Impact of COVID-19 on Macroeconomic Performance in Africa: A Case Study of Sub-Saharan Africa

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Abstract

This study explored the impact of the COVID-19 pandemic on macroeconomic performance in Sub-Saharan Africa (SSA), focusing mainly on economic growth and trade openness. The study also investigated how the pandemic is moderating the effect of investment and exchange rate on economic growth and trade openness in SSA. Panel data consisting of over 38 SSA countries spanning from 2010 to 2022 was analyzed using the Generalized Method of Moments estimator to achieve the objective. The results showed that the pandemic had a significant impact on economic growth and trade openness. Specifically, the effect of the pandemic on growth was negative, while its effect on trade was positive. Furthermore, the results showed that the pandemicsignificantly moderated the effect of domestic investment and exchange rate on economic growthand trade. The study concludes by emphasizing the need for policies that are important for practice,research, and future economic disruptions.

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CHAPTER 1: INTRODUCTION

This study investigated the impact of the COVID-19 pandemic on macroeconomic performance in Sub-Saharan Africa. Specifically, two questions were answered: 1) What is the impact of the pandemic on economic growth in SSA? 2) How has the pandemic affected trade in Sub-Saharan Africa? Did the pandemic moderate the effect of investment and exchange rate on economic growth and trade in SSA? To answer these questions, this study made use of the Generalized Method of Moments (GMM) estimator for analysis on panel data for selected sub-Saharan African countries. The study covers a sampled period of 2010 to 2022 for over 38 targeted countries in Sub-Saharan Africa. In keeping with the already developed literature, the study employed seven variables, where the dependent variables are economic growth and trade, while the regressors included the COVID-19 dummy, domestic investment and exchange rate, and control variables like GDP of the rest of the World, Urbanization, and financial development. The choice of estimation techniques is driven by the data, the objectives, and simulations. The study found that the pandemic's impact on economic growth and trade openness was significant. Specifically, the effect of the pandemic on growth was negative, while its effect on trade was positive. Furthermore, the results also revealed that the pandemic significantly moderated the effect of domestic investment and exchange rate on economic growth and trade.

This study was motivated by three main reasons. First is to understand the impact of the pandemic on economic growth and trade in SSA. The second motivation is the need for planning and policy frameworks that will help against shocks in the event of future pandemics, especially when empirical evidence is available. The third motivation is the sparseness of empirical evidence on the dynamic effects of the pandemic on macroeconomic performance in the SSA region. On the first motivation, which is the impact of the pandemic on macroeconomic performance in SSA, in

2020, the African Development Bank (AfDB) reported that African continent experienced a shrinked economic growth of about 2.1%, with the Southern Africa region bearing the highest hit with a depletion in the economy by 7.05 with a fall of -2.7%, -1.5%, and -1.1% for Central Africa, West Africa, and North Africa, respectively (AfDB, 2020). Sharp contractions were witnessed in global trade, which had significant implications on the livelihoods of people in Africa, as a result of the region's high reliance on trade, heavy dependence on commodities, a fragile food system, and limited fiscal capacity to respond (Kassa, 2020). Furthermore, several underlying socioeconomic issues in sub-Saharan African countries prior to the pandemic were exacerbated in tremendous proportion, including debt burdens, FDI, and political stability (Adefeso and Muraina, 2024; Abeywickarama et al., 2024). Thus, the study aids in quantifying and explaining how the pandemic affected macroeconomic performance in the region, providing empirical evidence of the disruptions and challenges faced, particularly in areas of growth, trade, investments, and tourism. Secondly, this study is motivated by the need for planning and policy frameworks that will help against shocks in the event of future pandemics, especially when driven by empirical evidence. A lot of uncertainty regarding how the pandemic will develop in the upcoming years, despite countries rushing to implement steps to address the crisis, still remains significant (Dutta & Fischer, 2021). Therefore, by analyzing the impact of the pandemic on SSA economies, this study provides insights for better planning, policy development, and resilience strategies for future shocks. Finally, since the inception of the pandemic, as noted by Amutabi (2024), to find out how the pandemic has affected growth, trade, and other matters, numerous studies have been conducted. However, most research has concentrated on forecasting or developing prediction projections based on the severity of the disease because the pandemic's ultimate results are still largely unclear (McKibbin & Fernando, 2021). Thus, this study addresses a significant gap in literature by making

available empirical information on the dynamic effects of the pandemic on macroeconomic performance in SSA. By focusing on this under-researched area, it adds to the existing body of knowledge and provides valuable insights that were previously lacking, thereby enriching understanding of how the pandemic altered economic growth, trade, investments, and exchange rates in the region.

The start of the pandemic can be traced to December 2019, in Wuhan, Hubei Province of China, where the outbreak of pneumonia of unknown origin was reported to the World Health Organization (WHO) China country office. After several investigations, this virus was then called the coronavirus disease (COVID-19). Its rapid spread around the globe, as well as the fatality rates, which were in the thousands, on 12 March 2020, the World Health Organization (WHO) was led to classify it as a pandemic of global proportion (Ciotti et al., 2020). Even currently, the pandemic has inflicted and continues to inflict disastrous impacts globally (Arellano, Bai, & Mihalache, 2024), particularly with respect to loss of human lives, economic effects, public health, and increased poverty rates across countries. Furthermore, the shock saw a devastating impact on the healthcare systems of different economies in the world. The global supply chain nearly collapsed following a drop in manufacturing and demand for energy resources (Abeywickrama et al., 2024). The contagious nature of the COVID-19 pandemic resulted in the closing of international borders and a severe collapse of the tourism industry of most tourist-dependent economies following the global adoption of WHO guidelines (Anyanwu and Salami, 2021). Initially, when the pandemic started, most national governments refused to implement strict quarantine guidelines due to their macroeconomic impact. However, with its rapid spread, lockdown procedures were implemented in schools and factories, and several industries were ordered to cease operations. Healthcare

centers were rapidly overwhelmed as there was seemingly no cure or functioning management procedures for the rapidly expanding pandemic (Goodman, 2024).

While the globe was severely hit by the effect of the pandemic, Africa, particularly Sub-Saharan Africa (SSA), was also hit significantly, particularly economically. Before the start of the pandemic, SSA's GDP reached $2.2 trillion current US dollars in 2019, tripling from $777.2 billion current US dollars in 1990 (World Bank, 2020). However, the COVID-19 pandemic causeda severe economic contraction, with GDP growth plummeting to between -2.1% and -5.1% in 2020in SSA economies (IMF, 2021). FDI in Africa declined by 16% in 2020 to $40 billion, from $47 billion in 2019 (UNCTAD, 2021). The World Bank further showed that 40 million more people fell into extreme poverty by 2021, raising the total to 462 million (World Bank, 2021). Latest insights by Yonzan, Mahler, and Lakner (2023) suggest that 691 million people (or 8.6% of the global population) were to live in extreme poverty (i.e., those living below $2.15/day) from 2023onwards, which is just below the level prior to the start of the pandemic, with SSA still worst hit (Omotayo & Ogunniyi, 2024). Furthermore, by 2030, an estimated 7% of people in the globe are expected to still be living in extreme poverty (World Bank, 2023). Recovery remains uneven andfragile, with the IMF projecting gradual growth from 3.4% in 2023 to 3.8% in 2024 (IMF, 2024).The rest of the thesis will be structured as follows: The second section provides some backgroundon the concepts and the conceptual framework and discusses the related literature as well as establishing the research gap. The third section describes the data and discusses the variables to beemployed in detail. The fourth section presents the theoretical framework as well as the methodology and model specifications. The results are presented and discussed in the fifth section.Finally, the conclusion and policy implications are drawn in the sixth section.

CHAPTER 2: BACKGROUND, CONCEPTUAL FRAMEWORK, AND RELATED LITERATURE

An Overview of the COVID-19 pandemic and its Economic impacts Globally

The COVID-19 pandemic

While the definition of a pandemic has been historically unstable, it has been defined or conceptualized by the WHO as the spread of a disease with a global coverage and impact (Pitlik, 2020). Furthermore, pandemics have been explained by Pitlik (2020) to have eight characteristics, which include novelty, explosiveness, minimal population immunity, wide geographic extension, fast disease movement, contagiousness, infectiousness, and severity. Pandemics involve the widespread, concurrent transmission of new or recurring infectious disease outbreaks, impacting vast numbers of individuals and frequently leading to significant fatalities, as well as causing social and economic upheaval (Madhav et al., 2017). Given a lack of dispute in literature regarding these characteristics any disease must have to be rated as a pandemic, it is safe to state that there has been just one pandemic in the 21st century, which is the COVID-19 pandemic (Pitlik, 2020). With its origin traced to Wuhan, China, the COVID-19 pandemic became a pandemic of global proportion due to its impact on almost all aspects of human existence and the world at large. Since December 2019, there have been around 760 million cases and 6.9 million fatalities globally, while the true number of cases as well as mortality due to the disease is believed to be higher (WHO, 2023).

The pandemic, which started in late 2019 (November), had significant and far-reaching effects on nearly every aspect of society. Its rapid and widespread coverage around the world has not only been a significant challenge and crisis for public health but has also triggered substantial economic, social, demographic, and political disruptions. From a public health perspective, the pandemic not only caused millions of infections and deaths worldwide but also led to the overwhelming of

healthcare systems, as well as creating a demand for medical supplies, treatments, and vaccines (Filip et al., 2022). Shortages in medical staff, hospital beds, and ventilators, particularly during the peak of the pandemic, were witnessed in several nations, leading to pressure on health facilities (Winkelmann et al., 2022). The immediate response to the pandemic, which included options such as lockdowns, social distancing measures, and mask mandates to curb the spread of the virus, also led to several problems, especially social. However, even though these necessary health interventions were important, they had severe economic consequences.

Economically, the pandemic led to a global recession, with many industries severely impacted. Sectors such as tourism, travel, hospitality, trade, and retail faced significant losses, as well as millions of individuals losing their jobs or having their labor market status disrupted (Naseer et al., 2023). Supply chains were interrupted globally, with trade volumes decreasing, as well as many businesses and firms struggling to stay afloat. Governments and policymakers around the globe had to respond by introducing stimulus packages, social welfare, and relief programs to support both individuals and businesses affected by the economic downturn caused by the direct and indirect effects of the pandemic. Still, recovery has been uneven across countries and industries, with many developing nations experiencing slower rebounds due to weaker economic structures (Sanchez & Pain, 2022).

