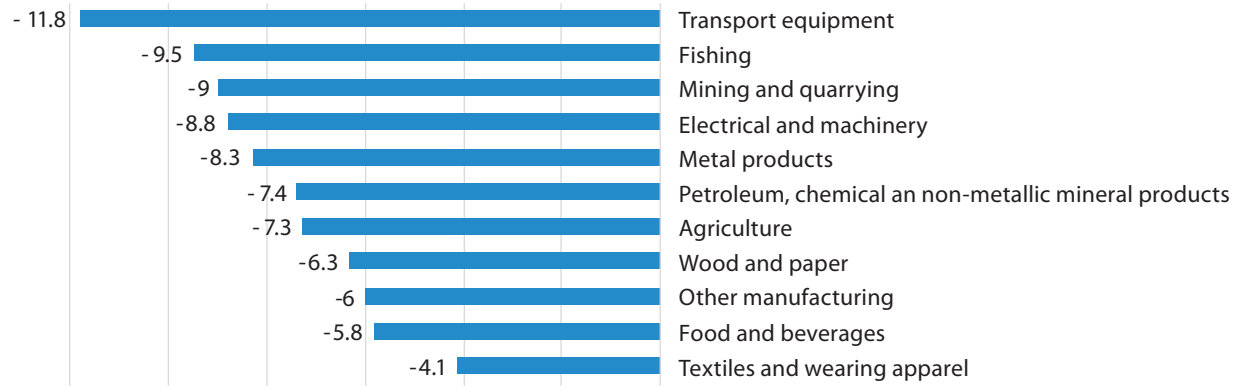
FIGURE 4.4—CHANGES IN AVERAGE EXPORT PRICES OF AGRICULTURAL COMMODITIES BETWEEN 2019 AND 2020 FOR SELECTED AFRICAN COUNTRIES (PERCENTAGE)



Source: Authors' computation from World Bank (2021a).

Note: Percentage point variation between October 2019 and April 2021 forecasts by the World Bank. MWI = Malawi; ETH = Ethiopia; CPV = Cabo Verde; CAR = Central African Republic; KEN = Kenya; CIV = Côte d'Ivoire; RWA = Rwanda; SDN = Sudan; SEN = Senegal; CMR = Cameroon; EGY = Egypt; ZWE = Zimbabwe; DRC = Democratic Republic of the Congo; NAM = Namibia; ZAF = South Africa; LSO = Lesotho; MOZ = Mozambique; CGO = Congo; CHD = Chad; GIN = Guinea; ZMB = Zambia; GHA = Ghana; GAB = Gabon. Countries are grouped into agriculture-dominated exporting countries, energy- and mineral-dominated exporting countries, and mixed agricultural and nonagricultural exporting countries.

FIGURE 4.5—SECTOR-SPECIFIC PERCENTAGE CHANGES IN GLOBAL TRADE OF COMMODITIES BETWEEN 2019 AND 2020



Source: Authors' computation from Verschuur, Koks, and Hall (2021).

Changes in the daily global trade of commodities between 2019 and 2020 are recorded for aggregate groups of commodities.

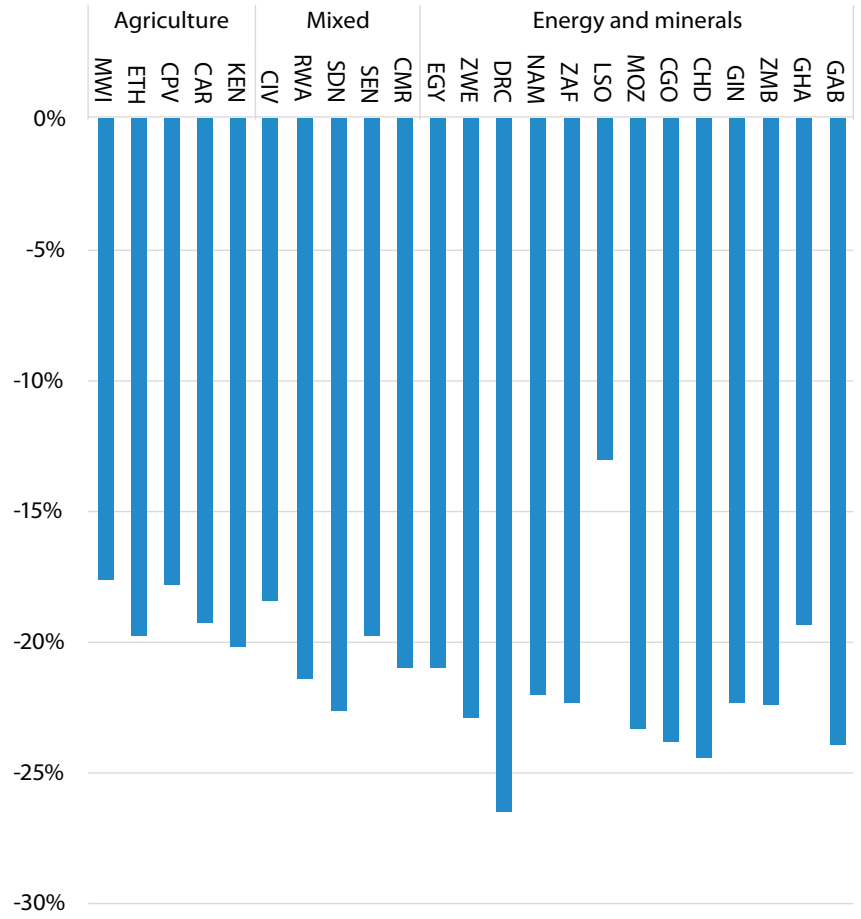
The pandemic has caused a decline in trade volume for all primary commodities (Figure 4.5). Traded volumes of mining and quarrying products and petroleum products declined by 9.0 percent and 7.4 percent, respectively, between 2019 and 2020. Similarly, traded volumes of fish and agricultural products fell by 9.5 percent and 7.3 percent, respectively. However, a modest decline was recorded for the traded volumes of food and beverages (5.8 percent).

