GHANA

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The Economic Costs of COVID-19 in Sub-Saharan Africa

Insights from a Simulation Exercise for Ghana

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ACRONYMS AND ABBREVIATIONS

COVID-19	2019 novel coronavirus
GDP	Gross Domestic Product
GH¢	Ghana Cedi (currency)
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
SAM	Social Accounting Matrix
US$	United States Dollar (currency)

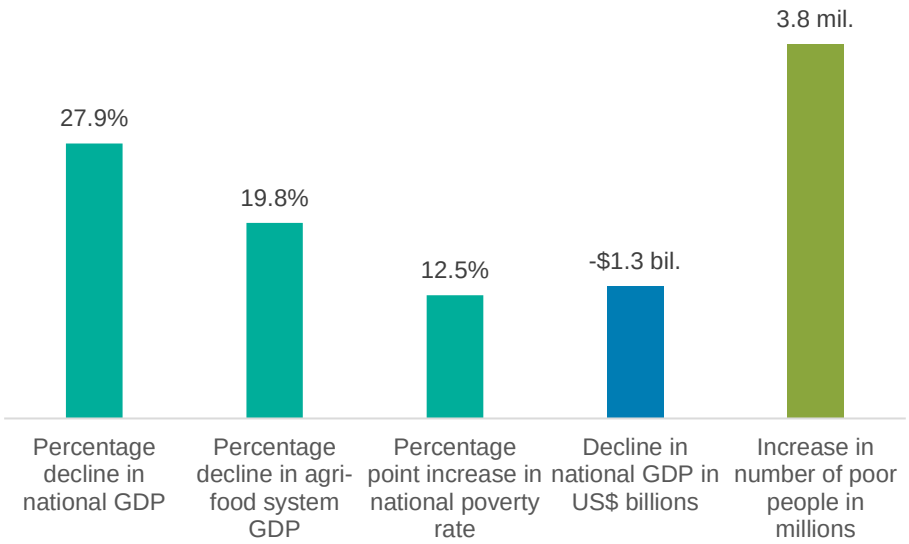
Currency: Ghanaian cedi (GH¢): US$ 1.00 ≈ GH¢ 5.75, mid-2020

EXECUTIVE SUMMARY

In the absence of a vaccine, countries globally have resorted to social distancing measures, travel restrictions, and economic lockdown policies to reduce transmission of the coronavirus. While necessary to preserve human life, the economic costs of these blunt policy measures are expected to be high, especially in sub-Saharan Africa where many live hand-to-mouth and lack access to safety nets to sustain themselves when livelihoods are disrupted. High levels of indebtedness may also limit the extent to which governments are able to access funds needed to mitigate the socioeconomic effects of COVID-19 policy responses. Countries are also not immune to external shocks associated with the COVID-19 pandemic. With around two-thirds of the global economy under some form of lockdown or quarantine, global supply chains are disrupted, demand is weakened, and commodity markets are in turmoil. Countries in sub-Saharan Africa may be particularly vulnerable given low levels of economic diversification and their high degree of openness. Substantial shocks to tourism revenue, foreign direct investment, and private remittance flows are already predicted for 2020.

Amidst concerns that the International Monetary Fund's (IMF) COVID-19-adjusted GDP growth forecasts for developing countries are too optimistic, we estimate the economic costs of COVID-19 in Ghana using a Social Accounting Matrix (SAM) multiplier model. This economywide model framework is suited to measuring short-term impacts of unanticipated, rapid-onset demand- or supply-side shocks, and is easily replicable in different country-contexts where similar databases exist. Results show that Ghana's partial lockdown, although in force for only three weeks during April 2020 and restricted to the major urban areas of Accra and Kumasi, has likely caused national GDP to fall by 27.9 percent or US$ 1.3 billion during the three-week lockdown period, relative to baseline GDP for the same three-week reference period (Figure 0.1).

Figure 0.1: Economic impacts during Ghana's three-week partial lockdown



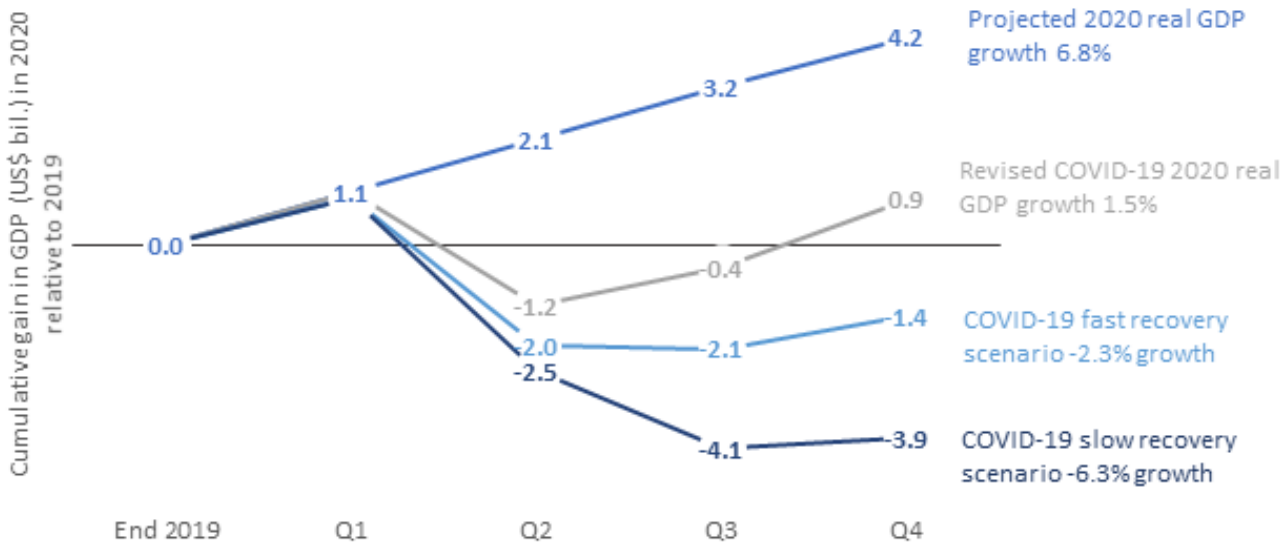
Source: Ghana SAM Multiplier Results

Despite exemption of the food sector from lockdown measures, COVID-19 policies and external shocks likely caused a 19.5 percent loss in value-added in the agri-food system, i.e., the sum of agriculture, agroprocessing, food services, and food trade and transport services GDP. This illustrates the intricate and strong links between different economic sectors and the difficulties in implementing policies that selectively shut down only parts of the economy.

Following the COVID-19 related lockdown measures adopted by many countries in the second quarter of 2020, governments have now started the process of gradually easing restrictive

measures and allowing their economies to recover. Depending on whether Ghana's recovery is slow or fast, we estimate annual GDP losses could range from -8.6 to -12.3 percent in 2020. This translates to year-on-year real GDP growth rates of -2.3 to -6.3 percent for 2020 (Figure 0.2). Previously, Ghana's Ministry of Finance revised its GDP growth estimate for 2020 downwards from 6.8 to 1.5 percent (MoF 2020), a revised estimated also validated by the IMF (2020). Our more pessimistic outlook relates to several possible factors, including that the lockdown lasted longer than was initially planned, our assumptions about the speed of the recovery period, and that our model accounts for direct and indirect effects of policy and economic shocks drawing on input-output relationships between sectors.

Figure 0.2: Projected cumulative GDP losses in 2020 relative to 2019



Source: Revised Ghana SAM Multiplier Results
Note: Revision was to correct an error in converting 2013 real prices to 2019 real prices made in constructing the original figure.

Household income losses during the lockdown period are substantial, ranging from 19.8 percent for the poorest households (bottom quintile) to 29.8 percent for the wealthiest (top quintile). Income losses could cause around 3.8 million Ghanaians to become temporarily poor. Many vulnerable households will remain affected going into the third and fourth quarters of the year as the economy gradually recovers, even though poverty rates return to close to pre-COVID-19 levels by the end of the year.

Although Ghana's partial lockdown was only in force in urban areas, our results suggest that rural farm households are also vulnerable. In fact, more than a third of people that are expected to fall below the poverty line during this period are rural farm households. These households should therefore not be excluded from social support program currently being developed by the government of Ghana, many of which are apparently designed to favor urban households. Special support measures for the food system are also warranted, not only to protect rural livelihoods, but to ensure stable and safe food supply across all markets.