Socially, COVID-19 altered everyday life. The closure of schools and businesses forced a rapid shift to remote learning and working environments (Franken et al., 2021). Social isolation, mental health challenges, and disruptions to regular routines became widespread. The pandemic exposed and, in many cases, exacerbated existing inequalities, particularly in access to healthcare, economic opportunities, and social protection measures (Barron et al., 2022). Vulnerable populations, including the elderly, low-income groups, and minority communities, faced

disproportionate impacts from the health and economic consequences of the pandemic (Liu, Dean, & Elder, 2023). Overall, the COVID-19 pandemic reshaped global health, economics, and social interactions, leaving lasting effects that continue to influence policies and behavior worldwide, with recovery still slow and uneven, particularly in the developing world.

Economic Disruptions and Global Recession

The COVID-19 shock caused major economic disruptions worldwide and the steepest recession since the Great Depression. In 2020, the global GDP declined about -3.5%, causing widespread problems in nearly every major sector and economy, both developed and underdeveloped (Ajmal et al., 2021). Significant decline was witnessed in hard-hit industries such as travel, hospitality, and manufacturing due to restrictions on movement and decreased consumer spending. According to Syaifudin et al. (2022), during the COVID-19 pandemic, the tourism and travel sector suffered a collapse in international export revenue of an estimated $1.3 trillion while the hospitality business witnessed mass layoffs and closures. Free & Hecimovic (2021) and Khan & Ali (2023) stated that a major impact of the COVID-19 pandemic was on the global supply chain. It laid bareweaknesses in production networks leading to delays across industries like manufacturing and delivery of goods. For example, the semiconductor shortage disrupted production capacities around the world in both the automotive and electronics sectors. In addition, financial markets were affected by the pandemic; in its early months, there were stock market crashes (Harjoto & Rossi, 2023). For instance, as opined by Elfiswandi et al. (2021), the Dow Jones Industrial Averagefell by nearly 30% in February-March of 2020.

There was only a short-term relief in the form of government responses with stimulus packages and central bank interventions, which have temporarily managed to prop up economies but at a noticeable expense: increased public and private debt levels raising questions over future financial

stability (Zaring, 2020). Vulnerable populations were left facing a serious economic shock, deepening inequalities within and between countries. Income losses were particularly severe in emerging economies where the informal labor market prevails, causing poverty to worsen. In essence, while the global economy remains on the recovery path, persistent effects such as bottlenecks in the supply chain and inflation, along with widening inequality, have remained significant issues limiting sustained growth.

Labor Market Crisis and Employment Challenges

The COVID-19 pandemic has dramatically reshaped the worldwide labor force and brought forth multiple challenges when it comes to discussion relating to employment. One of the main consequences observed was an increase in unemployment rates (Hamouche & Chabani, 2021). In developed and developing countries, businesses closed or downsized due to lockdowns as the effects of job denudation grew for millions across both realms. According to Orji & Amah (2024), the International Labour Organization reported that global working hours in 2020 declined by 8.8% and led to the loss of full-time employment of some 255 million jobs. While many sectors, such as hospitality and travel in particular, still have far to go before reaching pre-pandemic employment levels, some recovery has kicked into gear.

At the same time, it has accelerated the adoption of remote work and changed labor market trends in certain societies. With local stay-at-home orders put in place, organizations quickly turned to virtual work setups that, although developing as a temporary solution, have become part and parcel of organizational schema across numerous sectors (Dias et al., 2020). The gig economy is only going to continue its growth in light of the evolution of remote work, with many workers taking on freelance or contracting gigs. Umar et al. (2021) interpreted this transition as opening up more arenas for flexibility but also reinforcing the looming reality of job insecurity, as gig economy jobs

tend to lack benefits along with long-term sustainability. As a result of the foregoing, the labor market is then faced with both unemployment and instability crises, with substantial swings toward remote work along with the gig economy. The Covid-19 pandemic also exposed and deepened structural susceptibilities of the global labor systems, demanding well-drafted policy interventions to promote sustainable and inclusive recovery.

Government Responses and Economic Recovery Efforts

With the economic effects of the COVID-19 pandemic having become a major global concern, governments around the world took various fiscal and monetary measures in response (Makin & Layton, 2021; Alberola et al., 2021). Advanced economies, such as the US, put in place large fiscal stimulus packages. In 2020, the United States passed over a $2.3 trillion relief package as part of their CARES Act that included direct payments to citizens and also expanded unemployment benefits on top of providing resources for small businesses & health services, etc. (Karim et al., 2022). Additional steps, such as the American Rescue Plan in 2021, included $1.9 trillion of assistance to state and local governments along with additional direct payments and child tax credits (Torres & Warner, 2024). Whereas developing nations tried to resort to multilateral support from institutions like the International Monetary Fund (IMF) and World Bank, as they have different fiscal constraints. The IMF had to provide succor for many African and Latin American countries, making provision for emergency loans and debt relief in order to ward off the worst of the economic fallout. Most of these countries also made use of fiscal strategies, such as cash transfers and subsidies for the vulnerable sectors, but less robustly than their wealthier counterparts (Kozul-Wright, 2020).

The most significant variation has been the sustainable focus in the aftermath measures. Thus, while the more fiscally sound developed countries concentrated on demand-side measures, aiming

at stimulating demand and growth, many developing countries had to spend and borrow with an equal eye on the need to provide immediate relief as well as medium- and long-term sustainability of outstanding debts. However, both these groups of nations are now transitioning towards building the capacity for management of future shocks with initiatives towards enhancing healthcare infrastructure, creating fiscal buffers, and fortifying the economies in the future. In this staged crisis response plan, the variation highlights the continued differences in capacity of developed and developing countries crisis management, with the latter relying heavily on international assistance and long-term recovery difficulties.

COVID-19 pandemic and Macroeconomic Stability in SSA

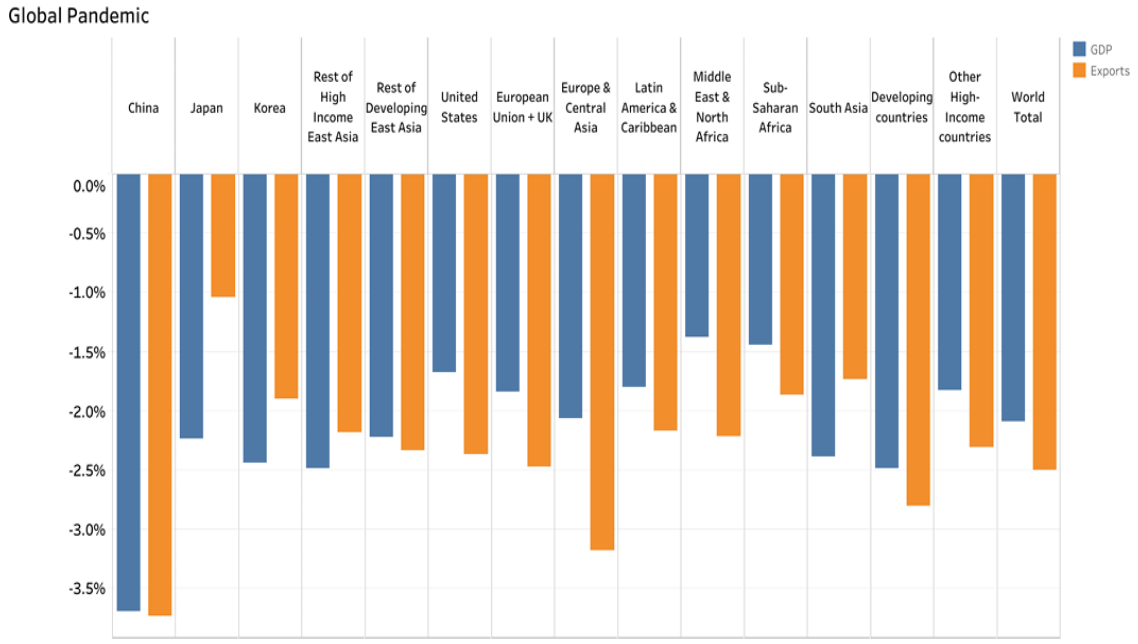
Impact of COVID-19 on Economic Growth in SSA

As an implication of the COVID-19 pandemic, Agwanda et al. (2021) opined that the economic growth in Sub-Saharan Africa declined extremely, and the region's production was significantly compressed. Such a downturn was primarily caused by lockdowns, restrictions on movement, and the collapse of the main industries, including tourism, agriculture, oil export, and others. In 2020, the region's GDP fell by 1.7 percent, causing the first recession in more than 25 years, as could be seen in Figure 2.1.

Countries highly dependent on tourism experienced a considerable decline, such as Mauritius, while oil exporters like Nigeria suffered from the falling prices for oil. Furthermore, the informal sector, which represents a significant share of SSA's economy, also experienced the degree of recession, generating the factors that exacerbated the economic downturn in the region (Kinyondo & Pelizzo, 2021). Sectoral effects were severe, as many formal economies suffered from the closure of businesses and also the disruption of the supply chains (Agwanda, Dagba, Opoku, Amankwa, & Nyadera, 2021). In South Africa, for example, the mining and manufacturing sectors were mostly slowed down, causing a 7% drop in GDP. The drop in the Nigerian GDP was in the

region of 1.8% for an economy that was driven by oil revenues (Anyanwu & Salami, 2021). Agriculture in Nigeria suffered from the same disruptions that affected the rest of the countries, including disrupted logistics and lack of export opportunities.

Figure 2.1: GDP and Exports across World Regions during the Pandemic



Source: World Bank Group (2020)

Regarding recovery, the outlook for SSA's future continues to be imbalanced. On the one hand, the region's economic growth is expected to increase up to 3.5 percent by 2024, from the current negative value (Kinyondo & Pelizzo, 2021). On the other hand, the growth rate is slower and more unstable than expected, as inflation, foreign debt, and the slow rate of vaccination remain as major challenges. Countries within the region employed internal policy instruments, such as fiscal policies, to support economic growth, as well as external credit products and financial aid from such institutions as the IMF. The trajectory of SSA's recovery is closely dependent upon today's global economic trends, such as low demand for commodities, falling prices, and global trade.

Though SSA countries' recovery is underway, sustainable long-term growth requires continued support related both to immediate health needs and more structural transformations.

COVID-19 pandemic and trade disruption within SSA

The COVID-19 pandemic is believed to have greatly impacted trade across sub-Saharan Africa, thereby greatly affecting the global and regional supply chains. The borders were closed, and trade was restricted due to COVID scare; Banga et al. (2020) and Obayelu et al. (2021) all corroborated this fact. Such regulations saw a huge reduction in trade volumes, including export and import volumes, creating a major shortage of various products in the various areas. The manufacturing, agriculture, and raw materials sectors were hugely impacted. For example, many raw materials, such as foodstuffs and other farm products, are highly produced within the sub-Saharan regions. The global restriction on certain goods mainly affected countries such as Nigeria and South Africa, which essentially depend on exports of raw materials (Panda, 2022). The delays experienced in the supply chain in the agricultural sector impacted the delivery of various products before going to waste, resulting in a huge loss in terms of trade, reduced incomes for the farmers, among other impacts.