Similar to international prices of commodities, the changes in country-specific import and export volumes depend on the structure of a country's external trade. The average changes in export volumes by country are shown in Figures 4.6 and 4.7. The average volumes of export for primary commodities decreased for all selected countries between 2019 and 2020, with declines ranging from 13 to 27 percent. As expected, agriculture-dominated exporting countries experienced a smaller decline in the average export volumes of primary commodities, compared with the energy- and mineral-dominated exporting countries.

Results and Discussion

The COVID-19-related disruptions affecting global supply chains of primary commodities, including agricultural and food commodities, can significantly impact African economies and food systems. Changes in prices received for primary commodity exports or paid for imports translate into gains or losses of foreign exchange earnings by African countries. Changes in the availability of cargo or the operation of airports and seaports also affect the cost and volume of goods shipped. Individual economies are affected based on their degree of exposure to shocks in different primary commodity markets, which in turn depends on the bundle of primary goods that countries sell to or buy from foreign markets. Changes in exported and imported quantities, as well as related prices, are transmitted to domestic producers and consumers, resulting in changes in production activities and

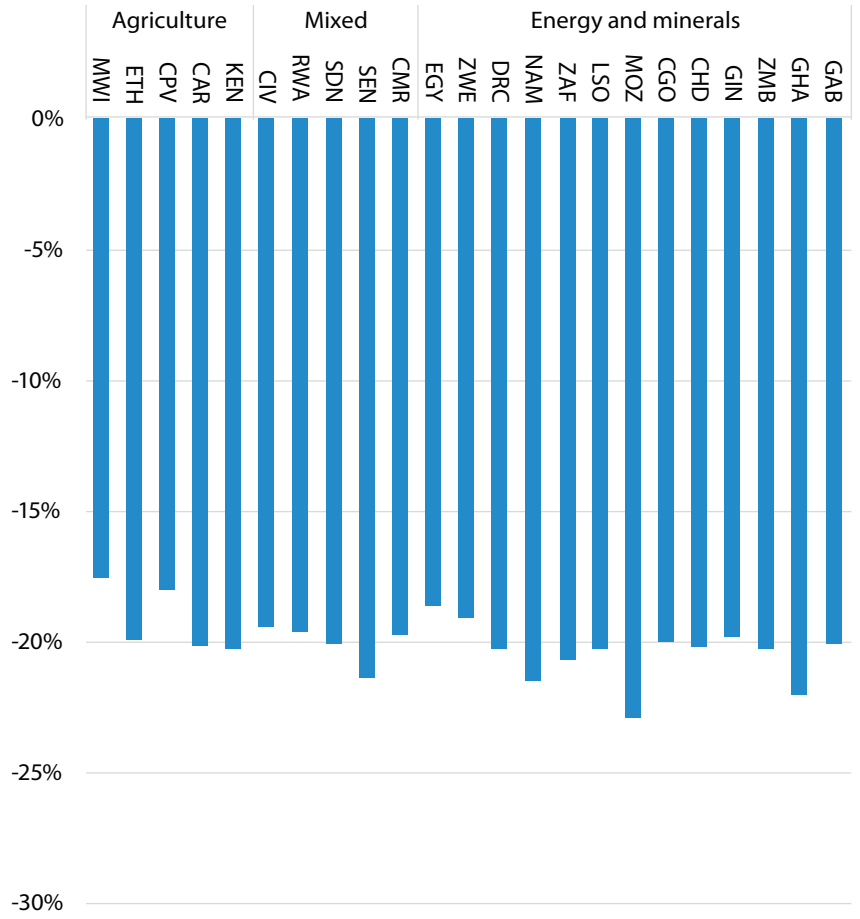
FIGURE 4.6—CHANGES IN AVERAGE EXPORT VOLUMES OF PRIMARY COMMODITIES BETWEEN 2019 AND 2020 FOR SELECTED AFRICAN COUNTRIES (PERCENTAGE)



Source: Authors' computation from Verschuur, Koks, and Hall (2021).

Note: MWI = Malawi; ETH = Ethiopia; CPV = Cabo Verde; CAR = Central African Republic; KEN = Kenya; CIV = Côte d'Ivoire; RWA = Rwanda; SDN = Sudan; SEN = Senegal; CMR = Cameroon; EGY = Egypt; ZWE = Zimbabwe; DRC = Democratic Republic of the Congo; NAM = Namibia; ZAF = South Africa; LSO = Lesotho; MOZ = Mozambique; CGO = Congo; CHD = Chad; GIN = Guinea; ZMB = Zambia; GHA = Ghana; GAB = Gabon. Countries are grouped into agriculture-dominated exporting countries, energy- and mineral-dominated exporting countries, and mixed agricultural and nonagricultural exporting countries.

FIGURE 4.7—CHANGES IN AVERAGE EXPORT VOLUMES OF AGRICULTURAL COMMODITIES BETWEEN 2019 AND 2020 FOR SELECTED AFRICAN COUNTRIES (PERCENTAGE)