1. INTRODUCTION

As the COVID-19 pandemic spreads across sub-Saharan Africa, the region's political leadership faces an almost impossible policy dilemma. In the absence of a vaccine and amidst concerns about precarious health systems, severe shortages of intensive care beds and ventilators, and the underlying poor health of the population (The Economist 2020, Bishop 2020), it is imperative for countries to slow down the viral spread to ensure that health systems can cope with rising patient numbers and that mortality rates are kept as low as possible. However, the instruments available to policymakers to reduce the spread of the virus are blunt, and basically entail measures that restrict the movement and physical interaction of people, or in extreme cases, force certain sectors to shut down. Apart from skepticism about how well such measures would work in densely populated informal neighborhoods, they can be extremely costly from a socioeconomic standpoint. With many people in sub-Saharan Africa living hand-to-mouth, a sudden income shock can have devastating consequences for people's food security and health.

For this reason, government stimulus programs and social support packages should ideally complement social distancing and economic lockdown measures. These support measures can be costly, especially when considering that governments themselves can anticipate deep cuts to tax revenues as economies grind to a halt. Borrowing may be an option to some governments, but with more than half the countries in sub-Saharan Africa already exceeding the International Monetary Fund's (IMF) 55 percent debt-to-GDP threshold (Onyekwena and Ekeruche 2019), the ability of countries to provide such support is severely hamstrung. The policy dilemma is perhaps best articulated by Hausman (2020), who remarks "*the flatter you want the contagion curve to be, the more you will need to lock down your country—and the more fiscal space you will require to mitigate the deeper recession that will result*".

While government has some control over these tough domestic decisions, it can do little to prevent external shocks associated with the COVID-19 pandemic. With around two-thirds of the global economy under some form of lockdown or quarantine (Deloitte 2020), global supply chains are disrupted, demand is weakened, and commodity markets are in turmoil. Countries in sub-Saharan Africa may be particularly vulnerable given low levels of economic diversification, their relative openness, and an overreliance on a limited range of export commodities for foreign exchange earnings and government revenue. With disruptions to international travel, tourism revenues in sub-Saharan Africa are expected to decline by 32 percent (UNWTO 2020), while foreign direct investment could drop 30 to 40 percent (UNCTAD 2020). Households in sub-Saharan Africa may be directly impacted by the predicted 23 percent decline in private remittance receipts this year (World Bank 2020).

In parallel to concerns about health and socioeconomic costs, a concern globally is the impact that COVID-19 may have on food supply chains, whether as a result of global trade restrictions, disruptions to domestic agricultural input- and output supply systems linked to restrictions on economic activity, or rising food prices as consumers stock up or resort to panic-buying (Gakpo 2020, Glauber, Laborde and Vos 2020). There have also been concerns about diet quality as income losses or relative price shocks push consumption away from vegetables, fruit, and animal-source foods towards less perishable, calorie-dense staples (Headey and Ruel 2020). For this reason, global actors have been closely monitoring food trade flows and commodity price, while governments are encouraged to ensure that restrictive measures do not adversely affect agri-food systems.

The objective in this paper is to estimate the economic costs of COVID-19 policies and external shocks in a developing country context, with a focus on agri-food system impacts. Ghana is selected as a case study. Ghana recorded its first two cases of COVID-19 infection on 12 March 2020. The government responded by gradually introducing social distancing measures, travel restrictions, border closures, and eventually a partial, two-week "partial" lockdown in the country's largest metropolitan areas of Accra and Kumasi. Social distancing measures have been enforced nationwide and include bans on conferences, workshops, and sporting and religious events, as well as the closure of bars and nightclubs. All educational institutions are also closed. The partial lockdown measures in urban areas directed all residents to remain home except for essential business, prohibited non-essential inter-city travel and transport, and only essential manufacturing and services operations were permitted to continue (The Presidency 2020). At the time the lockdown was announced, Ghana's Ministry of Finance revised its GDP growth estimate for 2020 downwards from 6.8 to 1.5 percent (MoF 2020), although the Minister warned that growth could fall further if lockdown measures were extended. The lockdown was initially extended for a third week but was officially lifted on 20 April. Social distancing measures remain in place nationwide, although a gradual easing of restrictions commenced in June. Ghana's borders remain closed at the time of writing.

We estimate the economic costs of COVID-19 using a Social Accounting Matrix (SAM) multiplier model for Ghana. SAM multiplier models are ideally suited to measuring short-term direct and indirect impacts of unanticipated, rapid-onset demand- or supply-side economic shocks such as those caused by the COVID-19 pandemic. Through capturing the complex linkages between various economic sectors as well as household employment and consumption patterns, SAM multiplier models can be used to simulate the direct and indirect effects of economic shocks on domestic production, value-added (GDP), employment, and household income and poverty. Since the preliminary estimate by the Ministry of Finance (2020) focused only on GDP, and given the extension of the lockdown, our results add value to our understanding of the wide-ranging effects of COVID-19 in Ghana.

The remainder of the paper is structured as follows. Section 2 provides information about Ghana's COVID-19 outbreak. Section 3 introduces the SAM multiplier model and the simulation approach. Section 4 presents the model results; and Section 5 concludes. Technical information about the model is provided in the Annex.

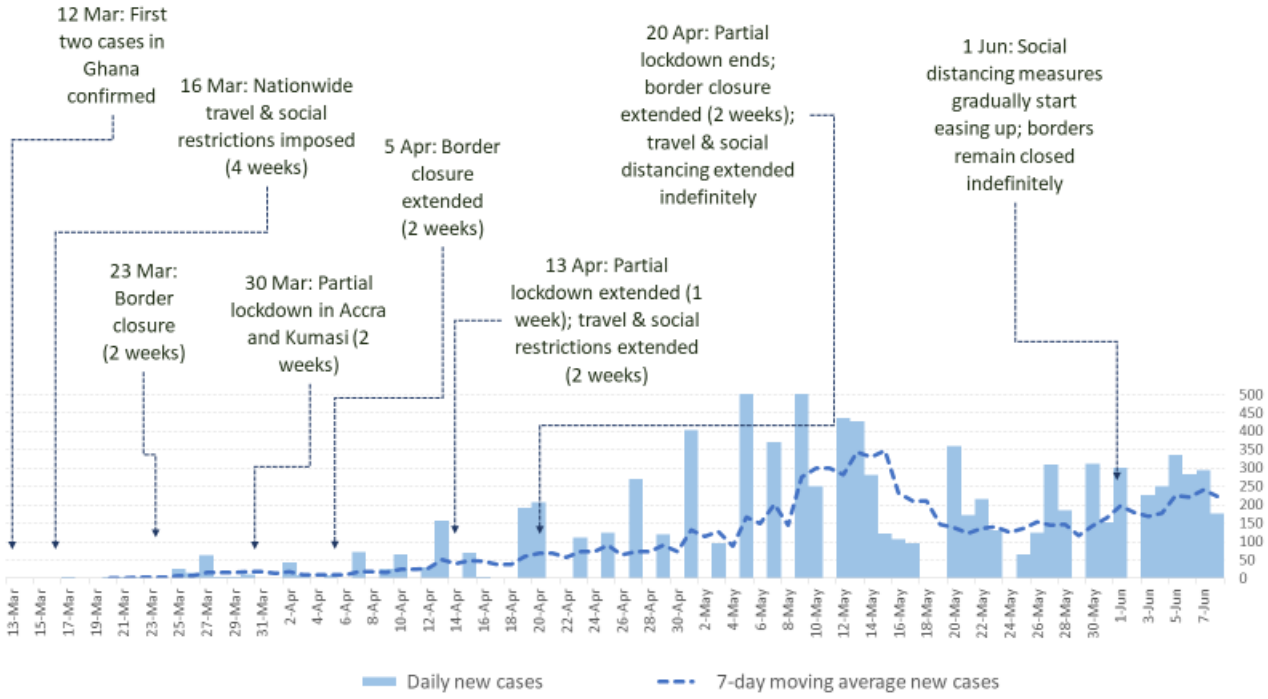
2. GHANA'S COVID-19 OUTBREAK

2.1 Preparedness and Response

Ghana began preparing for the spread of COVID-19 in January 2020 with the establishment of a National Technical Coordinating Committee tasked to review the country's resilience and preparedness to manage an outbreak (MoH 2020). By early March, President Nana Akuffo-Addo committed GH¢ 572 million (US$ 100 million) towards a coronavirus National Preparedness and Response Plan, which sought to strengthen the capacity of health facilities, laboratories, and points of entry to detect and control viral spread and to create public awareness. Although a World Health Organization report (WHO 2020) described Ghana's readiness to deal with the COVID-19 pandemic as "adequate", global statistics on COVID-19 hospitalization rates are sobering (CDC COVID-19 Response Team 2020, Bishop 2020). With an estimated 200 Intensive Care Unit beds and 200 ventilators available at private and public facilities in Ghana (Arhinful 2020, GhanaWeb 2020), the country can ill afford active infections rates to spiral out of control.