The inception of the African Continental Free Trade Area, in 2021, was initially affected by the pandemic, which delayed the implementation. Nevertheless, it is still a promising tool for recovering the economy in SSA, due to its potential for boosting intra-African trade and reducing reliance on other markets (Matezo & Matondo, 2022). Ultimately, the core goal of the agreement was to enhance regional integration. By eliminating tariffs on the majority of goods, which had already been fairly restricted, it may support trade among African countries. As a result, such activity may serve as a reliable mitigation tool for the future fluctuations that may emerge (Nchanji et al., 2021).

According to Obayelu et al. (2021), the pandemic serves as a strong driver for change; many SSA countries reshaped their trade policies to increase resilience. Now most of the post-pandemic strategies are directed at export diversification and the creation of a strong basis for increasing intraregional trade. For example, in Kenya and Rwanda, policies are being implemented to expand the development of value-added industries capable of increasing the share of production and services and decreasing dependence on the export of raw materials (Matezo & Matondo, 2022). Moreover, regional initiatives supported by AfCFTA are being advocated since they would provide the member countries with a higher level of self-sufficiency and reduce vulnerability to global market volatility. If these strategies are addressed accordingly, SSA not only will recover but also will have a stronger economic foundation that will allow it to resist future global shocks.

Macroeconomic Stability and Debt Vulnerability

According to Ndung'u et al. (2021), debt dilemmas in Sub-Saharan Africa were severely aggravated by the COVID-19 pandemic. In the aftermath of the unprecedented crisis, governments across the continent had to increase borrowing to build necessary healthcare infrastructure, as well as introduce stimulus packages. As a consequence, debt ratios in the region resurged to unprecedented levels, accelerated by the growing reliance on market-based borrowing and loans from international financial organizations. For example, according to the International Monetary Fund, not a single SSA country had issued a Eurobond since 2022, indicating restricted opportunities for inexpensive borrowing (Heitzig et al., 2021). This situation raises dire concerns relative to debt sustainability and a growing dependence on foreign loans.

Exploring further on macroeconomic variables, Calderon et al. (2020) opined that inflation and currency volatility have compounded macroeconomic imbalance in SSA. The supply shocks contributed by the COVID-19-related disruptions in the supply chain together with the use of

forceful fiscal stimulus measures have increased inflation rates to double digit in around half of SSA countries. Nigeria and Zambia, for instance, have seen their currencies greatly erode against others, making imports costly and putting much pressure on the spending power of the people (Okolie et al., 2022). This has been a source of additional problems as regards economies that depend on imports to access some basic goods and services.

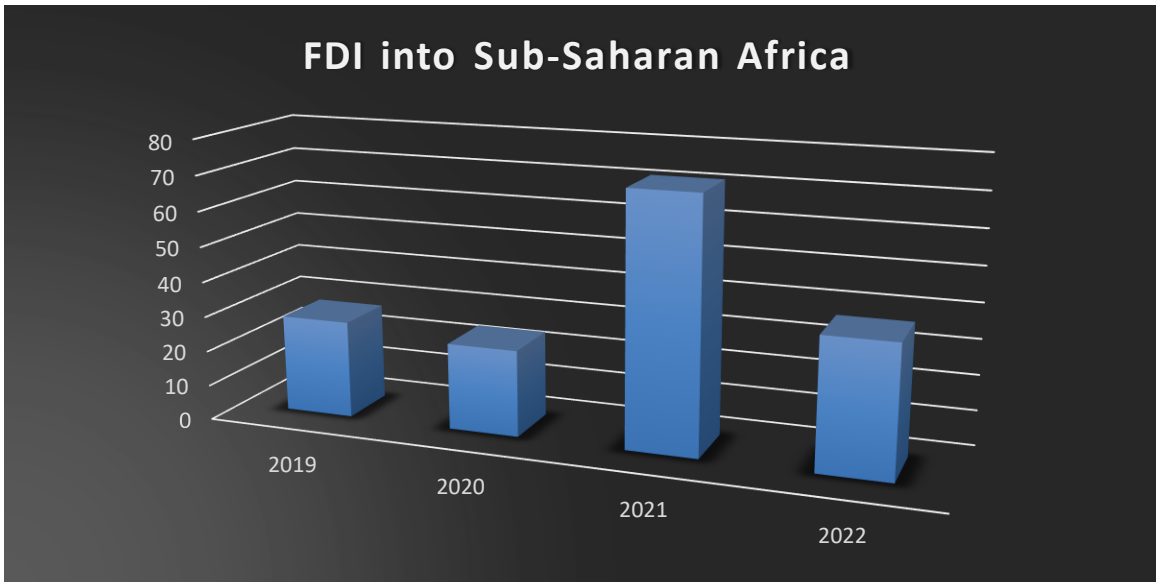
As a measure, most of the SSA governments have implemented fiscal and monetary policies to stabilize their economies. This includes budgetary measures such as analytically reducing leverage and increasing savings, among other measures aimed at reducing inflation and stabilizing exchange rates through monetary policies carried out by central banks. Debt relief on the part of creditor countries has also come into force, especially through the G20 Debt Service Suspension Initiative, and has affected it, but its long-term impacts remain worrying given the fact that the debtor countries still experience fewer resources for developmental sectors.

Conceptual Framework for Understanding the Link between the COVID-19 Pandemic and Economic Growth and Trade

Statistics have shown that the impact of COVID-19 was severe and led to an observable reduction in the economic growth of Sub-Saharan Africa (SSA), which recorded its first recession as a region in 25 years. Across the region, the GDP was down by an average of 1.9% in 2020, and some countries within the region, which include South Africa, saw a deeper rate of decline in the GDP of as much as 7.0% (IMF, 2020). These were due to, as stated earlier, lockdowns, travel restrictions, and decreased overall spending across the world. The industrial segment that was most affected is the manufacturing that shrank by 8% cumulatively across SSA nations in 2020 (Anyanwu & Salami, 2021). Conceptually, the pandemic influenced growth and trade indirectly

through transmission channels such as FDI, revenue losses, private consumption, global market volatilities (crude oil prices), and even public health policies.

Figure 2.2: FDI inflows into SSA region



Source: Microtrend (2024)

Furthermore, sectors like the service sector, particularly tourism and hospitality, also incurred heavy losses; for instance, in Kenya, the tourism revenues reduced to 68% during the pandemic, contrary to the several years of economic growth. Other economic variables, such as FDI, reduced by 12% in 2020, down to $24.64 billion from $27.75 billion in 2019. Even though there was a rise in the FDI in 2021 (Microtrend, 2024), the impact was still much more within the scope of economic activities within the region, as subsequent years witnessed decline, as could be seen in figure 2.2. Consumption also declined as people's income reduced significantly, hence a decline in the demand for products in the market. The government saw a dramatic decline in their earnings; especially the oil-importing nations saw a decline as high as 60 percent in oil earnings because of a decline in crude prices across the globe (Bloomberg, 2020), as could be seen in figure 2.3. The informal sector, which was/is the source of over 80% of employment in some SSA countries, was

again, the hardest hit because the majority of such employees were unable to earn an income during successive lockdowns.

Figure 2.3: Global Crude Oil Prices

Source: Bloomberg (2020)

The COVID-19 pandemic deepened these long-term economic vulnerabilities in SSA, exposing structural deficiencies, including underfinanced healthcare and volatile social protection systems. Healthcare spending by SSA states, at an average of approximately 5% of the total GDP, is far below that of more developed nations, which is more than 9% of the total GDP (Matezo & Matondo, 2022). It made many countries susceptible to the health calamity, and it was hard to contain the pandemic's health and economic fallout. Furthermore, the economic shrinkage cruelly affected the poverty alleviation process. Covid-19, in the opinion of the World Bank, pulled an extra 40 million persons into extreme poverty in SSA, erasing the achievements of years.

COVID-19 Pandemic and Trade: Shifting Patterns and Future Prospects

It has been well stated in the course of the discussion that the COVID-19 outbreak disrupted the global economy, and Sub-Saharan African countries were no exception. The measures during the

outbreak also impacted global value chains as export destinations locked down and restricted movement, causing significant declines in SSA exports and its principal products like oil, minerals, and agricultural produce (Panda, 2022). For those countries that are highly dependent on their exports, for instance, Nigeria, Angola, and other oil-exporting countries, the pandemic resulted in a decline in exports and therefore its shockers, which led to a considerable reduction in the sale of its major exports, such as oil and raw materials (Anyanwu & Salami, 2021). In addition, ports were shut down, and rising costs of shipment meant further embarrassments as shipment problems persisted and trade deficits widened.

The intra-African trade was also met with a number of challenges too. Despite the then-global realities, the African Continental Free Trade Area (AfCFTA) was developed as a platform for increasing intra-African trade; however, its immediate application was stifled by the pandemic because of the closure of borders and increasing trade barriers (Heitzig et al., 2021). Thus, most of the SSA countries were still dependent on their trade partners, who were not within the African continent, for basic consumer goods such as medical amenities and machinery. This made the continent very much dependent on the international markets, thus showcasing it was easily affected by any shifts that occurred globally.

In response to these problems, the emphasis has been gradually shifting towards the strategies of trade diversification and regional integration. The expansion of the range of export goods, a process now referred to as diversification, is considered to be of growing importance for the SSA countries (Matezo & Matondo, 2022). Dependence on a limited number of export products, inclining to oil or mineral exports in effect, exposed these economies to external volatilities. Hence, penetrating into sectors such as agriculture, technology, and services can go a long way in providing sustainable economic growth (Agwanda et al., 2021).

Regional integration, AfCFTA and the like, is also an important factor for the recovery of SSA's trade. AfCFTA seeks to increase the trade between the African partners through export diversification, establishment of liberalized trade in goods, services, and facilitated trade in investment goods (Kozul-Wright, 2020). If SSA countries bring efficiencies in the dealing of products within the continent, then such countries are in a position to reduce their dependence on the global market and further make their regional productivity beneficial. Such integration may lead to sustainable economic development, sources of employment, and enhancement of the African economies to cope with the future shocks.

Hence, the course for the future of SSA's trade involves the diversification strategy and the deepening of regional integration. Building strong regional value chains with the help of AfCFTA and also relying on export-oriented growth will not only assist SSA to come out of the current state of economic downturn but also pave the way towards more sustainable growth paths in the future (Agwanda et al., 2021). Such strategic changes are important for establishing the SSA region's readiness for future global disruptions, hence being in a better position than before to handle other disruptions in the future.