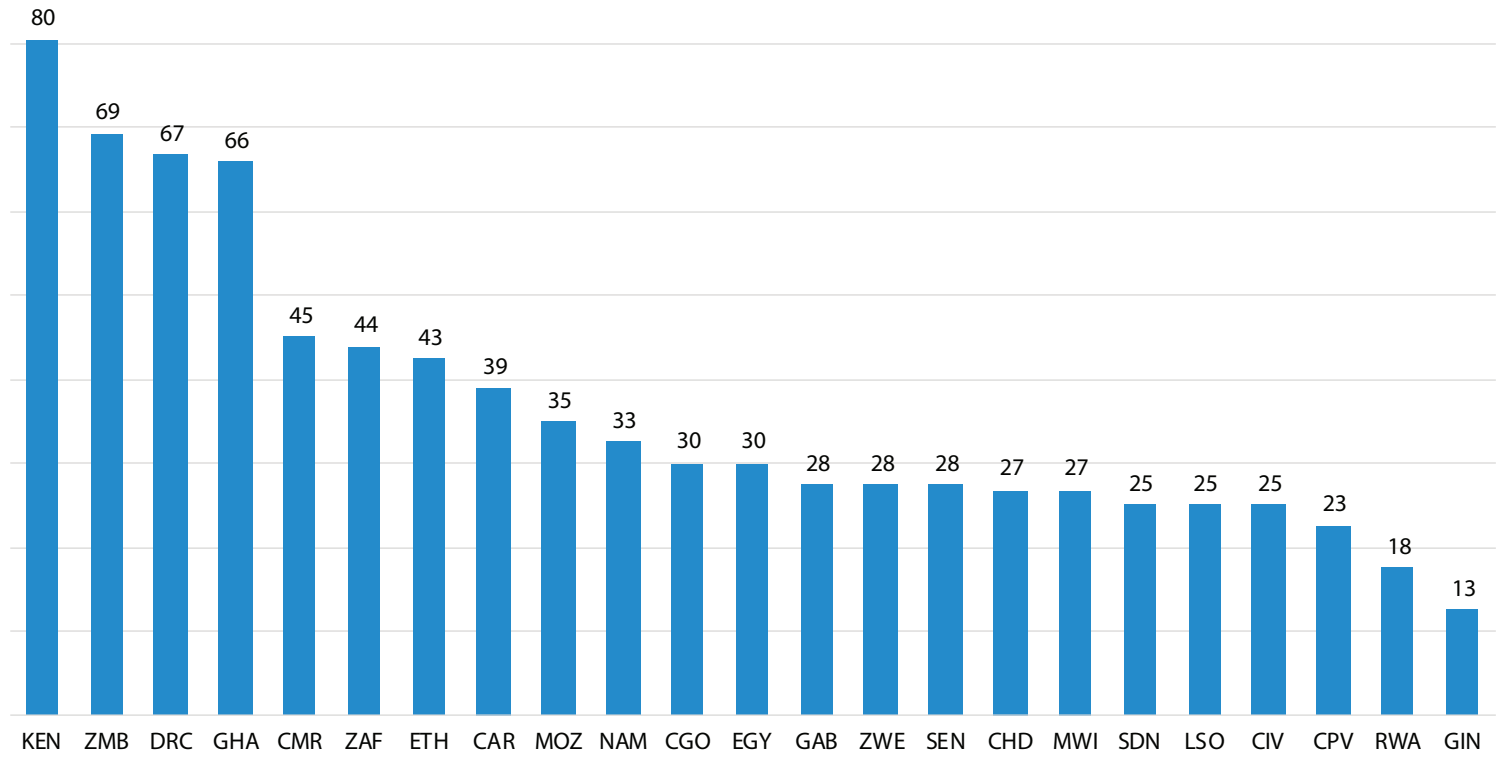


Source: Authors' computation from Verschuur, Koks, and Hall (2021).

Note: MWI = Malawi; ETH = Ethiopia; CPV = Cabo Verde; CAR = Central African Republic; KEN = Kenya; CIV = Côte d'Ivoire; RWA = Rwanda; SDN = Sudan; SEN = Senegal; CMR = Cameroon; EGY = Egypt; ZWE = Zimbabwe; DRC = Democratic Republic of the Congo; NAM = Namibia; ZAF = South Africa; LSO = Lesotho; MOZ = Mozambique; CGO = Congo; CHD = Chad; GIN = Guinea; ZMB = Zambia; GHA = Ghana; GAB = Gabon. Countries are grouped into agriculture-dominated exporting countries, energy- and mineral-dominated exporting countries, and mixed agricultural and nonagricultural exporting countries.

demand for both agricultural and nonagricultural products. Ultimately, these changes affect the pace of growth and available incomes, and thus livelihoods. The final impact depends on the ability of domestic producers and consumers, and the economy in general, to adjust to changing market conditions.

FIGURE 4.8—SENSITIVITY OF FOOD SYSTEMS TO COVID-19-RELATED GLOBAL TRADE SHOCK, SCORE IN PERCENTAGE, COMPUTED FOR SELECTED AFRICAN COUNTRIES

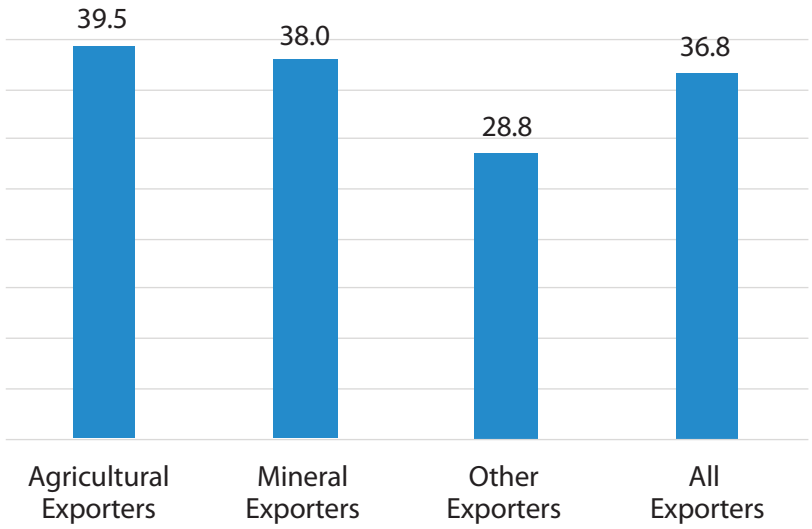


Source: Authors' simulation results.

Note: MWI = Malawi; ETH = Ethiopia; CPV = Cabo Verde; CAR = Central African Republic; KEN = Kenya; CIV = Côte d'Ivoire; RWA = Rwanda; SDN = Sudan; SEN = Senegal; CMR = Cameroon; EGY = Egypt; ZWE = Zimbabwe; DRC = Democratic Republic of the Congo; NAM = Namibia; ZAF = South Africa; LSO = Lesotho; MOZ = Mozambique; CGO = Congo; CHD = Chad; GIN = Guinea; ZMB = Zambia; GHA = Ghana; GAB = Gabon.