Figure 2.1 provides a timeline of policy measures against cumulative confirmed COVID-19 cases. Ghana recorded its first two cases of COVID-19 infection on 12 March 2020. Soon thereafter, President Akufo-Addo announced nationwide travel and social restrictions effective from 16 March (The Presidency 2020). These measures included a ban on entering the country for foreign nationals travelling from countries with more than 200 COVID-19 cases; a ban on public gatherings, such as conferences, workshops, political rallies, and (some) religious activities (funeral attendance was to be limited to 25 people); and closure of universities, senior high schools, and basic schools. Businesses, retail outlets, restaurants, hotels, transport operators, and local markets could continue to operate but had to adhere to social distancing and enhanced hygiene measures. Ghana only started relaxing some of these social distancing measures at the beginning of June 2020.

Figure 2.1: Cumulative COVID-19 cases and timeline of policy response measures, mid-March to mid-June 2020



Source: Authors' representation based on GSS (2020) and MoF (2020). Last updated: 13 June 2020.

Although by 23 March Ghana had only recorded 25 cases (GSS 2020), Ghana's international borders were closed, initially for a two-week period, but several further extension have been announced since then and borders remain closed at the time of writing. On 30 March, a partial lockdown was announced in Ghana largest metropolitan areas, Accra (including neighboring Tema and Kasoa) and Kumasi (The Presidency 2020). The lockdown was extended for one week until 20 April. All residents were directed to remain home, only leaving for essential purchases (food, medicine, water) or essential services (banking transactions, use of public toilet facilities, or medical care). The lockdown further prohibited inter-city movement of vehicles and aircrafts for private and commercial purposes, except for those providing essential services and cargo. Within city limits, passenger vehicles and taxis were instructed to reduce their number of passengers, resulting in an estimated 25 to 33 percent reduction in capacity (Ayamga 2020).

Workers in certain categories were exempt from the stay-at-home directives. These included: (i) members of the executive, legislature and the judiciary; (ii) production, distribution and marketing of food, beverages, pharmaceuticals, medicine, paper and plastic packages; (iii) environmental and sanitation activities; (iv) staff of Volta Aluminum Company, an aluminum

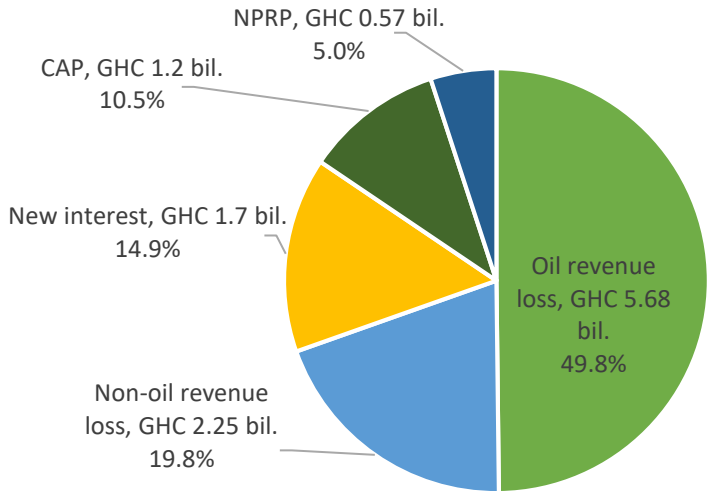
smelter; (v) road and railway construction workers; (vi) mining workers; (vii) fisherfolk; (viii) members of the security agencies assigned lawful duties; (ix) staff of electricity, water, telecommunications, e-commerce and digital service providers; (x) staff of fuel stations; (xi) health workers; (xii) media; and (xiii) persons in the food value chain (The Presidency 2020).

The lockdown was formally lifted after three weeks primarily due to concerns about its devastating socioeconomic impacts (The Presidency 2020). As noted, social distancing measures were gradually lifted from the beginning of June, but the country's borders remain closed.

2.2 Financing and Budget Considerations

Ghana's Ministry of Finance conducted an early rapid assessment of the likely budgetary impacts of COVID-19. On the revenue side, government expects to lose GH¢ 5.68 billion in oil revenue due to the two-thirds decline in crude oil prices. Non-oil revenues are expected to fall by GH¢ 2.25 billion due to the slowdown in economic growth (MoF 2020) (Figure 2.2). Government also faces significant unforeseen costs associated with the COVID-19 response programs, including the National Preparedness and Response Program (GH¢ 572 million), and the Coronavirus Alleviation Program (GH¢ 1.20 billion). The latter makes provision for various stimulus and support measures, including GH¢ 600 million in the form of soft loans to small and medium enterprises, to which private sector banks will contribute a further GH¢ 400 million; GH¢ 320 million to supplement healthcare workers' incomes; and GH¢ 280 million for household water supply subsidies, food packages, and public grain procurement from smallholders (MoF 2020, MyjoyOnline 2020). In order to finance these costs and to cover losses in revenue, government obtained an IMF loan of US$ 1 billion (GH¢ 5.72 billion) (MyjoyOnline 2020). Interest on the loan of around GH¢ 1.7 billion will become payable this year.

Figure 2.2: Costing the COVID-19 pandemic



Source: Compiled from MoF (2020)
Note: NPRP = National Preparedness and Response Program; CAP = Coronavirus Alleviation Program.

In summary, revenue losses and unforeseen program costs related to COVID-19 are estimated at around GH¢ 11.4 billion, which raises the fiscal deficit from 4.7 percent of projected GDP to 7.8 percent of revised GDP. The new IMF loan, which comes at a time when Ghana's debt stock is already GH¢ 200 billion or 60 percent of GDP (MoF 2019), will cover about half of the COVID-19 costs and revenue losses. Government further proposes to defer interest spending on existing loans from the Bank of Ghana and to temporarily reduce or suspend payments to sovereign investment funds, such as the Stabilization Fund and the Heritage Fund. It also plans to reduce planned capital and current expenditure by GH¢ 1.25 billion this year (MoF 2020).

2.3 Protecting the Agri-Food System

In recognition of the socioeconomic importance of the agricultural sector and the vulnerabilities of the agri-food system, the Minister of Agriculture released a press statement on 30 March explicitly exempting the agri-food system from domestic COVID-19 related restrictions (MoFA 2020). This meant (i) all farmers could continue their farming activities; (ii) input suppliers and retailers could continue distribution and sales of farm inputs; (iii) the transportation of farm inputs within lockdown zones and in the rest of the country could continue uninterrupted; (iv) food processing companies could continue production and distribution of their products; and (v) subsidized fertilizer and seed subsidies would continue to be provided through the Planting for Food and Jobs program.

Despite this pronouncement, the Ministry of Food and Agriculture (2020) acknowledged reports of unavailability of food in some markets, instances of government security personnel restricting movements of traders of farm inputs and food despite their exempt status, increases in food prices in some markets, and increased food losses in producing areas and at markets due to supply chain challenges and low patronage of markets. There are several reports of local authorities temporarily closing markets or restricting trade because patrons or traders failed to adhere to social distancing protocols (IFPRI 2020).

Supply chain challenges have also been reported. The cocoa sector anticipates significant losses due to a lack of access to credit and the global market contraction (Ayitey 2020). Cashew farmers experienced a 50 percent price drop in the first quarter of 2020 as foreign investors were unable to travel to Ghana to procure nuts (B&FT Online March). With the planting season approaching, some analysts are concerned about commercial farmers deciding to plant less crop area than normal in anticipation of a decline in consumer demand (Goldstreet Business 2020).

Globally, international commerce is expected to contract between 13 and 32 percent in 2020 as a result of COVID-19 (Walker 2020). If these disruptions spill over into food supply chains, it may have important implications for Ghana. First, it may affect food availability directly. As elsewhere in Africa, Ghana's food needs are increasingly met through imports, with rapid increases recently being seen in processed food imports especially (Aragie, Artavia and Pauw 2019). This places Ghana in a vulnerable position should it be required to shift to domestic supply chains on short notice.

Second, it could affect the availability of farm inputs. Should the fertilizer supply chain be affected, the timing could be disastrous for Ghana. On average, 75 percent of annual fertilizer needs are imported in the first two quarters of the year in time for the planting season (Africa Fertilizer 2020). Almost 80 percent of that fertilizer is procured through the Planting for Food and Jobs program, which subsidizes 50 percent of the retail price (MoFA 2019, Africa Fertilizer 2020). Given the precarious financial position of government due to COVID-19, fertilizer suppliers may be cautious about delivering inputs on credit (Gyasi 2020), especially given the experience in 2013 when government cash flow problems led to fertilizer suppliers not being paid.