Related Literature

Multi-country Studies

In an expansive study, Gagnon, Kamin, and Kearns (2023) investigated the impact of the COVID-19 pandemic on the global trajectory of real GDP. They used an unbalanced panel data set spanning over the course of 2020 and 2021 to estimate the model they developed for 90 countries from 2020 Q1 through 2021 Q4. The panel dataset used consisted of variables relating to COVID-19, government policies, and global trade. They used the OLS estimator with two-stage regression procedures to account for potential endogeneity. The study analysis revealed that COVID-19 death rates had minimal impact on real GDP in the overall sample. However, changes in the strictness

of government-imposed lockdown measures played a significant role in affecting GDP. Their analysis further showed that the impact of the pandemic varied between wealthy and poorer nations. While COVID-19 deaths appeared to have a marginally stronger negative effect on GDP in advanced economies, this difference was not statistically meaningful. On the other hand, lockdown measures were more detrimental to economic activity in emerging and developing nations. Furthermore, global trade became a critical channel for transmitting the pandemic's economic effects across countries.

Chaabouni and Mbarek (2024) explored whether the link between human capital and economic growth changed pre- and post-pandemic. Their study used a panel of 17 European countries, with data covering the periods 2015–2019 (before the pandemic) and 2019–2022 (after the pandemic). Applying the GMM technique, they found that both education and health had a significant and positive impact on economic growth, resulting in higher growth overall. Prior to the pandemic, their findings revealed bidirectional causality between health and economic growth and between economic growth and education. There was also a unidirectional causal link from education to health. However, after the COVID-19 outbreak, the study found no significant causal relationship between economic growth, education, and health. This indicates that the pandemic significantly moderated and diminished the impact of both health and education on economic growth.

Farayibi et al. (2023) examined the medium- and long-term effects of the COVID-19 pandemic on the progress of the United Nations' Sustainable Development Goals (SDGs) in MENA countries using robust econometric methods. Their findings indicated that, across all models used, an increase in COVID-19 cases had a negative impact on GDP per capita. Specifically, a 1% rise in COVID-19 cases led to a statistically significant reduction in GDP per capita by 0.015%, all else being equal. Additionally, COVID-19 cases significantly affected the Human Development Index

(HDI), with a 1% rise in cases reducing HDI by 0.009. They argued that since HDI comprises health, education, and living standards, this result reflected how increasing COVID-19 cases harm overall health, subsequently lowering HDI. The pandemic's impact on productivity also contributes to a decline in HDI. Antara & Sumarniasih (2022) studied the impact of the COVID-19 pandemic on the economic growth of Bali and Indonesia. They carried out their analysis using several methods, including descriptive statistics as well as simple comparative data (before and after the pandemic) to build their argument. The results of their analysis showed the pandemic had a negative effect on the economy of both countries, with the impact more pronounced in Bali when compared to that of Indonesia. Furthermore, they found that as a result of the pandemic, the economy of Bali contracted by as deep as -9.31% compared to the economic growth they witnessed in 2019. On the impact of the pandemic on the Indonesian economy, they found that economic growth dipped and contracted by -2.07% compared to 2019 levels.

Hayakawa and Mukunoki (2021) analyzed how COVID-19 influenced global trade, focusing on exports from 34 countries to 173 destinations. They examined monthly data from January to August in both 2019 and 2020, using a gravity model and various variables to capture the pandemic's impact. Their analysis revealed several key insights: First, regardless of which COVID-19 proxies were used, both exporting and importing countries experienced significant negative effects on trade. Second, by July 2020, the adverse impact on trade for importing nations began to subside, suggesting that the initial disruptions from the pandemic were gradually reduced after the first wave. Third, these effects differed by industry; nonessential, durable goods were more negatively affected over a longer period, while industries involved in medical products experienced positive outcomes.

Arita et al. (2022) used Trade Data Monitor's monthly bilateral export figures from January 2016 to December 2020 for 93 countries to assess COVID-19's effect on agricultural trade. Their analysis, using the Poisson Pseudo Maximum Likelihood (PPML) estimator, found that the pandemic caused a 5-10% decrease in agricultural trade. However, the impact on agricultural goods was 2-3 times less severe compared to non-agricultural items. Moreover, higher-value agricultural products and most non-food items were more negatively affected, and product throughput at ports was significantly disrupted by the pandemic.

Similarly, Barbero, de Lucio, and Rodríguez-Crespo (2021) employed the PPML estimator to study the impact of the pandemic on bilateral trade using monthly trade data from 68 countries exporting to 222 destinations between January 2019 and October 2020. Their study highlighted three important findings: First, countries that were part of regional trade agreements before the pandemic faced disproportionately greater negative impacts on bilateral trade. Second, indicators related to government responses to the pandemic showed a significant negative effect. Amutabi (2024) examined the pandemic's effect on the trade balance of East African Community (EAC) economies from March 2020 to December 2022 using the PMG model. Their findings indicated that while the pandemic had an insignificant short-term effect on trade deficits, its long-term impact was positive and significant. The pandemic increased short-term imports, but no significant long-term effect was found, although the effects of the pandemic were still felt despite the easing of lockdown measures.

Finally, this negative effect was more pronounced when both the exporting and importing countries had similar income levels, with the greatest decline in exports observed between high-income nations. Al-Deehani (2020) investigated the impact of the pandemic on African countries by focusing on the GDP and trade impacts. Historic data spanning from 1961 to 2020 was used to

ascertain the differences in the economic growth and trade caused as a result of the pandemic. The Generalized Least Squares estimator was used due to heteroscedasticity in the variables. The results from the analysis of the data showed that the pandemic had a negative effect on the economic performance and productivity of the selected African countries. The authors concluded that the 10 African countries selected for study were influenced adversely in the context of trading activities and GDP growth as a result of the pandemic.

Specific Country Studies

Nguyen, Le, Thalassinos, & Trieu (2022) investigated the impact of the COVID-19 pandemic on the economy of Vietnam by focusing on economic growth and monetary policy. In terms of their methodology, they made use of the Bayesian methods to estimate the DSGE models fitting to achieve their objectives. The analysis revealed that a one standard deviation shock (approximately a 1.49% rise in the likelihood of a COVID-19 outbreak) to the Covid status variable causes an immediate 0.94% reduction in the output gap. However, this effect is short-lived, lasting only for one quarter, after which the output gap begins to expand again. Additionally, the shock leads to an immediate decline in refinancing interest rates, inflation, and exchange rate changes, although the magnitude of these reductions remains relatively minor. Similarly, using the Bayesian approach to a new Keynesian dynamic stochastic general equilibrium (NK-DSGE) model, Zhang, Zhang, & Zhu (2021) also examined the impact of the COVID-19 pandemic on the sustainability of key macroeconomic variables such as economic growth, government debt, and income inequality in China. Data used estimations spanned from 1996Q1 to 2020Q3. They found from their analysis that the COVID-19 pandemic significantly impacted sustainable macroeconomic development by negatively impacting and increasing debt and social inequality through shocks in aggregate demand and labor demand. They further found that monetary policy is an important instrument for

price stability, economic growth, and minimizing welfare losses when both labor demand and aggregate demand are significant.

In their research, Chipumuro and Chikobvu (2022) examined South Africa's inbound tourism from foreign countries, covering the period from 2009 to February 2020 using time series data and models. They applied the ARIMA model to forecast the pandemic's impact on tourist arrivals to South Africa, comparing actual arrivals post-February 2020. Their study considered monthly data from different regions, including overseas, SADC countries, other African nations, and unspecified areas. The ARIMA (1,1,0)(1,1,0)12 model was selected for its excellent predictive accuracy. According to their analysis, tourist arrivals followed a consistent ARIMA pattern before COVID-19, exhibiting an upward trend and seasonal fluctuations since the 1994 democratic elections. However, the pandemic caused a loss of over 90% of South Africa's monthly tourist arrivals, showing minimal recovery and leaving the tourism sector in a dire state.

Regarding trade, Wemesa et al. (2021) explored the pandemic's impact on Uganda's trade balance. Their descriptive research showed that the pandemic caused a short- to medium-term imbalance in Uganda's trade, exacerbated by the government's containment measures, particularly the first lockdown announced by the president. Hancock and Mora (2023) studied the pandemic’s effects on Chinese trade through its major partners—the US and Japan. They found that products in the middle of the global supply chain were impacted more severely, with the shock’s intensity determined by the partner country's role in the chain. Additionally, Chinese exports were more affected than imports, regardless of the processing status of goods. Tan et al. (2022) used a quantitative approach to evaluate the pandemic's impact on China's economy, particularly on trade-related sectors. Utilizing a hypothetical scenario and the Computable General Equilibrium (CGE) model, they calculated economic losses, revealing that in the absence of COVID-19, GDP growth

in 2020 would have been 4–8%, whereas after the pandemic, GDP growth dropped to -8.77 to -12.77%. Sectors such as transportation and services were most affected, with manufacturing and supply chains also experiencing significant economic losses.

Büchel et al. (2020) used data from Switzerland's Federal Customs Administration to assess the pandemic's effect on international goods trade between January and July 2020. They found that Swiss trade decreased by 11% compared to 2019. The decline after the "Federal Lockdown" in March 2020 was more pronounced than the trade contraction after Lehman Brothers' collapse in 2008. Their analysis of COVID-19 cases, containment measures, and Swiss trade patterns indicated that the pandemic impacted both the demand and supply sides of foreign trade. However, trade restrictions and currency fluctuations did not significantly contribute to the sharp decline in Swiss trade during the first half of 2020. Ongan and Gocer (2022) also identified a significant impact of the pandemic on the bilateral trade balance between Japan and the United States across 60 industries. Lastly, India, Sutradhar, Agarwal, and Goswami (2020) analyzed the pandemic's effects on India's foreign trade. Their trend analysis using graphs and tables revealed a negative impact, with substantial contractions in both exports and imports during the early stages of the pandemic.

Summary of Literature and Novelty of Research

The summary of literature highlights and suggests the fact that several studies have examined the impact of the COVID-19 pandemic on various macroeconomic indicators across various contexts. The majority of these studies find that the pandemic impacted the economy negatively. For instance, Gagnon, Kamin, and Kearns (2023) found that while COVID-19 deaths had minimal impact on GDP, government lockdowns significantly influenced GDP, particularly in developing countries. Similarly, Chaabouni & Mbarek (2024) found that health and education had a positive

impact on economic growth pre-pandemic, with this relationship weakening significantly post-pandemic. Farayibi et al. (2023) found that a 1% increase in COVID-19 cases led to a decrease in GDP per capita and the Human Development Index (HDI) in MENA countries. On trade, the study revealed similar trends. Hayakawa and Mukunoki (2021) found that both exporting and importing countries experienced significant declines in trade as a result of the pandemic, though these effects subsided after the first wave. Barbero, de Lucio, and Rodríguez-Crespo (2021) found that the pandemic significantly impacted trade negatively, with a more pronounced negative impact on trade amongst countries with regional agreements. With the African context importantly, Al-Deehani (2020) found that the pandemic's impact on GDP and trade in a panel of 10 African countries was negative. On a country-specific level, Nguyen et al. (2022), using Bayesian models, found short-term declines in the output gap and minor reductions in interest rates, inflation, and exchange rate fluctuations in Vietnam. Similarly, Chipumuro & Chikobvu (2022) examined the pandemic's effects on tourism in South Africa, revealing a 90% drop in tourist arrivals. In Uganda, Wemesa et al. (2021) found that COVID-19 caused a temporary imbalance in the country's trade. The existing literature offers a robust exploration of COVID-19's impact on economic growth, trade, human development, and other macroeconomic variables across different global regions, using a variety of econometric techniques. However, studies that focus on Sub-Saharan Africa (SSA) specifically, or that focus on how the pandemic impacted macroeconomic performance, particularly regarding economic growth and trade in the region, remain sparse and limited. Additionally, a large chunk of empirical literature focused primarily on developed or individual countries, with few exploring the region-specific impact of COVID-19 in SSA and the intricate relationships between the pandemic, economic growth, and trade in the region.