The COVID-19-related global trade disruptions have adversely affected the food systems in the 23 African countries covered by this analysis (Figure 4.8). In accordance with the construction of the score, the higher the score, the higher the adverse effects of the trade shock on the food systems. Kenya shows the highest score (80 percent) indicating that the COVID-19-related global trade shock has adversely affected the country's food systems more than any other country covered by the analysis. Three other countries show a relatively high score: Zambia (69 percent), Democratic Republic of the Congo (67 percent), and Ghana (66 percent). However, more than half of the selected countries (13 out of 23) show a relatively low score of 30 percent or less. Guinea (13 percent) and Rwanda (18 percent) recorded the lowest scores. Countries are affected by both price and volume shocks. The fall in prices and volumes of energy products primarily affected the first group of countries (Democratic Republic of the Congo, Ghana, and Kenya). Moreover, the prices of copper, tea, and cocoa increased slightly but

FIGURE 4.9—IMPACT OF COVID-19-RELATED GLOBAL TRADE SHOCK ON AFRICAN FOOD SYSTEMS, AVERAGE SCORE IN PERCENTAGE, COUNTRIES GROUPED BY EXPORTS



Source: Authors' simulation results.

Note: Agricultural Exporters = agriculture-dominated exporting countries; Mineral Exporters = energy- and mineral-dominated exporting countries; Other Exporters = mixed agricultural and nonagricultural exporting countries.

not enough to compensate for the decline in their traded volumes, which also contributed to decreased export revenues in the Democratic Republic of the Congo, Ghana, Kenya, and Zambia. The surge in gold prices helped mitigate the adverse effects of the pandemic on food systems in Guinea and Rwanda. These countries generate a large share of their export revenues from gold exports.

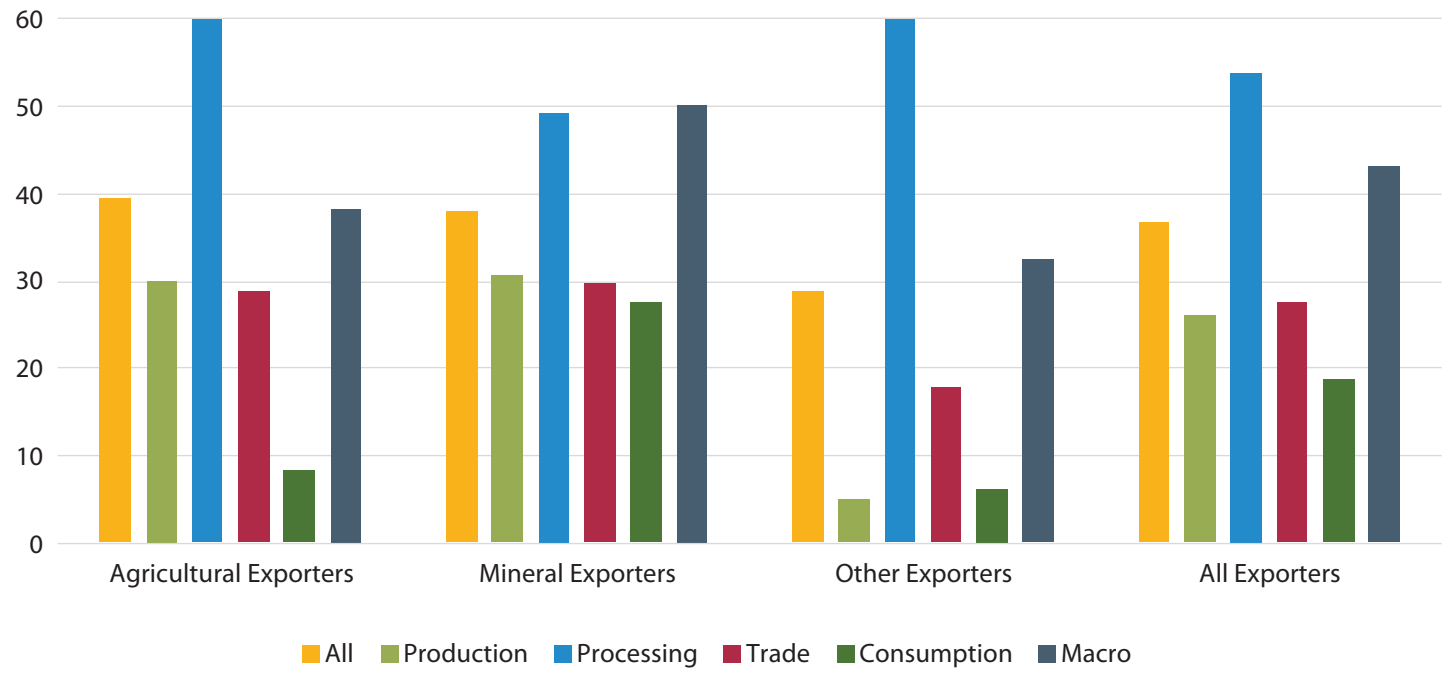
Overall, the countries covered by the study have an average score of 36.8 percent, but this shows some heterogeneity. Indeed, when we look at the scores of countries grouped according to the composition of their primary commodity export basket (Figure 4.9), the food systems of the more diversified exporting countries are less affected by the COVID-19-induced global trade shock (28.8 percent), compared with both agriculture-dominated exporting countries (39.5 percent) and energy- and mineral-dominated exporting countries (38.0 percent). Thus, these results indicate that a diversified export basket is an important factor that contributes to strengthening Africa's food systems against the adverse effects of external shocks.