None of these agri-food system impacts are intended consequences of domestic policies. As such, we do not directly simulate supply-side restrictions on the agri-food system in the modeling exercise. However, we do measure and decompose the indirect effects of COVID-19 within the broader agri-food system. More generally, the discussion here demonstrates the importance of continually monitoring the situation on farms and in retail and wholesale markets.

3. SIMULATING THE ECONOMIC IMPACTS OF COVID-19

3.1 Model and Data

Social Accounting Matrix (SAM) multiplier models are ideally suited to measuring short-term direct and indirect impacts of unanticipated, rapid-onset demand- or supply-side economic shocks, such as those caused by the COVID-19 pandemic (Breisinger, Thomas and Thurlow 2009, Round 2003). At the heart of the multiplier model is a SAM, an economywide database that captures resource flows associated with all economic transactions that take place in the economy, usually over the course of a financial year. As such the SAM represents the structure of the economy at a point in time, showing the relationships between actors (i.e., productive activities, households, government, and foreign institutions) in terms of how they interact and transact via commodity and factor markets (Round 2003).

The SAM multiplier model in this study is calibrated with a new 2018 SAM for Ghana, an update of a 2015 SAM developed jointly by Ghana Statistical Services, the Institute of Social, Statistical and Economic Research, and IFPRI (GSS, ISSER & IFPRI 2017). While the updated SAM has a 2018 base-year, multiplier results are applied to national accounts, household income, and population data for 2019 to permit an assessment of the likely impacts of COVID-19 in 2020, relative to 2019 values. This ensures comparability with the Ministry of Finance (2020) analysis referred to earlier.

The SAM multiplier model provides a mechanism for estimating the effects of an external shock, typically an exogenous change in final demand for goods and services (E_c), on total supply (Z_c) of commodities $(c_1, \dots, c_n)$.. Through capturing input-output, employment relationships, and the functional distribution of income, the model also generates results on domestic production, employment, and changes in household incomes. Final demand (E_c) typically includes government consumption demand, investments, and exports. Household consumption demand may be treated as endogenous or exogenous in SAM multiplier models, depending on preferences. For the analysis here, we assume household demand is exogenous, i.e., a change in income will not result in a secondary round of consumption demand shocks. This is to avoid over-estimation of the multipliers, which is a common concern when households are treated as endogenous (Haggblade and Hazell 1989).

A commonly used variant of the standard SAM multiplier model is a “semi-input-output” or “supply constrained” SAM multiplier model. Under a semi-input-output specification, supply in one or more sectors (e.g., Z_k, $k \in c_1, \dots, c_n$) is treated as exogenous, with the associated final demand component (E_k) becoming endogenous. Theoretically, such a model “closure” can be used to simulate a supply-side shock, e.g., a reduction in supply due to a mine or factory closing, but implicitly then demand would be satisfied through a reduction in net-exports (or, essentially, imports). However, this is not realistic in a COVID-19 context where global supply chains are constrained. Since many of the restrictive COVID-19 measures are simultaneously supply- and demand-side measures, i.e., supply is constrained through restrictions imposed on productive activities, while demand is reduced through limitations on what consumers may purchase, we apply changes to the exogenous demand component (i.e., ΔE_c) as a proxy for the simultaneous shock to supply and/or demand.

At least one potential limitation to our simulation approach relates to the fact that supply constraints cannot be imposed on sectors through forward linkages. For example, if a sector A supplies intermediate inputs to a downstream sector B, and sector A’s output is reduced through a negative shock to its exogenous demand component, sector B’s output will not automatically be constrained. Even if the exogenous shock exceeds the initial value of exogenous demand, the

model will treat negative exogenous demand (say, exports) as a positive shock to supply (i.e., via imports), thus ensuring that sector B's output is not constrained by a lack of intermediate input supply. A way around this problem is to directly shock demand for sector B's output. Note, however, that the model does capture the effect of backward linkages. Thus, a decline in downstream sector B's output resulting from a shock to its exogenous demand component will lead to a decline in demand for upstream sector A's output.

A final point worth noting is that the short-run analysis period assumes that technical input-output relationships, output choices of producers, and consumption patterns of households do not change in response to the simulated shock. SAM multiplier models therefore assume prices are fixed, which is considered a drawback. Since flexible prices and behavioral responses are incorporated into general equilibrium models, such models are often considered superior to fixed-price models. However, considering that the COVID-19 shocks constitute an almost catastrophic lockdown of demand and economic activities, rather than a shock to equilibrium where adjustments work through price-endogenous market mechanisms, the SAM multiplier framework is appropriate in this context, at least in the short run. For more on the equations making up SAM multiplier models, please refer to the Annex.

3.2 Simulation Setup

We distinguish between domestic policy-induced impact channels and external impact channels. As explained previously, all shocks are imposed via changes to the exogenous demand component (ΔE_c) of a sector. As such, our impact channels, listed in Table 3.1, are defined along individual sectors or clusters of sectors that are affected by the various COVID-19 related policy measures or external shocks. The model defines 86 sectors that can be mapped to impact channels, although not necessarily uniquely so – for example, the construction sector is impacted directly via the partial lockdown of the construction sector as well as via reductions in government revenue and foreign direct investments which impacts physical infrastructure spending. Underlying the 86 sectors are more detailed supply-and-use data for 175 economic sectors in Ghana. Therefore, in defining sector-level shocks across the 86 sectors we consider implications of policy prescriptions at a more detailed 175 sector-level and estimate a weighted average shock that is applied to the relevant aggregated sectors in the model.

As shown in Table 3.1, 18 potential impact channels are identified, although policy directives in Ghana result in four of those, namely farming, mining, water and energy, and health, are fully exempt from lockdown measures. Lockdown measures are deemed to have:

- "Extreme" impact on manufacturing, hospitality, and foreign remittances (supply shock imposed in excess of 50 percent during the lockdown period);
- "High" impact on construction, trade, transport, education, sports and entertainment, and private services (30 to 50 percent supply shock imposed), and
- "Some" impact on business services, government services, exports, government revenue and foreign direct investments (supply shock less than 30 percent imposed).

More detailed information about the shocks applied at the 86- and 175-sector levels are available from the authors.

Table 3.1: Impact channels

No.	Channel description	Policy measures	Impact simulated	Geographical coverage and demand/supply component
Domestic policy impact channels				
1	Direct restrictions on farming	Complete exemption; explicit government support for farming activities; input/output markets functioning. Anecdotal evidence of food scarcity and price spikes in some markets, and harassment of traders or input dealers (not simulated)	**None**/exempt	**N/A**
2	Limiting mining operations	Deemed essential sector; all operations and mining support services and supplies also exempted.	**None**/exempt	**N/A**
3	Closing non-essential manufacturing operations	Essential manufacturing goods exempted, including food, beverages, pharmaceuticals, medicine, paper and plastic packages, some metals, and manufacturing of protective clothing. Complete shutdown in non-essential sectors, enforcement in informal subsectors (approximately 5% of supply) may be weak.	**Extreme** impact: 84% average decline simulated	**Accra and Kumasi** only. Shock applied to domestic supply.
4	Disruptions to energy and water supply	Electricity and water distribution exempted (essential sector)	**None**/exempt	**N/A**
5	Limiting construction activities	Partial exemption. Resident building permitted (i.e., workers reside on or near building site). Public infrastructure exempted.	**High** impact: 37% average decline simulated	**Accra & Kumasi** only. Shock applied to investment (construction) demand.
6	Closing non-essential wholesale and retail trade	Trade of essential goods exempted. Some disruptions in markets, e.g., temporary closures, but these are unintended and not simulated.	**High** impact: 39% average decline simulated	**Accra & Kumasi** only. Shock applied to domestic supply.
7	Transport and passenger travel restrictions	Trade of essential goods exempted. Some disruptions in markets, e.g., temporary closures, but these are unintended and not simulated. Social distancing measures reduce passenger transport capacity.	**High** impact: 34% average decline simulated	**Nationwide** restrictions apply. Shock applied to domestic supply.
8	Limiting hotel and restaurant operations	Complete shutdown of bars and clubs. Social distancing in hotels and restaurants. Significantly reduced hotel and restaurant patronage, especially in lockdown zones.	**Extreme** impact: 50% average decline simulated	**Nationwide** restrictions apply. Shock applied to domestic supply.
9	Closing non-essential business services	Essential services exempt. Non-essential services may continue to operate but under work-from-home conditions, which is feasible for some but may lead to reduced productivity for all sectors.	**Some** impact: 15% average decline simulated	**Accra & Kumasi** only. Shock applied to domestic supply.
10	Government work-from-home orders	Public services and government agencies remain open, but non-essential staff teleworking, leading to reduced productivity. Public and private security services exempted (essential).	**Some** impact: 20% average decline simulated	**Accra & Kumasi** only. Shock applied to domestic supply.
11	Closing all schools in the country	All public schools closed; limited scope for online learning. Universities closed with some scope for online learning.	**High** impact: 30% decline simulated	**Nationwide** restrictions apply. Shock applied to domestic supply.
12	Disruptions to hospitals and clinics	Health services exempted (essential)	**None**/exempt	**N/A**
13	Banning sports & other entertainment	Most sports and outdoor entertainment banned. Some media activities operating (e.g., newspapers, radio, TV). Religious gatherings suspended; small funerals permitted.	**High** impact: 39% average decline simulated	**Nationwide** restrictions apply. Shock applied to domestic supply.
14	Domestic & private services	Most personal services (e.g., hairdressing or domestic work) suspended or affected	**High** impact: 38% average decline simulated	**Accra & Kumasi** only. Shock applied to domestic supply.