Therefore, this study fills these crucial gaps by examining the causal impact of COVID-19 on economic growth and trade within SSA, using panel data analysis and covering a broader sample of 38 countries over the period 2010 to 2022. This study further makes available a unique contribution by assessing whether the pandemic moderated the influence of key macroeconomic variables, such as investments and exchange rates, on economic growth and trade, which has been underexplored in the SSA context. The study utilizes the Generalized Method of Moments (GMM) estimators, which further strengthens the robustness of its findings and offers a deeper understanding of the pandemic's impacts on the region. This approach addresses the limitations of previous studies by offering a comprehensive, data-driven analysis specifically tailored to SSA, which remains underrepresented in the broader context of literature.

CHAPTER 3: DATA AND VARIABLE DISCUSSIONS

Data used and their Sources

This study utilized annual data from 2010 to 2022 to identify the impact of the COVID-19 pandemic on economic growth and trade in selected Sub-Saharan African countries. The GDP per capita acts as an indicator of economic growth. Inflation is assessed by the consumer price index, whereas trade, domestic investment, and foreign direct investment are quantified by percentage of GDP. The exchange rate is measured in local currency against the US dollar. Furthermore, globalization can be evaluated using social, political, and economic indices as explanatory variables. Globalization data is obtained from the 2024 globalization index website, while Covid-19 is derived using dummy pointers. Table 3.1 offers a detailed summary of the data source and the associated unit measures.

Table 3.1: Data and Source

Variable	Metric	Sources
Economic Growth	Log GDP constant 2015 USD	WDI (2024)
Government Spending	Log Government Final Consumption Expenditure	WDI (2024)
Exchange rate	Official Exchange Rate	WDI (2024)
Urbanization	Urban Population Growth % of population	WDI (2024)
Labor force	Labor force Participation Rate, Total	WDI (2024)
Financial Development	Financial Development Index	IMF (2024)
Domestic Investment	Log Gross Fixed Capital Formation	WDI (2024)
Trade	Trade % of GDP	WDI (2024)
GDP rest of the World	World GDP minus SSA GDP	Author Computation
Covid-19	Dummy	Author Computation

Source: Author's compilation

Description and Definition of variables and their inclusion in the analysis based on empirical literature

i. Economic growth

Economic growth defines an increase of goods and services output within an economy over a specified duration, commonly assessed by the escalation of real Gross Domestic Product (GDP). It is a primary indication of a nation's economic vitality. Economic growth is frequently designated as the dependent variable in research on macroeconomic performance. It is affected by multiple elements, including investment, commerce, and governmental policy. Researchers often utilize economic growth to evaluate the efficacy of policies or the effects of external shocks such as foreign direct investment (FDI) or globalization. Barro (1996) emphasizes economic growth as the principal indicator of development and associates it with variables such as foreign direct investment, domestic investment, and trade, illustrating how fluctuations in these elements substantially influence the economy's growth trajectory.

ii. Trade

Trade denotes the exchange of products and services among nations. Trade openness, defined as the ratio of exports plus imports to GDP, reflects the extent of an economy's integration into the global market. Trade is frequently incorporated in evaluations to assess its influence on economic growth and development. Open economies, characterized by elevated trade levels, are typically anticipated to have accelerated growth owing to access to expansive markets, finance, and technology. Empirical literature, including the work of Frankel and Romer (1999), indicates a positive correlation between trade and economic growth, wherein augmented commerce fosters elevated growth rates by improving productivity and competitiveness. Beyond economic growth,

trade has significant on a wide range of economic factors including poverty, inequality, employment, etcetera.

iii. Exchange rate

The exchange rate denotes the value of one currency in relation to another, frequently benchmarked against the US dollar. It affects trade dynamics, investment patterns, and overall economic performance. Fluctuations in exchange rates impact both foreign direct investment and trade movements. A stable and advantageous exchange rate is frequently associated with increased international investment and trade levels. An empirical study investigates the effects of exchange rate variations on domestic economic variables such as inflation, growth, and external debt. Edwards (1993), examine the correlation between exchange rate regimes and economic performance, concluding that exchange rate stability fosters investment and trade, hence facilitating economic growth. Rapetti, Skott, and Razmi (2012) analyze asymmetries across groups of countries and conclude that currency undervaluation has a stronger and more consistent positive effect on economic growth in developing nations. However, they observe that the relationship between real exchange rate (RER) undervaluation and per capita GDP is not linear, primarily benefiting the least developed and wealthiest countries. This irregular pattern presents a puzzle that warrants further investigation.

iv. Domestic investment

Domestic investment denotes the capital outlay by national entities, encompassing the government, corporations, and households, within the nation. It encompasses investments in infrastructure, equipment, and human resources. Domestic investment is frequently examined in conjunction with FDI to evaluate its complementary or substitutive connection with foreign investment. It is a crucial factor in assessing long-term growth potential and productivity. Study by Levine and

Renelt (1992) indicates that domestic investment is essential for sustained economic growth, demonstrating a strong link between investment rates and growth rates among nations.

v. Financial Development

The financial sector comprises institutions, instruments, markets, and the legal and regulatory frameworks that facilitate credit-based transactions. Financial sector development primarily addresses the costs associated with acquiring information, enforcing contracts, and conducting transactions (Valickova, Havranek, & Horvath, 2015). Reducing these costs has led to the creation of financial instruments, markets, and intermediaries tailored to different legal, regulatory, and tax systems (World Bank, 2024). This development enhances the financial system's ability to perform five core functions: generating information on potential investments and allocating capital, overseeing investments and enforcing corporate governance, enabling risk management and diversification, mobilizing and pooling savings, and simplifying the exchange of goods and services. Progress in the financial sector strengthens these functions, promoting economic efficiency by minimizing costs tied to information, enforcement, and transactions (World Bank, 2024). Valickova, Havranek, & Horvath (2015) in their meta-analysis found a positive effect of financial development, however, individual differences still ensued.

vi. Government Spending

Government spending, or expenditure, refers to the total funds allocated by a government to finance its operations and services (Burkhead & Miner, 2007). It is generally divided into three categories: government consumption, transfer payments, and interest payments. Government spending serves various objectives, including funding infrastructure projects, providing public services, ensuring social security, and maintaining national defense (Fan & Rao, 2003). Alqadi, &

Ismail (2019) in the review of empirical and theoretical literature found the impact of government spending on growth is inclusive, with majority of studies suggesting a positive impact.

vii. Urbanization

Urbanization refers to the movement of people from rural to urban areas, resulting in a decline in the rural population and changes in societal structures to accommodate this shift (Davis, 2015). It also encompasses the growth of urban populations compared to rural ones and is closely associated with the expansion of towns and cities as more individuals settle and work in centralized locations. The term "urban population" describes the number of individuals residing in urban areas, as determined by national statistical standards. Additionally, the urban population percentage represents the proportion of people living in urban areas per 100 individuals in the overall population (WDI, 2024). Chen et al., (2014) in their study found that urbanization has a significant influence on growth.

viii. GDP of the Rest of the World

In analysis, GDP of the Rest of the World is usually generated particularly in trade analysis, as Global GDP minus the GDP of the specific entity. In this analysis, it is gotten as Global GDP minus the GDP of the SSA countries that form the panel. Bah, Ondoa, & Kpognon (2021) used this variable in their analysis in trade related literature.

ix. Labor force Participation

The labor force participation rate (LFPR) is the percentage of a country's working-age population that is actively involved in the labor market. The labor force is the sum of the employed and unemployed people. Studies such as Thaddeus et al., (2022) found LFPR to impact growth negatively in SSA. However, majority of evidence suggest a positive effect.

x. COVID-19 Pandemic

COVID-19 is the worldwide pandemic induced by the SARS-CoV-2 virus, leading to extensive health and economic repercussions. The pandemic caused a decline in economic activities, interrupted supply lines, and placed pressure on global health systems. Covid-19 is frequently used as a dummy variable or as a shock in economic models to evaluate itsdirect and indirect impacts on economic growth, investment, trade, and employment. It facilitatesthe analysis of economic responses to the crisis and assesses their resilience to external shocks. Eichenbaum et al. (2020) illustrates the severe economic repercussions of Covid-19, utilizing models to evaluate the effectiveness of fiscal and monetary measures in alleviating the issue. The pandemic is an important element in analyzing post-crisis economic recovery. The Pre-Covid era (2010-2019) takes the value of 0, while the Covid Era (2020-2022) takes the value of 1

Justification of the Data Time Frame and Structure

The period from 2010 to 2022 is optimal for examining the macroeconomic effects of Covid-19 by contrasting the pre-Covid-19 era (2010-2019) with the era (2020-2022). The justification for the timeframe is premised on factors such as having a balanced data, analyzing the trade and growth after the global financial crises of 2007-2009, as well as the choice of the estimator which warrants that the cross-section (N) be greater than the Timeframe (T). The pre-Covid-19 era encompasses enduring economic trends such as globalization, investments, and trade, whereas the post-pandemic era emphasizes the immediate and continuing repercussions of Covid-19. A time-varying methodology is employed to monitor the evolution of variables such as GDP, inflation, and FDI across time, utilizing annual data for pre-Covid-19 trends and high-frequency data for the post-Covid-19 period due to increased volatility. The empirical literature endorses this

methodology, facilitating the examination of both long-term trends and short-term disturbances. This strategy offers insights into the recovery and structural alterations subsequent to the epidemic.

CHAPTER 4: METHODOLOGY

Theoretical Framework

The theoretical basis underpinning the study is the Solow growth model. This model posits that a consistent economic growth rate can be achieved by the optimal mix of three factors: labor, capital, and technology. The model can be presented as follows:

$$(t) = ((t)), (t) * (t)) \quad 4.1$$

Where r =, K = capital, L = labor, A = knowledge and t = time.