The analysis now turns to assessing and comparing the effects of the global trade shock on the components of food systems. The food system is assessed through the following five components: production and input use, processing industries, agricultural and food trade, consumption, and macroeconomic environment. In this regard, the simulation results indicate that food processing is by far the most sensitive component of the systems to the COVID-19-related global trade shock (Figure 4.10). The explanation lies in the fact that processed food and food services industries are relatively more sensitive to changes in households' incomes (that is, they have higher income elasticity) as compared with agrifood products. Indeed, the deterioration of the macroeconomic environment due to the recurrence of the COVID-19-related shock reduced employment and household income, resulting in a sharp decline in demand for processed food and food services. Indeed, this result is consistent with the findings of Van Hoyweghen and colleagues (2021), who investigate the impact of the COVID-19 pandemic on the fruit and vegetable supply chain in Senegal, using trade statistics and survey data collected through online questionnaires and telephone interviews with smallholder farmers, agro-industrial companies, agricultural workers, traders, importers, and consumers. By comparing COVID-19 effects between modern and traditional value chains, they found that the large fresh fruit and vegetable companies in Senegal were hardly affected by the pandemic.

The consumption component is relatively less sensitive to the COVID-19-related global trade shock. This may seem less surprising when we consider the nondiscretionary component of household consumption expenditures and the relative rigidity in food consumption habits. Empirical evidence suggests that the rational behavior of households is to keep the consumption of food and other necessities constant in response to health risks and shocks (Somi et al. 2009). Wagstaff (2007) found that households are likely to reduce their food expenditures following a health shock, but by less than they reduce expenditures on nonfood items such as housing and electricity.

Moreover, consistent with the previous results (Figure 4.9), we observe that the group of countries with relatively diversified primary commodity exports has food system components that are less sensitive to the COVID-19-related global trade shock, particularly in production, consumption, and trade (Figure 4.10).

FIGURE 4.10—SENSITIVITY TO COVID-19-RELATED GLOBAL TRADE SHOCK, AVERAGE SCORE IN PERCENTAGE, BY COUNTRY GROUPS AND ALONG THE FOOD SYSTEM CHAIN



Source: Authors' simulation results.

Note: Agricultural Exporters = agriculture-dominated exporting countries; Mineral Exporters = energy- and mineral-dominated exporting countries; Other Exporters = mixed agricultural and nonagricultural exporting countries.

To further investigate the impact of the COVID-19-related global trade shock on African food systems, we adopt another grouping of African countries to control for the changes in the export prices of agricultural and primary commodities. Because the above results are primarily driven by the price shock, by grouping countries according to the size of the price shock we expect to better understand the effects of factors unrelated to price. This new grouping allows us to identify three groups of countries, as presented by Table 4.2.

In the first group (designated G.1 in the table), we observe a decline in net export prices for agricultural commodities, as well as for primary commodities in general. However, nonagricultural commodity prices decline more than agricultural commodity prices. Here, we seek to know why countries in this group show heterogeneity in the sensitivity of their food systems even though they experienced the same price shock. As the prices of energy products decline more than the prices of agricultural commodities, these countries compensate for the loss of external revenues from energy products by increasing their export revenues from agricultural products. Thus, this mechanism favors the agricultural sector and contributes to mitigating the adverse impact of the pandemic on food systems in the energy-dominated export countries (Chad, Congo, Egypt, Gabon, and Sudan). In the agriculture-dominated export countries, such as Kenya, this compensation mechanism is limited and dominated by the direct price effects of

the pandemic on agricultural and food commodities. The impact of the COVID-19-related global trade shock is also high for Cameroon for the same reason.

The second group (G.2) is characterized by higher declines in the net export price of agricultural products relative to nonagricultural products. In this group, Zambia and Ghana record the highest adverse impacts. These countries are primarily affected by the agricultural price shocks—lower export prices for Zambia and higher import prices for Ghana.

The last group (G.3) is characterized by increasing mineral prices with a relatively higher average mineral price compared with average agricultural price, with the exception of the Democratic Republic of the Congo. In this group, the food systems are primarily impacted indirectly through the exposure of the mineral economy to global trade. For instance, in Guinea (the country with the lowest score), although the prices of agricultural exports have fallen, the increasing price of mineral products allows the country to mitigate the direct negative effects of the shock on its food systems. In contrast, the opposite trend is observed in the Democratic Republic of the Congo, where the increase in agricultural export prices is not enough to compensate for the decline in mineral export prices. In the mineral-dominated export countries such as Guinea and the Democratic Republic of the Congo, the indirect effects surpass the direct effects of the COVID-19-related global trade shock.

TABLE 4.2—COVID-19-RELATED GLOBAL TRADE SHOCK, EXPORT AND IMPORT PRICE SHOCKS, AND IMPACT SCORE FOR SELECTED AFRICAN COUNTRIES, PERCENTAGE CHANGE BETWEEN 2019 TO 2020

Group	Country	Impact Score	Agriculture		All Primary	
			Export Price	Import Price	Export Price	Import Price
G.1—Decline in net export prices of nonagricultural commodities greater than that of agricultural commodities	KEN	80.5	-0.7	0.0	-1.8	0.0
	CMR	45.0	-0.4	6.6	-12.2	0.1
	EGY	30.0	-1.7	3.1	-9.0	-2.5
	GAB	27.5	-2.5	0.6	-18.8	1.6
	CHD	26.8	-6.0	0.5	-17.4	1.8
	SDN	25.0	-0.8	2.2	-12.9	-8.0
G.2—Decline in net export prices of agricultural commodities greater than that of nonagricultural commodities	ZMB	71.8	-8.0	0.8	-0.9	7.8
	GHA	65.9	0.4	10.5	0.1	5.3
	MOZ	35.0	0.1	4.1	-11.5	-10.8
	MWI	26.8	-5.1	2.7	-4.8	-1.6
	CIV	25.0	0.8	6.1	-4.4	-4.0
G.3—Increase in net export prices of mineral products greater than that of agricultural products	ZAF	44.0	0.0	2.0	2.0	-5.0
	CAR	39.0	-1.0	1.0	1.0	-6.0
	NAM	33.0	0.0	1.0	2.0	1.0
	ZWE	28.0	-5.0	0.0	-2.0	-5.0
	SEN	28.0	6.0	8.0	1.0	-7.0
	GIN	13.0	-2.0	6.0	7.0	-3.0
	DRC	67.0	4.6	3.0	-0.1	1.0
	ETH	43.0	4.0	4.0	4.0	2.0
	LSO	25.0	-1.1	-4.0	-0.4	-9.0
	CPV	23.0	2.0	1.0	2.0	-2.0
	RWA	18.0	7.0	5.0	9.0	0.0

Source: Authors' computation from simulation results.