No.	Channel description	Policy measures	Impact simulated	Geographical coverage and demand/supply component
External impact channels				
15	Reduced export demand	Global oil demand declines, but production continues. Cocoa sector anticipates losses related to global market turmoil and reduced access to credit. Reduced international tourism and business travel.	**Some** impact: 7% average decline simulated	**Nationwide** restrictions apply. Shock applied to exports
16	Falling foreign private remittances	Decline in the value of remittances sent by nationals working abroad	**Extreme** impact: 50% average decline simulated	**Nationwide** restrictions apply. Shock applied to household income (affects consumption)
17	Falling government revenues	Fall in government revenues partially offset by lending and budget restructuring. Decline in government investment spending expected.	**Some** impact: 2% decline simulated	**Nationwide** restrictions. Shock applied to investment (construction) demand.
18	Falling foreign direct investments	Fall in foreign direct investment inflows results in decline in investment spending.	**Some** impact: 7% decline simulated	**Nationwide** restrictions. Shock applied to investment (construction) demand.

Source: Author's compilation

We define shocks as a percentage decline in domestic supply or in one of the final demand components. While the model is calibrated to national data, some measures only apply within the lockdown zones. In those instances, shocks are adjusted for the lockdown zone's share in sector-wide national GDP (see final column in Table 3.1). Accra and Kumasi are important commercial hubs in Ghana. Census and labor force data show that the specific districts affected by lockdown measures are home to 25 percent of Ghana's population and a similar share of the workforce. However, due to the higher-skilled nature of urban jobs, workers in the lockdown zone earn a significant wage premium over those in other urban or rural areas. Based on Labor Force Survey data (GSS 2016), we estimate that the lockdown districts account for between 28 and 46 percent of GDP in industry and manufacturing (average 33 percent) and 37 to 41 percent of GDP in services (average 39 percent).

3.3 Scenarios and Reporting

We first report on the anticipated impacts of COVID-19 during the lockdown period, which in the case of Ghana was in force for three weeks from 30 March to 20 April. When calculating percentage losses in national or sectoral GDP or in household income, the denominator (baseline value) is scaled to the lockdown period and adjusted for seasonal fluctuations based on historical trends. The second set of results looks at the impacts over the 2020 calendar year, starting in quarter one (pre-COVID-19) and extending through quarter four. Following the lockdown period, we assume policy measures are either lifted quickly, resulting in a fast recovery, or gradually, resulting in a slow recovery (Table 3.2). The fast and slow scenarios may equally represent a scenario where economic actors, due to concerns for their own health, are slow to return to a business-as-usual scenario even as restrictions are fully lifted.

Table 3.2: Easing of restrictions and recovery scenarios

<table>
<tr><th colspan="2"></th><th>Faster easing</th><th>Slower easing</th><th>Global shocks</th></tr>
<tr><td rowspan="3">Q1</td><td>January</td><td colspan="3" rowspan="2">No shocks in the pre-COVID-19 period</td></tr>
<tr><td>February</td></tr>
<tr><td>March</td><td colspan="2" rowspan="2">Full lockdown period over three weeks</td><td rowspan="3">• Remittances & export demand decline from 1 March onwards</td></tr>
<tr><td rowspan="3">Q2</td><td>April</td></tr>
<tr><td>May</td><td>• Production losses from lockdown policies fall 30%</td><td>• Production losses from lockdown policies fall 5%</td></tr>
<tr><td>June</td><td colspan="2"></td></tr>
<tr><td rowspan="3">Q3</td><td>July</td><td rowspan="3">• Losses reduced by 90% (transport & sports by 50%)</td><td rowspan="3">• Losses reduced by 50% (transport & sports by 70%)</td><td rowspan="3">• External shocks reduced by 50%</td></tr>
<tr><td>August</td></tr>
<tr><td>September</td></tr>
<tr><td rowspan="3">Q4</td><td>October</td><td rowspan="3">• Losses reduced by 99% (transport & sports by 95%)</td><td rowspan="3">• Losses reduced by 90% (transport & sports by 80%)</td><td rowspan="3">• External shocks reduced 75%</td></tr>
<tr><td>November</td></tr>
<tr><td>December</td></tr>
</table>

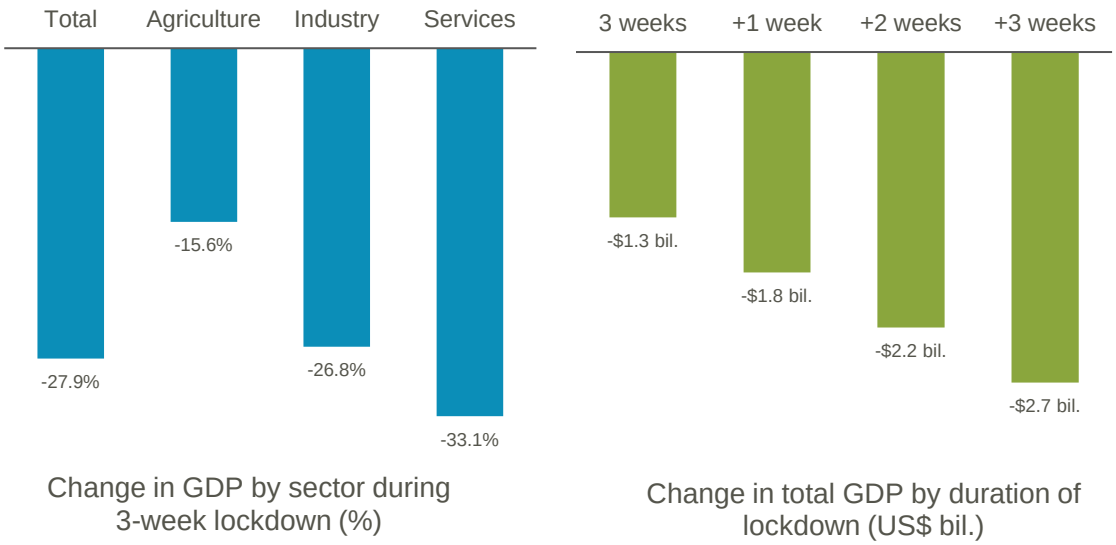
Source: Author's compilation

4. MODEL RESULTS AND DISCUSSION

4.1 Impacts During Lockdown

We first consider the impact during the three-week lockdown. Figure 4.1 shows the impact on aggregate GDP and its components. The largest losses, in absolute and relative terms, are recorded in the industrial (-26.8 percent) and services (-33.1 percent) sectors, which contribute over 90 percent of the recorded 27.9 percent loss in national GDP during the lockdown period (left panel). This is equivalent to GH¢ 6.3 billion or US$ 1.3 billion in lost GDP during the three-week period (right panel). Ghana's lockdown period was relatively short; should it become necessary to reintroduce the lockdown again in future, every additional week of lockdown would cost the economy around US$ 450 million in lost GDP.