Equation 4.1 above entails at each given time t, the economy possesses a certain quantity of inputs (namely capital, labor, and knowledge), which are amalgamated to generate output Y. A and L are incorporated into the model multiplicatively and are termed effective labor. Maintaining capital K and labor L constant, a rise in knowledge (technical development) enhances output. The primary assumption regarding the production function, as articulated in equation 4.1, is that the function demonstrates consistent returns to scale in both capital and effective labor, which can be typically expressed as follows;

$$(cK, cAL) = (K, AL) \; For \; all \; c >= 0 \quad 4.2$$

Equation 4.2 indicates that multiplying both inputs by any nonnegative constant results in a proportional change in the output. Additional assumptions include that the initial levels of capital, labor, and knowledge are considered fixed and positive, with labor and knowledge increasing at constant rates. Depreciation, savings rates, labor supply, and technical advancement are presumed constant, employment variations are disregarded, and there is no governmental intervention. Considering the economy's growth over time, the theory, however, emphasizes output per unit of effective labor (y) and capital stock per unit of effective labor (k), as articulated in equation 4.3 below.

$$(t) = [(t)] \quad 4.3$$

To further expand equation (4.3) other determinants of effective labor could include trade, investment and economic distortions in form of shocks such as the pandemic amongst others.

Empirical Strategy

The study employs a dynamic model to systematically analyze the significance of COVID-19's impact on economic growth. Comparable research employs these estimation methodologies (Adeleye et al., 2022; Adeleye & Eboagu, 2019). The dynamic model refers to the Arellano and Bond (1991) two-step system generalized method of moments (system-GMM) estimator approach. This addresses endogeneity, cross-sectional dependence, serial correlation, and heteroscedasticity by incorporating instruments that are uncorrelated with the regressors in the estimation process. Another rationale for employing dynamic panel data modeling is the potential upward bias of the endogenous estimators associated with the OLS technique.

The validity of instruments utilized in system-GMM determines the consistency of the parameters derived from this estimator. Arellano and Bond (1991) proposed two specification tests to assess the validity of instruments: the Hansen statistic and the second-order serial correlation AR (2). The inability to reject the null hypothesis about the validity of over-identifying limitations, along with the absence of second-order serial correlation, supports the findings. Finally, the utilization of static and dynamic methodologies mutually reinforces each other to assess the consistency of the effects of COVID-19 on economic growth.

Model Specifications

This study follows the earlier underpinned theory to construct a working model to reflect Covid-19 impacts on the economic growth. Following the specifications of Gagnon, Kamin, and Kearns

(2023) with significant modifications, and given the variables already stated in chapter three, the model's functional form is expressed as:

$$GDP = (GS, EXR, LAB, URB, DINV, TRD, COVID) \quad 4.4$$

Equation (4.4) can also be expressed as follows:

$$GDP_{it} = \theta_0 + \theta_1 GS_{it} + \theta_2 EXR_{it} + \theta_3 LAB_{it} + \theta_4 URB_{it} + \theta_5 DINV_{it} + \theta_6 TRD_{it} + \theta_7 COVID_t + \varepsilon_{it} \quad 4.5$$

Where:

GDP = Economic growth

LAB = Labor force participation rate

EXR = Exchange rate

GS = Government Spending

URB = Urbanization

DINV = Domestic Investment

TRD = Trade

COVID = COVID-19 pandemic Dummy

i = Cross section

t = Time variant

ε = Error term

The pre-Covid era (2010-2019) takes the value of 0, while the Covid Era (2020-2022) takes the value of 1. Furthermore, to construct a working model to reflect Covid-19 impacts on thetrade, following the specifications of Nguyen et al. (2022) with significant modifications, and given the variables already stated in chapter three, the model's functional form is expressed as:

$$TRD = (EXR, FID, GDP, DINV, GDPrtw, COVID) \quad 4.6$$

Equation (4.6) can also be expressed as follows:

$$TRD_{it} = \theta_0 + \theta_1 EXR_{it} + \theta_2 GDPrtw_{it} + \theta_3 FID_{it} + \theta_4 DINV_{it} + \theta_5 COVID_t + \varepsilon_{it} \quad 4.7$$

Where:

TRD = Trade

EXR = Exchange rate

GDPrtw = GDP of the rest of the world

FID = Financial Development
DINV = Domestic Investment
COVID = COVID-19 pandemic Dummy
i = Cross section
t = Time variant
ε = Error term
Note, GDP, GDP of the rest of the world, Domestic Investment and government spending are logged prior to estimations. **All description of the variables can be found in table 3.1**

CHAPTER 5: RESULTS AND DISCUSSION

Introduction

In this chapter, the results of the estimations are presented and discussed. First, the results of the pre-estimation tests—descriptive statistics, correlations, and cross-sectional dependence tests—are presented. The regression results from the system GMM estimation technique are then presented in order to ascertain the impact of the COVID-19 pandemic on growth and trade. Finally, the findings from estimation are discussed in line with theoretical and empirical literature. To keep discussions straightforward, only the key variables of interest in the study are discussed. That is, the results of control variables are not discussed even though reported.

Pre-estimation Tests

Descriptive Information

Table 5.1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP (US$ Billions)	507	39.17	90.13	.83	535.30
Exchange Rate (Local currency per US$)	502	706.06	1323.62	1.4	9565.08
Domestic Investments (US$ Billions)	489	12.10	41.45	3.45	626.40
Trade (% GDP)	494	70.45	33.24	2.70	222.18
Labor force Participation, Total	502	63.96	10.01	41.42	87.64
Government Spending (US$ Billions)	505	4.79	11.45	7.15	70.59
Urbanization (Urban Population Growth)	506	3.63	1.25	-1.91	7.21
GDP of the rest of the World (US$ Billions)	507	77355.44	7823.53	64523.32	90368.46
Financial Development, Index	469	0.16	0.12	0.03	0.59

Source: Author's Estimations from Data

Table 5.1 shows the descriptive statistics of the variables used in this study, including the dependent variables, the independent variables, and the control variables. The mean of GDP over the study period is $39 billion (2015 constant prices). This is quite relatively small, particularly when compared to that of the rest of the world: $77.36 trillion (2015 constant prices). Again, domestic investments and government spending have means of $12 billion (2015 constant price)

and $4.7 billion (2015 constant prices), respectively. These figures reveal the relatively small nature of domestic investments in the region, as well as the size of government spending. Trade to GDP has a mean of 70%, which shows the importance and significance of trade in the GDP dynamics of the region, as well as the presence of a high degree of trade openness. The labor force participation rate has a mean of 63% for populations 15-64, while the mean of urbanization, which is proxied by urban population growth, is 3.6. Finally, financial development has a mean of 0.16. This shows that financial development in the region is very weak and low.

Table 5.2: Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) GDP	1.00									
(2) Exchange Rate	0.03	1.00								
(3) Domestic Investments	0.53	0.08	1.00							
(4) Trade	-0.22	-0.09	-0.08	1.00						
(5) Labor force Participation	0.24	0.16	0.16	-0.12	1.00					
(6) Government Spending	0.59	-0.10	0.26	-0.09	0.02	1.00				
(7) Urbanization	0.18	0.22	0.11	-0.31	0.32	-0.15	1.00			
(8) GDP of the rest of the World	0.07	0.06	0.03	-0.09	-0.04	0.01	-0.1	1.00		
(9) Financial Development	0.28	-0.24	0.19	0.33	-0.02	0.56	-0.4	0.06	1.00	
(10) COVID-19 pandemic	0.04	0.01	0.02	-0.09	-0.03	0.01	-0.0	0.52	0.03	1.0

Source: Author's Estimations from Data

Note; *the variable are defined as log GDP (US$ Billions), Exchange Rate (Local currency per US$), log of Domestic Investments (US$ Billions), Trade (% GDP), Total Labor force Participation rate, log of Government Spending (US$ Billions), Urbanization (Urban Population Growth % Total Population), GDP of the rest of the World (US$ Billions), and Financial Development Index*.

Table 4.2 shows the correlational analysis carried out to ascertain if significant collinearity exists among the variables used in this study. The result shows that there is no substantial correlation amongst the variables in the study. A hypothetical rule of thumb of 0.8 is used to know if variables are collinear and should be dropped. However, the highest correlation among the variables is between GDP and government spending, GDP and domestic investment, the COVID-19 pandemic and GDP of the rest of the world, and financial development and government spending. None of their correlations are up to 0.6, which shows that our estimates will not suffer from collinearity.

Table 5.3: Cross Sectional Dependence

Variable	CD-Test	P value
GDP	58.28	0.000
Exchange Rate	82.15	0.000
Domestic Investments	26.07	0.000
Trade	9.51	0.000
Labor force Participation	29.19	0.000
Government Spending	24.60	0.000
Urbanization	12.31	0.000
GDP of the rest of the World	98.14	0.000
Financial Development	23.07	0.000
COVID-19 Pandemic	98.14	0.000

Under the null hypothesis of cross-section independence, CD ~ N(0,1)

P values close to zero indicate data are correlated across panel groups.

Note; *the variable are defined as log GDP (US$ Billions), Exchange Rate (Local currency per US$), log of Domestic Investments (US$ Billions), Trade (% GDP), Total Labor force Participation rate, log of Government Spending (US$ Billions), Urbanization (Urban Population Growth % Total Population), GDP of the rest of the World (US$ Billions), and Financial Development Index*.

Table 5.3 shows the Pesaran's cross-sectional dependence test to ascertain if there is cross-sectional dependence. Cross-sectional dependence is a phenomenon that occurs when all units in the same cross-section of panel data are correlated (Tugcu, 2018). Cross-sectional dependence can lead to inconsistent estimators and invalid test statistics. Based on the result in table 5.3, it is evident that there is cross-sectional dependence among the variables employed in this study. Because the presence of cross-sectional is found among all the variables in the study, this is corrected for using the procedures of Tchamyou, Erreygers, and Cassimon (2019) and Asongu and Nting (2021). According to them, when there is evidence of cross-sectional dependence in a panel, this can be controlled for under the system GMM framework through the introduction of time effects in the model.

Regression Results

First, a baseline model is estimated using pooled OLS which is reported in the appendix. However, since the variables already showed the presence of cross-sectional dependence and inherent

endogeneity, relying on the OLS results can be misleading. Hence, the GMM is estimated. When the GMM is applied, coefficients of certain variables as well as the standard errors and direction of effects change after the GMM models are fitted to account for endogeneity, serial correlation, cross-sectional dependence and unobserved heterogeneity. Furthermore, the GMM results show that all results are efficient and robust. The AR (2) tests, year effects, and Hansen's test followed apriori expectation. Moreover, the number of groups is greater than the number of instruments.