Note: MWI = Malawi; ETH = Ethiopia; CPV = Cabo Verde; CAR = Central African Republic; KEN = Kenya; CIV = Côte d'Ivoire; RWA = Rwanda; SDN = Sudan; SEN = Senegal; CMR = Cameroon; EGY = Egypt; ZWE = Zimbabwe; DRC = Democratic Republic of the Congo; NAM = Namibia; ZAF = South Africa; LSO = Lesotho; MOZ = Mozambique; CGO = Congo; CHD = Chad; GIN = Guinea; ZMB = Zambia; GHA = Ghana; GAB = Gabon.

Conclusion

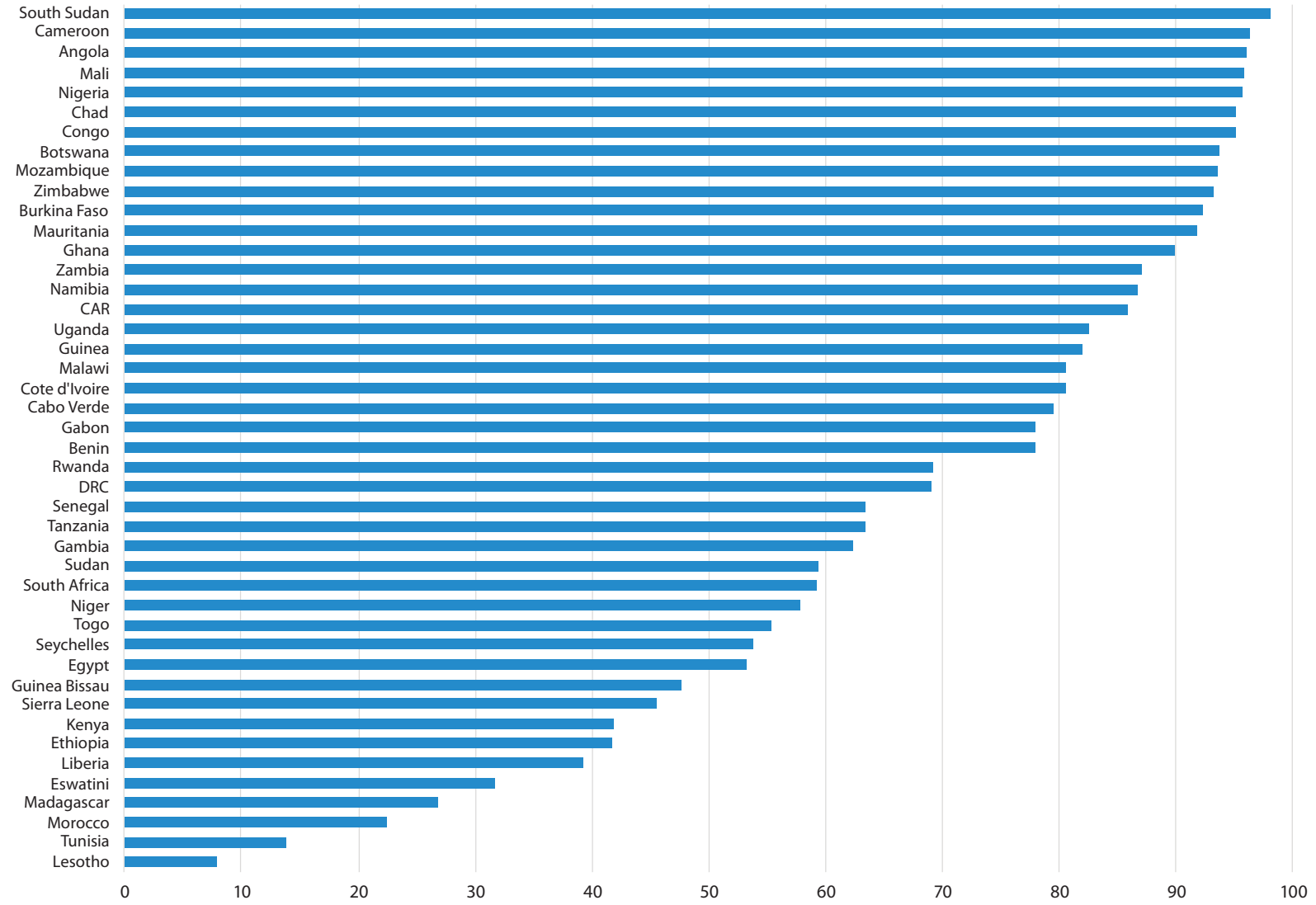
The COVID-19 health crisis and government responses to limit the spread of the virus have resulted in major disruptions in global trade and markets. In this study, we analyze the effects on the food systems in select African countries, focusing on the changes in global prices and market access of primary commodities. The analysis uses country-specific CGE models calibrated to SAMs that capture the most recent structure of each national economy. Because the assessment framework considers several indicators, a score is computed to evaluate the impact of the COVID-19-related global trade shock on African food systems. The score measures the proportion of indicators adversely impacted by the shock.

Our findings indicate that the COVID-19-related global trade shock had a moderate impact on the food systems in the selected African countries, with an average score of 37 percent. In other words, out of the 943 metrics defining the food systems in the selected African countries, 347 metrics were adversely affected by the COVID-19-related global trade shock associated with primary commodities. However, this average value masks a significant disparity among countries. Indeed, it has been demonstrated that countries with a diversified export basket—combining agricultural, energy, and mineral products—are less adversely impacted by the global trade shock than are other countries. As a result, a well-diversified export basket is key to strengthening the resilience of Africa's food systems to external shocks. These findings are even more compelling in relation to African economies that display a low contribution of agricultural commodities to their primary commodity export baskets, as well as a low degree of diversification across primary commodity export baskets.