Figure 4.1: Change in GDP during three-week lockdown and hypothetical extension, by percent and value

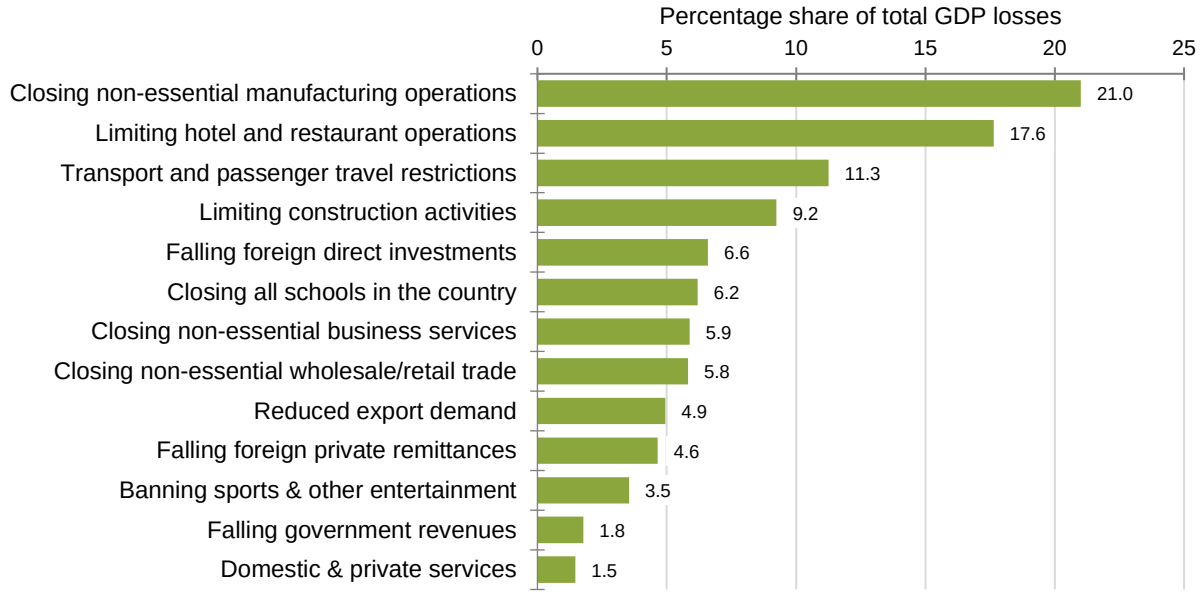


Source: Ghana SAM Multiplier Results

Figure 4.2 provides a breakdown of the contribution to total GDP losses of several of the impact channels described in Table 3.1. The relative contributions of these impact channels depend on the severity of the lockdown measures, the geographical scope of their implementation, the size of the cluster of sectors represented within each impact channel, and the extent of the

economic linkages that exist between affected sectors and other sectors. The severe restrictions imposed on non-essential manufacturing operations in Accra and Kumasi contribute about one-fifth to overall losses.

Figure 4.2: Contribution of restrictions and shocks to GDP losses during lockdown

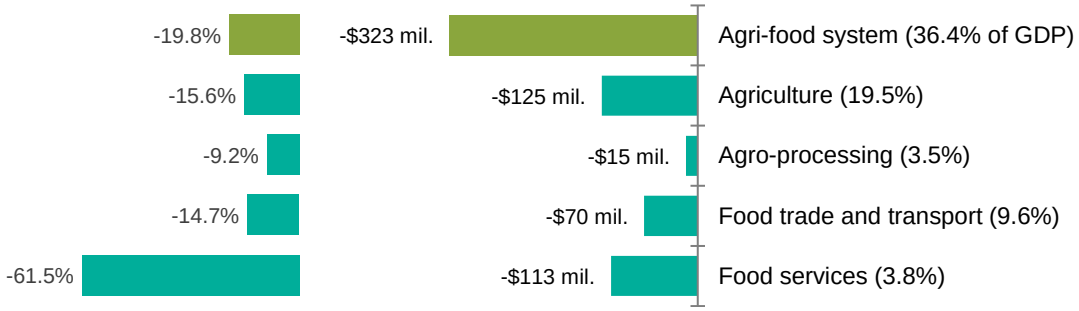


Source: Ghana SAM Multiplier Results

Restrictions in the hospitality and transport sectors and domestic limitations imposed on construction activities contribute a further two-fifths. Note that the construction sub-sector also suffers additional losses via the government and foreign direct investment impact channels, which lead to falling private and public capital stock formation.

Although primary agricultural activities are excluded from direct restrictions, the agricultural sector is not shielded from all adverse effects of the lockdown, with agricultural GDP falling 15.6 percent (Figure 4.3). These unintended knock-on effects of the COVID-19 related policies highlight the importance of using a model framework that explicitly captures inter-industry linkages and measures indirect effects. To understand the significance of these inter-industry linkages better, it is useful to consider effects along the entire agri-food system (AFS). The AFS accounts for 36.4 percent of GDP in Ghana and consists of primary agriculture, agro-processing, food services (hotels and restaurants), and food trade and transport services. Figure 4.3 shows that AFS GDP losses amount US$ 323 million or 19.8 percent.

Figure 4.3: Change in agri-food system GDP during lockdown period by system component, by percent and value

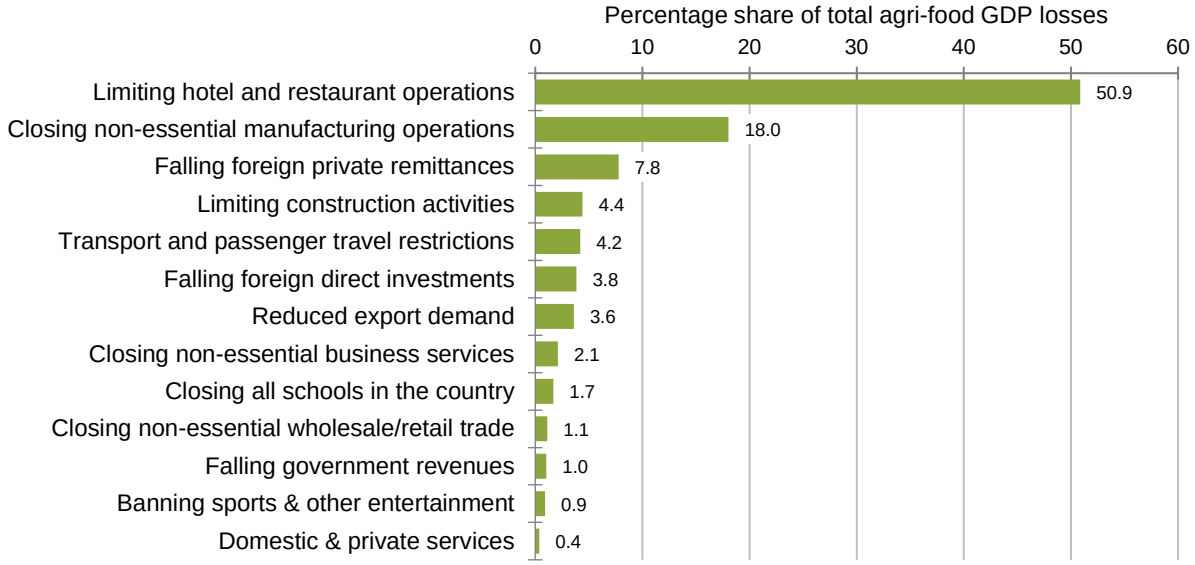


Source: Ghana SAM Multiplier Results. Note: Figures in brackets next to labels show each component's share of national GDP.

With respect to losses within each AFS component, we find that the food services sector, which is affected directly by social distancing measures and reduced patronage due to the fall in tourism,

not only declines significantly in relative terms (-61.5 percent), but also accounts for a large share of overall AFS GDP losses, despite being a relatively small subsector. Figure 4.4 provides a breakdown of the contribution of different impact channels to GDP losses Ghana's agri-food system and reconfirms the substantial effect restrictions on hotel and restaurant operations have on the food system.

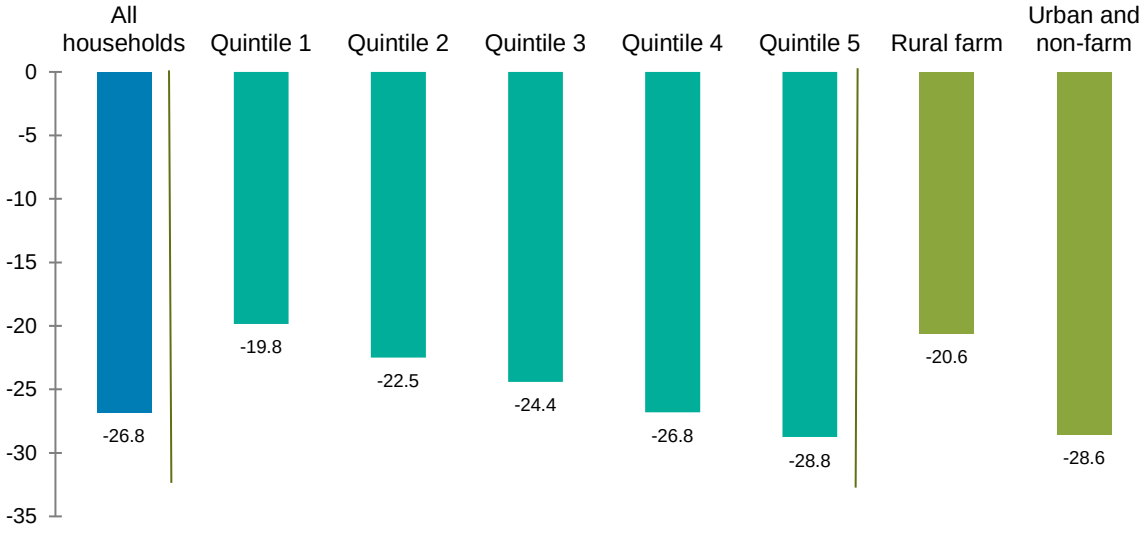
Figure 4.4: Contribution of restrictions and shocks to agri-food GDP losses during lockdown



Source: Ghana SAM Multiplier Results.