Table 5.4: COVID-19 Impacts on GDP using the Two-Step System GMM

	Overall Sample Log of GDP	Pre-Covid Log of GDP	During Covid log of GDP
L1.log of GDP	1.034***	0.991***	1.006***
	(0.0148)	(0.00782)	(0.00697)
Exchange Rate	0.0000172**	0.00000692**	0.00000429**
	(0.00000587)	(0.00000233)	(0.00000157)
Domestic Investment	0.00919**	0.0105*	-0.00754**
	(0.00283)	(0.00446)	(0.00224)
Trade	0.00123***	0.000589***	-0.0000203
	(0.000133)	(0.0000888)	(0.000153)
Labor Force Participation	-0.00667**	-0.00615***	-0.00389***
	(0.00215)	(0.000722)	(0.000553)
Government Spending	-1.120	1.320**	2.730*
	(9.440)	(4.570)	(1.220)
Urbanization	0.0171**	0.0325***	0.0192*
	(0.00528)	(0.00330)	(0.00897)
Covid-19 Pandemic	-0.0493***		
	(0.00428)		
Constant	-4.412*	3.737***	-6.532***
	(2.117)	(0.682)	(1.121)
YEAR (Significant)	Yes	Yes	Yes
AR(2)	0.094	0.68	0.792
Hansen	0.577	0.323	0.268
Number of Groups	37	37	36
Number of Instruments	29	33	33
F	4136156.0***	3283321.9***	8732965.9***
N	432	331	101

Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note; *the variable are defined as log GDP (US$ Billions), Exchange Rate (Local currency per US$), log of Domestic Investments (US$ Billions), Trade (% GDP), Total Labor force Participation rate, log of Government Spending (US$ Billions), Urbanization (Urban Population Growth % Total Population) and the Covid-19 pandemic (Dummy)*

Table 5.4 and Table 5.5 present the results of the estimations undertaken to answer the research

questions asked in this study. Three estimations are undertaken for both the GDP and trade models. Three periods (2010-2022, 2010-2019, and 2020-2022) are taken into consideration, reflecting the full sample period (2010-2022), which aids us to ascertain the impact of the pandemic on GDP and trade; the pre-Covid period (2010-2019) to ascertain the impact of exchange rates and domestic investment on GDP and trade before the pandemic; and the Covid period (2020-2022) to ascertain the impact of exchange rates and domestic investment on GDP and trade during the pandemic.

For overall sample in table 5.4, the coefficient value of the log-transformed lag of GDP suggests that a 1% increase in previous period GDP resulted in a 1.03% rise in the Africa's current period GDP. The result also shows that the COVID-19 pandemic had a negative and significant effect on GDP. Specifically, the coefficient of COVID-19 dummy is -0.04493 suggesting that COVID-19 period is associated with 4.9% contraction in GDP compared to pre- COVID-19 period. Exchange rate and domestic investment as key macroeconomic variables had significant and positive effects on GDP, although the effect of exchange is very small. Also, trade and urbanization both had positive and significant effects on GDP in the overall period. Meanwhile, while labor force participation has a significant and negative effect on growth, government spending had no significant effect. In the pre-Covid period, exchange rates and domestic investment both had significant and positive effects on GDP. Similarly, in the pre-Covidperiod, government spending, trade, and urbanization all had positive and significant effects on GDP, while labor force participation has a significant and negative effect on growth. However, inthe Covid period, while the exchange rate still had a significant effect on growth, the size of the coefficient compared to the pre-Covid period is smaller. Furthermore, the effect of domestic investment on growth becomes negative in the Covid period. This suggests that the pandemic impacted the relationship between exchange rate and domestic investment on growth negatively. This is similar to that of trade, whose effect becomes insignificant in the Covid period compared

to its positive and significant effect in the pre-Covid period. Government spending still had a positive effect on growth in the Covid period, with the size of effects being higher than in the pre-Covid period. Urbanization still had a significant effect on growth, but the size of the coefficient compared to the pre-Covid period is smaller. Finally, labor force participation has a significant and negative effect on growth in the Covid period. This result shows that the pandemic not only had a negative effect on GDP but also negatively impacted the effect of exchange rate, domestic investment, trade, and urbanization on growth.

Table 5.5: COVID-19 Impacts on Trade using the Two-Step System GMM

	Overall Sample Trade (% GDP)	Pre-Covid Trade (% GDP)	During Covid Trade (% GDP)
L1.Trade (% GDP)	0.668***	0.949***	0.893***
	(0.0187)	(0.0403)	(0.0712)
Exchange Rate	0.00247***	-0.000172	0.00274***
	(0.000252)	(0.000149)	(0.000480)
Domestic Investment	0.326	3.306***	0.117
	(0.588)	(0.870)	(0.639)
GDP	-6.318***	-5.961*	-4.399*
	(0.879)	(2.571)	(1.930)
GDP of the rest of the World	272.6***	505.0**	126.2***
	(28.07)	(143.2)	(11.56)
Financial Development	54.75***	1.030	39.22*
	(10.14)	(6.851)	(16.42)
Covid-19 Pandemic	13.69***		
	(1.503)		
Constant	8914.6***	14634.0***	-5989.4***
	(895.3)	(4042.3)	(821.0)
YEAR (Significant)	Yes	Yes	Yes
AR(2)	0.106	0.148	0.438
Hansen	0.139	0.645	0.321
Number of Groups	37	37	36
Number of Instruments	31	24	28
F	5820.5***	11360.9***	2365.8***
N	405	333	72

Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note; *the variable are defined as log GDP (US$ Billions), Exchange Rate (Local currency per US$), log of Domestic Investments (US$ Billions), GDP of the rest of the World (US$ Billions), Financial Development Index, and the Covid-19 pandemic (Dummy)*

Table 5.5 presents the results of the impact of the pandemic on trade. The variable for trade here

is the value of trade % GDP. Based on the results of the overall sample, the effects of the pandemic on trade were positive and significant. Specifically, the coefficient of COVID-19 dummy is 13.69 suggesting that COVID-19 period is associated with 13.69% increase in trade compared to pre-COVID-19 period. This means that positive gains in trade were witnessed as a result of the pandemic. Similarly, the exchange rate had a positive and significant effect on trade, while the effect of domestic investment was not significant. For the control variables, financial development and the GDP of the rest of the world both had positive and significant effects on trade, while GDP had a significant and negative effect on trade. In the pre-Covid period, the exchange rate did not significantly impact trade, while domestic investment had a positive and significant effect on trade. While the GDP of the rest of the world had positive and significant effects on trade in the pre-Covid period with a coefficient higher than both the overall sample and during the Covid period, financial development did not significantly influence trade in the pre-Covid period. As with the overall sample, GDP had a negative and significant effect on trade. In the Covid-19 period, the effect on the exchange rate becomes positive and significant, unlike its insignificance in the pre-Covid period. Meanwhile, like in the overall sample, the effect of domestic investment on trade becomes insignificant compared to its positive and significant effect in the pre-Covid period. Financial development and the GDP of the rest of the world both had positive and significant effects on trade in the Covid period, as with the overall sample, while GDP still impacted trade negatively in the Covid period.

Robustness of Results

Tables 5.6 and 5.7 show the robustness checks carried out on the impact of the pandemic on the selected macroeconomic variables. The instrumental variable fixed effects (IV-FE) estimator is used to ascertain how robust our estimates are to the econometric technique employed. A notable feature of the IV-FE estimator is its ability to handle time-variant effects as well as endogeneity.

The year variable is also included in the IV-FE modeling to account for cross-sectional dependence. Generally, the results show the pandemic's effect on GDP and trade is robust in terms of the direction of impact. The only differences are in the standard errors. It is therefore safe to conclude that the effect of the COVID-19 pandemic on growth in SSA is negative, while its impact on trade is positive.

Table 5.6: Robustness checks for COVID-19 Impacts on GDP using IV-Fixed Effects

	IV-Fixed Effects Log of GDP	GMM Log of GDP
L1.Log of GDP		1.034***
		(0.0148)
Exchange Rate	0.0000468**	0.0000172**
	(0.0000152)	(0.00000587)
Domestic Investment	0.150***	0.00919**
	(0.0148)	(0.00283)
Trade	-0.000778	0.00123***
	(0.000475)	(0.000133)
Labor Force Participation	-0.0112***	-0.00667**
	(0.00298)	(0.00215)
Government Spending	2.03***	-1.120
	(4.58)	(9.44)
Urbanization	0.00135	0.0171**
	(0.0104)	(0.00528)
Covid-19 Pandemic	-0.0272*	-0.0493***
	(0.0130)	(0.00428)
Year	0.0225***	0.00185
	(0.00204)	(0.00103)
Constant	-24.65***	-4.412*
	(4.069)	(2.117)
R^2	0.723	
F	127.8***	4136156.0***
N	437	432

Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note; *the variable are defined as log GDP (US$ Billions), Exchange Rate (Local currency per US$), log of Domestic Investments (US$ Billions), Trade (% GDP), Total Labor force Participation rate, log of Government Spending (US$ Billions), Urbanization (Urban Population Growth % Total Population) and the Covid-19 pandemic (Dummy)*

Table 5.7: Robustness checks for COVID-19 Impacts on Trade using IV-Fixed Effects

	IV-Fixed Effects Trade (% GDP)	GMM Trade (% GDP)
L1.Trade (% GDP)		0.668***
		(0.0187)
Exchange Rate	0.00656***	0.00247***
	(0.00159)	(0.000252)
Domestic Investment	8.447***	0.326
	(1.642)	(0.588)
GDP	-8.280	-6.318***
	(5.210)	(0.879)
GDP of the rest of the World	44.67	272.6***
	(33.74)	(28.07)
Financial Development	17.35	54.75***
	(25.62)	(10.14)
Covid-19 Pandemic	1.652	13.69***
	(1.655)	(1.503)
Year	-2.604**	-8.672***
	(0.977)	(0.884)
Constant	3895.3***	8914.6***
	(941.4)	(895.3)
R^2	0.236	
F	17.55***	5820.5***
N	441	405

Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note; *the variable are defined as log GDP (US$ Billions), Exchange Rate (Local currency per US$), log of Domestic Investments (US$ Billions), GDP of the rest of the World (US$ Billions), Financial Development Index, and the Covid-19 pandemic (Dummy)*

Discussion of Results

The result of the estimations shows that the Covid-19 pandemic had a negative effect on growth. There are several reasons as to why the pandemic reduced economic growth in SSA. For instance, key revenue paths of some SSA countries were heavily affected, such as oil exports. 7.3 percent of Africa's GDP and about 40 percent of the total exports are accounted for by oil exports (Sia et al., 2023). Nonetheless, since the pandemic's inception, there has been a significant drop in the prices of oil, with these fluctuations significantly impacting the region's oil-exporting economies. By 2020, fuel revenues in Africa are estimated to decline by over $65 billion, with the worst-hit countries being Angola, Nigeria, Libya, and Algeria (Sia et al., 2023). On average, their oil exports

from 2016 to 2018 made up 90% of overall exports, compared to 55% for Congo and Gabon. FDI was another key macroeconomic variable important for growth, which was hit by the pandemic. The inflow of FDI into SSA increased by over 500% from about US$8 billion in 2000 to about US$49 billion in 2019, with the region's economy witnessing a significant leap in growth during this period (Asafo-Agyei & Kodongo, 2022). However, as a result of the pandemic, FDI declined by 16% in 2020 to $40 billion, from $47 billion in 2019 (UNCTAD, 2021). Tourism is another important factor in the GDP of SSA, which was affected adversely by the pandemic. Noting that the pandemic has exerted a negative impact on the overall economy, Henseler, Maisonnave, & Maskaeva (2022) stated that the tourism sector, which contributes around 9% to real GDP and supports approximately 7% of all jobs in Africa, was severely impacted by the COVID-19 pandemic.