The consumption component is substantially less responsive to the global trade shock due to the relative rigidity of food consumption habits. In contrast, the food processing industry is by far the most vulnerable component of the system to the global trade shock caused by the COVID-19 pandemic. This can be explained by the industry's higher sensitivity to households' income variations. Multiple governments offered relief packages in support of the food industry to mitigate the adverse impact of the pandemic. Takeout orders, delivery, and online grocery shopping grew substantially during the pandemic. Actors across the food value chain have been embracing digital technologies as a way to mitigate the adverse impact of the health crisis. Government policies aimed at transforming and strengthening the resilience of the food system are important in terms of not only its preparedness for future crises but also its adaptability to the rapid changes in food consumption habits.

Appendix

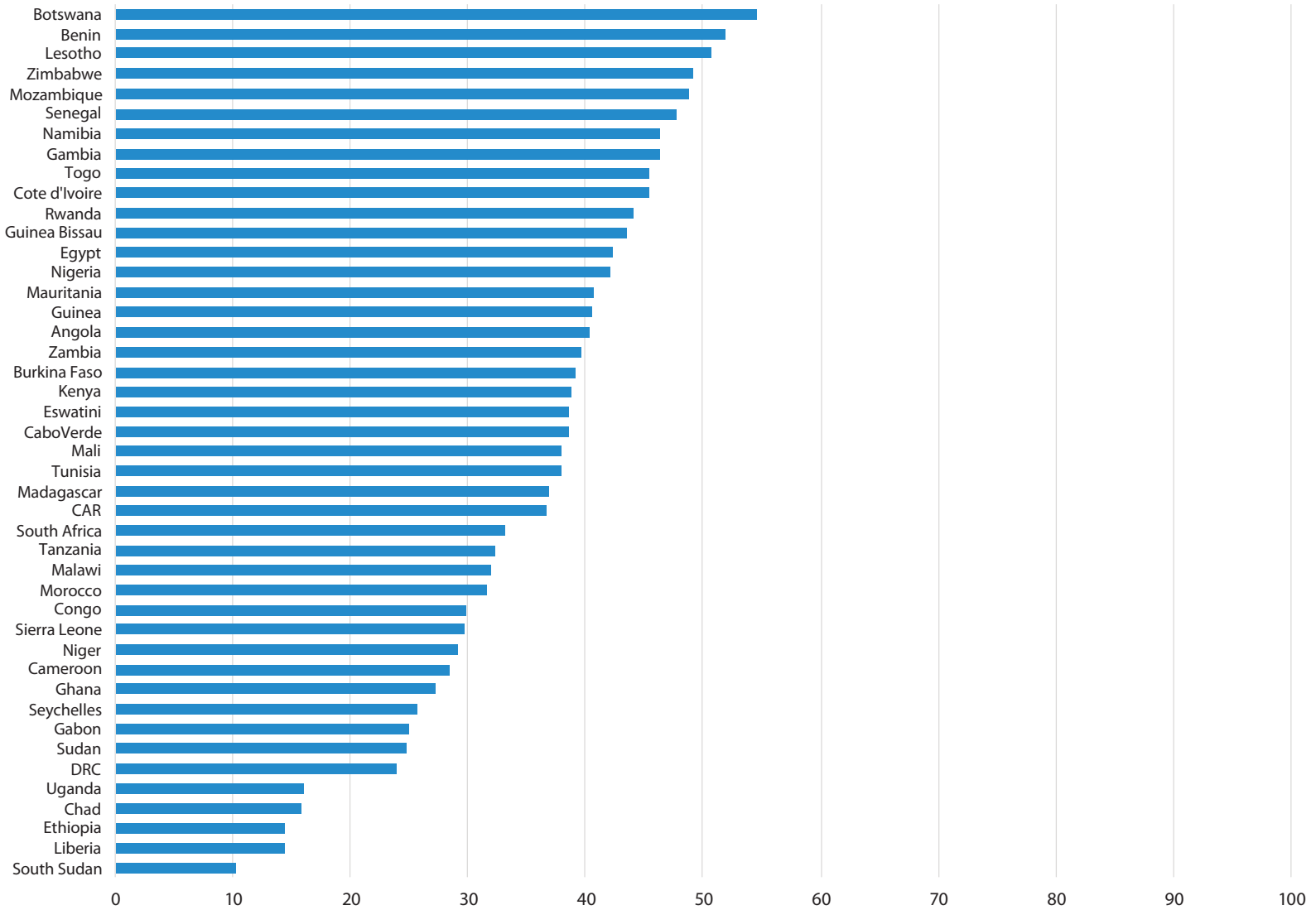
FIGURE 4A.1—PERCENTAGE SHARE OF PRIMARY COMMODITIES IN TOTAL EXPORTS, 2019



Source: Authors, based on data from DESA/UNSD (2021).

Note: CAR = Central African Republic; DRC = Democratic Republic of the Congo.