We next turn to household incomes. Given the nature of the lockdown measures introduced, household incomes are affected primarily via employment income losses and, to a lesser extent, via falling foreign remittances. As shown in Figure 4.5, total household income falls 26.8 percent during the lockdown period as livelihoods are temporarily lost. Higher-income households suffer greater income losses than lower-income households, which reflects their stronger ties to formal sector job markets, particularly in the manufacturing and services sectors, which are the sectors most severely affected by lockdown measures. Although the lockdown primarily targets urban households and, to a more limited degree, rural non-farm households, rural farm households are affected by social distancing measures and transport restrictions imposed nationwide, as well as indirectly via spillover effects of urban lockdown measures into the agricultural sector.

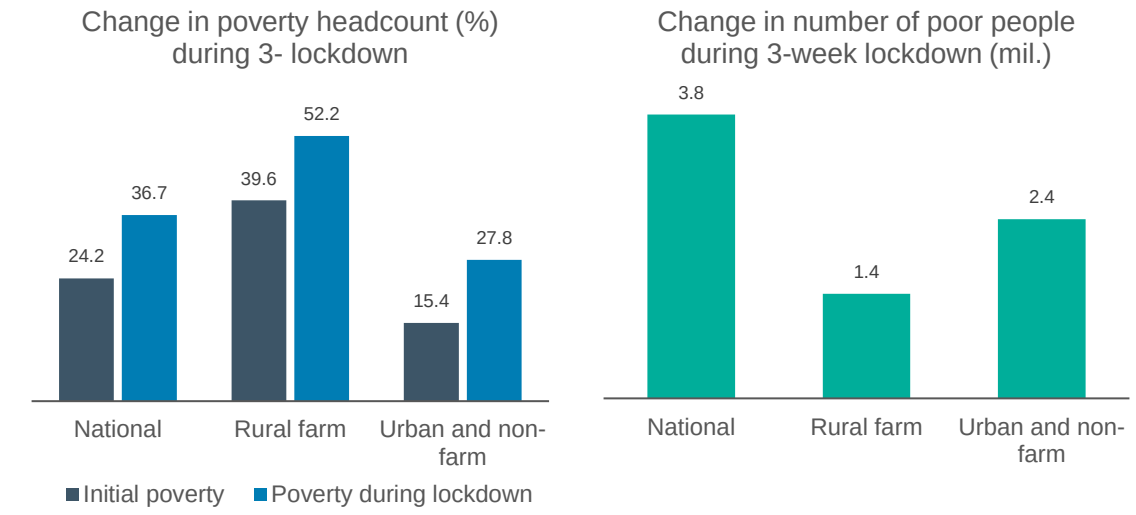
Figure 4.5: Change in household incomes during lockdown, percent



Source: Ghana SAM Multiplier Results

Figure 4.5 presents the effects on poverty due to the lockdown. In generating poverty estimates, we assume that a production slowdown translates into a decline in employment income. In reality, some employers would have continued to pay workers during lockdown or households would have been able to draw on savings to sustain consumption. As such, our result may overstate the actual experience of being poor, i.e., from the perspective of people's ability to access food. But, it nevertheless demonstrates the impact of the shock in terms of wage incomes or profits foregone. We find that the national rate of poverty increases 12.5 percentage points from a base of 24.2 percent to 36.7 percent, which equates to 3.8 million additional people falling below the poverty line during lockdown. Rural farm households are somewhat shielded from negative income shocks, but they still account for 37 percent (1.4 million) of those that fall into poverty. This is because many rural farm households have levels of consumption just above the national poverty line, so are more vulnerable to falling into poverty due to adverse income shocks.

Figure 4.5: Percentage change in poverty rate and change in number of poor during lockdown

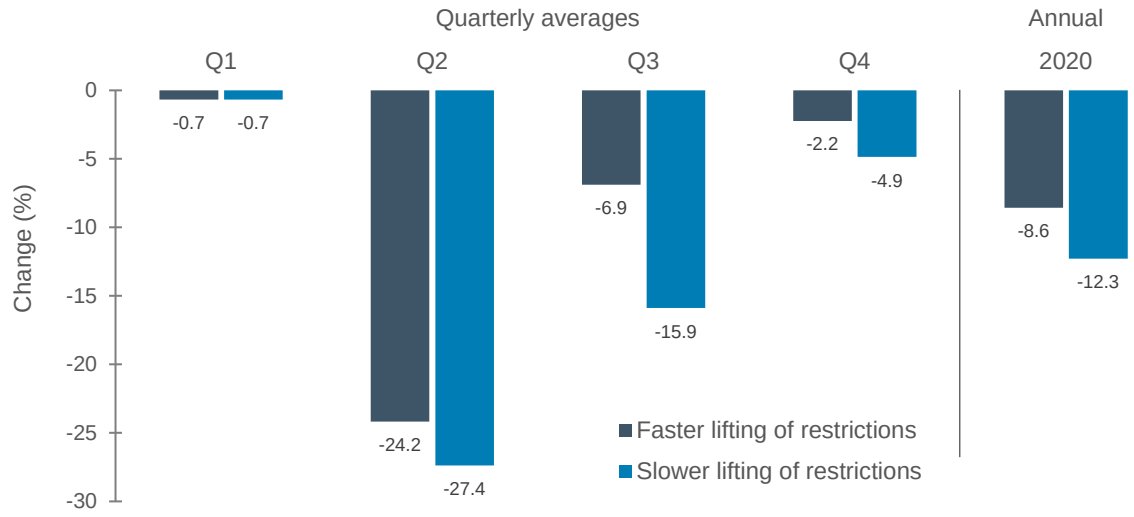


Source: Ghana SAM Multiplier Results

4.2 Recovery Scenarios

Whereas the earlier results report on the shocks experienced during Ghana's three-week lockdown period, we also measure the likely annual impacts of COVID-19 under two scenarios: a fast recovery scenario, which assumes restrictive measures are quickly lifted and business activities rapidly return to pre-crisis levels, and a slow recovery which assumes a more gradual easing of restrictions and a tentative return to business-as-usual. GDP results are shown in Figure 4.6. With the full lockdown only commencing towards the end of the quarter one (Q1), the loss in that quarter is minimal (-0.7 percent). The biggest impact is felt in Q2 when the actual lockdown is imposed, with an average loss of -24.2 to -27.4 percent in quarterly GDP. (Note that these percentage losses are slightly lower than those reported in Figure 4.1, because we account here for some restrictions being eased in the immediate post-lockdown period that still falls in Q2).

Figure 4.6: Change in GDP relative to baseline in 2020

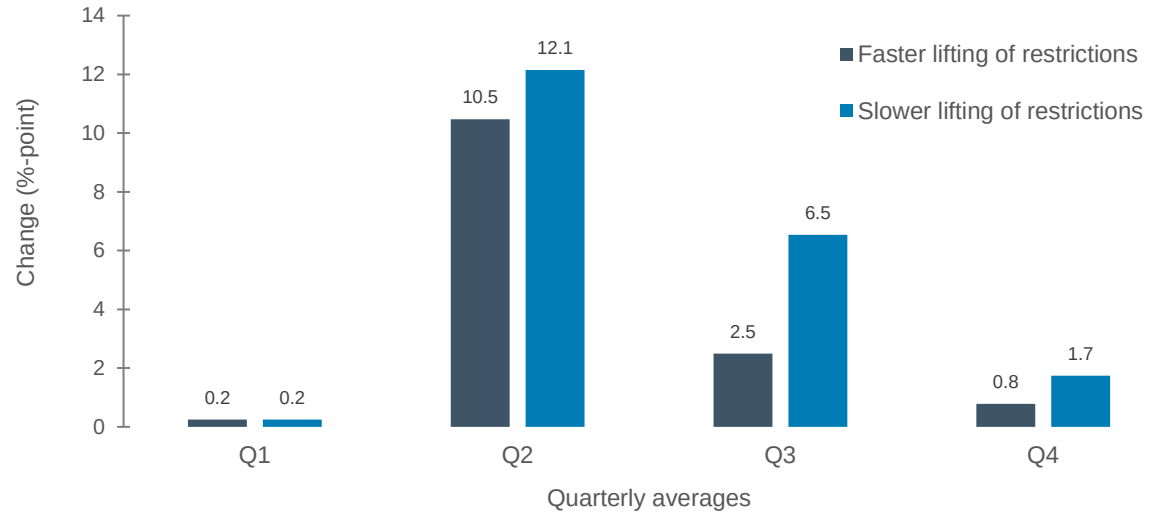


Source: Ghana SAM Multiplier Results

Further easing of restrictions in Q3 and Q4 result in losses ranging from -6.9 to -15.9 percent and -2.2 to -4.9 percent, respectively, depending on the speed of recovery. Our estimated weighted average loss in GDP for the calendar year ranges from -8.6 to -12.3 percent. Government's own expectation is a slowdown in growth from 6.8 to 1.5 percent this calendar year, which is equivalent to a 5.0 percent loss in GDP for 2020 (see Figure 0.2). The projection by government was done at a time when the lockdown was planned to last for only two weeks. Moreover, that our model framework captures both direct and indirect effects of COVID-19 may also explain the less optimistic outlook shown in our projections.

Compared to the 12.5 percentage point decline in the poverty rate during lockdown, Figure 4.7 shows how the poverty rate gradually returns to the baseline (or pre-crisis) poverty rate during the period from Q2 to Q4. By the end of the calendar year, the poverty rate will likely be between 0.8 and 1.7 percentage points higher than in the baseline. However, the millions of Ghanaians who suffer deprivations during Q2 and Q3 may require government support. Future analyses should consider the mitigating effects of the household support programs that government has established, which include subsidizing water char and providing income supplements to healthcare workers (section 2.2).

Figure 4.7: Change in poverty headcount rate relative to baseline in 2020



Source: Ghana SAM Multiplier Results

5. CONCLUSIONS

Following the example of countries across the globe, Ghana responded to the COVID-19 outbreak by introducing nationwide social distancing measures and travel restrictions, closing its international borders, and implementing a three-week lockdown in the country's largest metropolitan areas of Accra and Kumasi, which restricted the supply and marketing of non-essential goods and services. The objective of these restrictive measures was to limit the importation and spread of the coronavirus. As elsewhere, concerns about the economic implications of these measures were widespread and certainly not unfounded. In addition to domestic policy impacts, the global pandemic is disrupting global supply chains and economic activity, which could translate into falling exports and sharp reductions in government revenues, foreign direct investments, and private remittances.

The objective of this study is to estimate the economic costs of COVID-19 vis-à-vis output and value-added, employment incomes, household income, and poverty using a Social Accounting Matrix (SAM) multiplier model for Ghana. SAM multiplier models are ideally suited to measuring short-term direct and indirect impacts of unanticipated, rapid-onset demand- or supply-side economic shocks. Results from the multiplier model show that Ghana's partial lockdown, despite being implemented for a relatively short period and only in Ghana's major urban areas, will impose heavy economic costs. National GDP is estimated to fall by 27.9 percent during the three-week lockdown period, while agri-food system GDP losses are estimated at 19.8 percent, even though the food sector is largely excluded from the restrictive COVID-19 related measures. Even as lockdown measures are officially lifted, some restrictions (e.g., social distancing or border closures) are expected to remain in place for longer, while business may be slow to restart operations and reach pre-crisis production levels. Under our fast and slow recovery scenarios, we estimate that annual GDP will be 8.6 to 12.3 percent lower, respectively, than the baseline due to COVID-19.

With respect to poverty, and assuming the production slowdown during lockdown translates into an immediate decline in employment income, we find that the national poverty headcount rate increases by 12.5 percentage points during the lockdown period from a base of 24.2 percent. This substantial increase, albeit temporary, translates into an additional 3.8 million people falling into poverty during lockdown. Since some employers continued to pay workers during lockdown, and since some households may have had savings to fall back on to sustain consumption, our result may overstate the actual experience of being poor. Nevertheless, the results demonstrate the severity of the shock in terms of wage incomes or profits foregone. During the rest of 2020, as households' current incomes recover to (almost) pre-crisis levels by the end of the fourth quarter, the national poverty rate will be between 0.8 and 1.7 percentage points higher than at the start of the year. While the expected recovery is good news for most households, millions of people will experience temporary hardships, especially during the second and third quarter, and will likely require government support.

Further analysis is needed to assess the impact of household support measures that have already been announced. However, many of these tend to be biased in favor of urban households, whereas our results show that around 37 percent of households that become poor during the lockdown period are rural farm households. Special support measures for the food system are also warranted, not only to protect rural farm livelihoods, but to ensure stable and safe food supply across all markets.

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ANNEX: SOCIAL ACCOUNTING MATRIX (SAM) MULTIPLIER MODEL EQUATIONS

Following the example in Breisinger et al. (2009), consider a simple two-sector SAM multiplier model represented by two demand equations, where supply (Z_1 and Z_2) equals the sum of intermediate input demand, private household demand, and final demand (E_1 and E_2), assumed here to include government demand, investments, and exports. Intermediate input demand is expressed as a function of domestic production, X_1 and X_2 and the relevant technical coefficients, a_{ij}, denote demand for commodity i required per unit of commodity j produced. Household demand, in turn, is a fixed share (c_i) of income Y . Thus:

$$Z_1 = a_{11}X_1 + a_{12}X_2 + c_1Y + E_1 \quad [1a]$$

$$Z_2 = a_{21}X_1 + a_{22}X_2 + c_2Y + E_2 \quad [1b]$$

Supply is made up of domestically produced and imported goods and services. We assume that domestic production X_i is a fixed share (b_i) of income Z_i:

$$X_1 = b_1Z_1 \text{ and } X_2 = b_2Z_2 \quad [2]$$

Households derive income from employment, by assumption, a fixed share (v_i) of output:

$$Y = v_1X_1 + v_2X_2 \text{ or } Y = v_1b_1Z_1 + v_2b_2Z_2 \quad [3]$$

Substituting [3] into [1a] and [1b] yields the following equations:

$$Z_1 = a_{11}b_1Z_1 + a_{12}b_2Z_2 + c_1(v_1b_1Z_1 + v_2b_2Z_2) + E_1 \quad [4a]$$

$$Z_2 = a_{21}b_1Z_1 + a_{22}b_2Z_2 + c_2(v_1b_1Z_1 + v_2b_2Z_2) + E_2 \quad [4b]$$

Rearranging so that domestic supply components are on the left and the exogenous demand components are on the right and simplifying further yields the multiplier system of equations:

$$(1 - a_{11}b_1 - c_1v_1b_1)Z_1 + (-a_{12}b_2 - c_1v_2b_2)Z_2 = E_1 \quad [5a]$$

$$(-a_{21}b_1 - c_2v_1b_1)Z_1 + (1 - a_{22}b_2 - c_2v_2b_2)Z_2 = E_2 \quad [5b]$$

This can be expressed in matrix format as follows:

$$\begin{pmatrix} 1 - a_{11}b_1 - c_1v_1b_1 & -a_{12}b_2 - c_1v_2b_2 \\ -a_{21}b_1 - c_2v_1b_1 & 1 - a_{22}b_2 - c_2v_2b_2 \end{pmatrix} \begin{pmatrix} Z_1 \\ Z_2 \end{pmatrix} = \begin{pmatrix} E_1 \\ E_2 \end{pmatrix} \quad [6]$$

The first term in [6] is the identity matrix (I) minus the coefficient matrix (M), while its inverse $(I - M)^{-1}$ is known as the multiplier matrix. Thus, in matrix notation with vectors Z and E, the final multiplier equation becomes:

$$Z = (I - M)^{-1}E \quad [7]$$

This allows us to calculate the change in domestic supply (Z) for a given change in exogenous demand (E). Output multipliers (derived from the output vector, X), employment multipliers, and income multipliers (derived from the income measure, Y) are calculated through substitution. Equation [7] is generalizable for a SAM of any dimension.

Note when household demand [3] is treated as exogenous, this component of demand forms part of final demand (E) and the coefficient matrix (M) simply excludes the various share parameters (c_i, b_i and v_i).

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