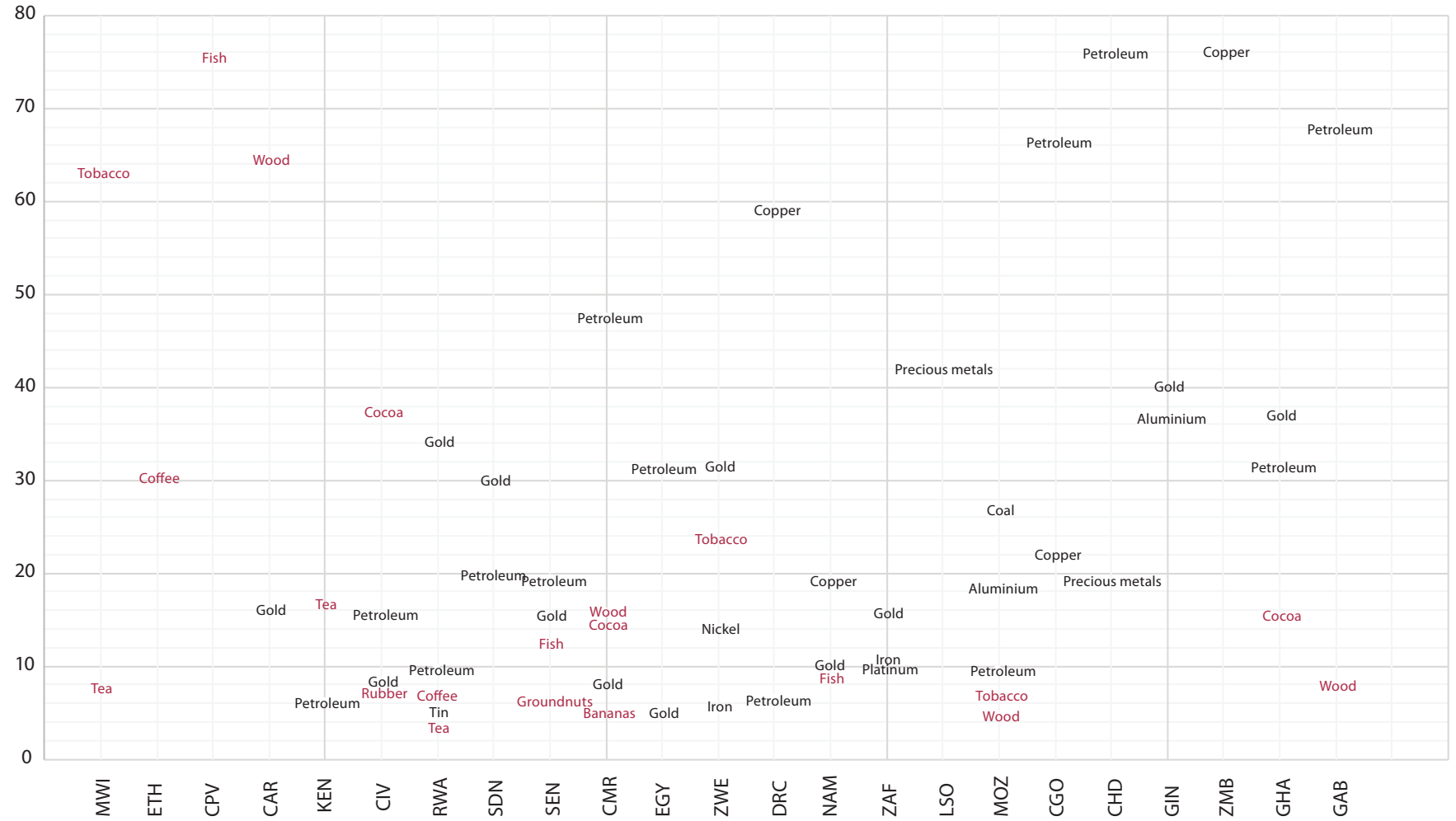
FIGURE 4A.2—PERCENTAGE SHARE OF PRIMARY COMMODITIES IN TOTAL IMPORTS, 2019



Source: Authors, based on data from DESA/UNSD (2021).

Note: CAR = Central African Republic; DRC = Democratic Republic of the Congo.

FIGURE 4A.3—PERCENTAGE SHARE OF SELECTED PRIMARY COMMODITIES IN THE EXPORT BASKET OF SELECTED AFRICAN COUNTRIES



Source: Authors, based on data from DESA/UNSD (2021).

Note: MWI = Malawi; ETH = Ethiopia; CPV = Cabo Verde; CAR = Central African Republic; KEN = Kenya; CIV = Côte d'Ivoire; RWA = Rwanda; SDN = Sudan; SEN = Senegal; CMR = Cameroon; EGY = Egypt; ZWE = Zimbabwe; DRC = Democratic Republic of the Congo; NAM = Namibia; ZAF = South Africa; LSO = Lesotho; MOZ = Mozambique; CGO = Congo; CHD = Chad; GIN = Guinea; ZMB = Zambia; GHA = Ghana; GAB = Gabon.

TABLE 4A.1—LIST OF INDICATORS TO ASSESS THE IMPACT OF COVID-19-RELATED GLOBAL TRADE DISRUPTIONS ON AFRICAN FOOD SYSTEMS

Component	Indicator
Agricultural production	Value-added agricultur
	Value-added agriculture
	Value-added manufact
	Value-added manufact
	Agriculture gross prod
Food processing	Food supply (kcal/capita/day) (b)
	Agriculture, forestry, and fish
	Fertilizer use, nutrientha)
	Fertilizer use, nutrient p
	Fertilizer use, nutrient
Food services	Arable land area equ
	Food imports (% of m
	Food exports (% of merchan
	Logistics performance index: Quality of tr
	Agricultural export value index (2014–2016 = 100)
Aggregate supply of agricultural and food products	Arable land area equ
	Food imports (% of m
	Food exports (% of merchan
	Logistics performance index: Quality of tr
	Agricultural export value index (2014–2016 = 100)
Trade	Agricultural export unit/value index (2014
	Agricultural export quantity index (2014–2016 = 100)
	Agricultural import value index (2014–2016 = 100)
	Agricultural import unit/value index (2014–2016 = 100)
	Agricultural import quantity index (2014–2016 = 100)
	Rural population (% of total population) (a)
	Total population growth (annual %) (a)
	Rural population growth (annual %) (a)
Consumption	Urban population growth (annual %) (a)
	Gross national income, value $ per capita
	Households and NPISHs final consumption e
	Agricultural export quantity index (2014–2016 = 100)
	Agricultural import value index (2014–2016 = 100)
	Agricultural import unit/value index (2014–2016 = 100)
	Agricultural import quantity index (2014–2016 = 100)
	Rural population (% of total population) (a)
	Total population growth (annual %) (a)
	Households' final consumption expenditure (
	Consumer prices, general indices (2015 = 100)
	Consumer prices, food indices (2015 = 100)
	Food price inflation (annual %)

Source: Authors' computation from simulation results.