Furthermore, based on the analysis, the results showed that in the pre-Covid period, the exchange rate and domestic investment both had significant and positive effects on GDP. However, in the Covid period, while the exchange rate still had a significant effect on growth, the size of the coefficient compared to the pre-Covid period is smaller. Furthermore, the effect of domestic investment on growth becomes negative in the Covid period. This means that the pandemic had a significant effect on domestic investment within the region, thus impacting growth. For instance, IMF (2021) estimates on private savings (which is an important facet of domestic investment) showed that there was no increase in private saving rates during the first year of the COVID-19 pandemic in SSA. Similarly, the study by Loko, Nembot, & Ribeiro (2022) found that the pandemic significantly and negatively impacted private savings of SSA households. Furthermore, Heinemann, Osman, and Xia (2021) noted that the pandemic significantly impacted the private sector, affecting sectors such as metal, mining, oil, gas, tourism, and transportation due to

decreased demand. Border closures disrupted supply chains, affecting sectors like industry and agriculture that rely on foreign inputs. Despite government support, the scale of the shock could be significant, with nearly as many firms on the brink of financial distress as in other developing regions. The ineffective roll-out of financial aids in Africa worsened the situation for firms. Several countries reported an increase in company closures and job losses, as employment decreased by 8.5% in Sub-Saharan Africa in 2020 (Heinemann, Osman, and Xia, 2021).

While the analysis revealed that the pandemic increased trade in SSA, however, during the pandemic period, the effect of trade on GDP was not significant. This is suggestive of another path through which the effect of the pandemic on growth can be seen. It is important to note, however, that how the pandemic influenced trade is nuanced and mixed (Amutabi, 2024). Finally, government spending had a positive effect on growth in the pre-Covid and the Covid period, with the size of effects being higher than in the pre-Covid period. Perhaps this is reflective of the importance of government spending during recessions and uncertainties. Keynesian economics holds that higher government expenditure, which includes all the consumption of, investment of, and transfer payments by the government, boosts consumption and aggregate demand, which in turn boosts output and speeds up the recovery from recessions (Tucker, 2012).

On trade, the results suggest that the effect of the pandemic on trade was positive. This means that positive gains in trade were witnessed as a result of the pandemic. The results suggest that despite the negative effects of the pandemic on most parts of economic activity, the results may be suggestive of that trade activities persisted despite disruptions as a result of the pandemic. Furthermore, this could be due to the accelerated implementation of policies aimed at boosting trade, such as the AfCFTA, especially as the study sample expands to 2022. Launched in early 2021, the AfCFTA may have helped maintain or even enhance regional trade flows, compensating

for potential declines in international trade. Additionally, certain sectors may have remained resilient or even expanded, such as pharmaceuticals, essential goods, and food products, which experienced steady demand throughout the pandemic (Heinemann, Osman, and Xia, 2021). The effects of the pandemic on trade generally are mixed. Amutabi's 2024 study examined the COVID-19 pandemic's impact on the trade balance of EAC economies from March 2020 to December 2022 using the PMG model. The study found a long-term relationship between COVID-19 and trade deficits, imports, and exports in the region. The pandemic's short-term impact on the trade deficit was insignificant, while its long-term impact was positive and significant. Despite easing lockdown measures, the pandemic had no significant impact on exports.

The effect of domestic investment on trade, which was positive and significant before the pandemic, became insignificant during the pandemic period. This change suggests that investments did not play as pivotal a role in driving trade as they did pre-COVID, possibly because firms and industries faced constraints or uncertainties that limited their capacity to invest in trade-related infrastructure or production. The COVID-19 pandemic significantly impacted domestic investment in Sub-Saharan Africa, negatively impacting private savings (Loko, Nembot, & Ribeiro, 2022) and affecting sectors like metal, mining, oil, gas, tourism, and transportation (Osman and Xia 2021), thus impacting the effect of domestic investment on trade specifically. The exchange rate also played a significant role in trade dynamics during the pandemic period, becoming a positive and significant determinant of trade in contrast to its pre-pandemic insignificance. This shift highlights the critical role of exchange rates in supporting trade activities when external shocks affect the economy. During the pandemic, SSA countries may have experienced currency depreciations, which likely made exports cheaper and thus more attractive to foreign markets, boosting trade. The newfound significance of exchange rates in the COVID

period underscores the importance of exchange rate management in protecting economies during global crises, as depreciation can offer a competitive advantage in export markets.

Financial development maintained a positive and significant influence on trade across both the pandemic and pre-pandemic periods, suggesting that a robust financial sector remains essential for sustaining trade flows (Saif, Ruan, & Obrenovic, 2021). Financial development likely provided critical support for trade financing (Malouche, 2009), enabling firms to navigate the pandemic's challenges more effectively. In the pre-COVID period, however, financial development was not a significant determinant of trade, possibly indicating that the financial sector's role became more pronounced when economies faced liquidity constraints and trade financing challenges. These results highlight the importance of a well-functioning financial sector in mitigating trade disruptions during economic shocks. Overall, the results of this study's analysis highlight the importance of exchange rate policies and financial sector resilience in supporting trade amid external shocks. Meanwhile, the shift in the role of domestic investment indicates that pandemic-related uncertainties can weaken the usual positive impact of investments on trade. This suggests that policy strategies during crises should prioritize exchange rate stability and financial support mechanisms to sustain trade activities. In conclusion, the findings of this study have significant implications for policy, research, and practice.

CHAPTER 6: SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

Summary

The COVID-19 pandemic exerted significant effects, particularly negative, on the globe. It ranged from healthcare to the economy to society, as well as other critical aspects of human endeavors. Its rapid spread around the globe, as well as the fatality rates, which were in the thousands, made it a pandemic of global proportion and the first major global pandemic since the turn of the century. While the pandemic affected the globe significantly, Africa, particularly Sub-Saharan Africa, was also hit significantly, particularly economically. With recovery remaining uneven and fragile, as well as the need to understand the impact of the pandemic on economic growth and trade in SSA, the need for planning and policy frameworks that will help against shocks in the event of future pandemics, and the sparseness of empirical evidence on the dynamic effects of the pandemic on macroeconomic performance in the SSA region, this study investigated the impact of the COVID-19 pandemic on macroeconomic performance in Sub-Saharan Africa by answering two questions: 1) What is the impact of the pandemic on economic growth in SSA? 2) How has the pandemic affected trade in Sub-Saharan Africa? Did the pandemic moderate the effect of investment and exchange rate on economic growth and trade in SSA? The Generalized Method of Moments (GMM) estimator was used for analysis on panel data for selected sub-Saharan African countries. The study covers a sampled period of 2010 to 2022 for over 38 targeted countries in Sub-Saharan Africa.

Many important findings emerged from the analysis undertaken in the study. First, the analysis showed that the COVID-19 pandemic had a negative and significant effect on GDP. That is, in the SSA region, the COVID-19 pandemic led to significant contraction in GDP. Furthermore, in the pre-Covid period, exchange rates and domestic investment both had significant and positive effects

on GDP. However, in the Covid period, while the exchange rate still had a significant effect on growth, the size of the coefficient compared to the pre-Covid period is smaller. Furthermore, the effect of domestic investment on growth becomes negative in the Covid period. This suggests that the pandemic impacted the relationship between exchange rate and domestic investment on growth negatively. Government spending still had a positive effect on growth in the Covid period, with the size of effects being higher than in the pre-Covid period.

On trade, the results showed that the pandemic had a significant effect on trade, which we intuit may have been due to the accelerated implementation of policies aimed at boosting trade, such as the AfCFTA, as well as many sectors remaining resilient or even expanding, such as pharmaceuticals, essential goods, and food products, which experienced steady demand throughout the pandemic. In the pre-Covid period, the exchange rate did not significantly impact trade, while domestic investment had a positive and significant effect on trade. In the Covid-19 period, the effect on the exchange rate became positive and significant, unlike its insignificance in the pre-Covid period. Meanwhile, as in the overall sample, the effect of domestic investment on trade became insignificant compared to its positive and significant effect in the pre-Covid period. Financial development had a positive and significant effect on trade in the Covid period, as with the overall sample, but was not significant in the pre-Covid period.

Implications of Findings

The findings of this study show the crucial need for adaptive as well as proactive fiscal and monetary policies in the face of global volatilities, uncertainties, and disruptions from the COVID-19 pandemic. It is important for policymakers to give more attention to creating and building resilient and sustainable economic frameworks that can withstand the test of crises, particularly strengthening domestic investment mechanisms to prevent negative spillovers. The observed

contraction in GDP highlights the need for reducing reliance on vulnerable sectors and urgently diversifying economic activities. Also, the result highlights the need for trade policies geared towards integration, such as the AfCFTA, for sustained investments in regional integration to shield domestic economies from global shocks and uncertainties. The positive effects of government spending on growth in the pandemic period underscore how crucially countercyclical fiscal policies can be effective during crises in line with the Keynesian economic theory. Finally, policies that are geared towards promoting exchange rate stability and enhancing financial sector development for managing growth and trade during crises should be fostered. Reforms geared towards managing currency volatilities, digitalization, and financial inclusivity during periods of economic uncertainty remained crucial.

Practically, the findings of this study further highlight the need for individuals, firms, and countries to prepare for shocks and economic disruptions. Households, governments, and practitioners should make efforts towards the development of crisis-response strategies that are robust, focusing on critical areas such as the promotion of local production in order to reduce overreliance on global markets, exchange rate stability and financial development for trade balance, supply chain resilience, and fiscal policy for stimulating aggregate demand. The positive impact of financial development on trade during the pandemic suggests that businesses should prioritize integrating advanced financial technologies, such as e-payment systems, to adapt to rapidly changing trade dynamics. Firms can further take advantage of the AfCFTA and other regional initiatives to boost local production, increase resilience, and mitigate risks associated with global trade and economic interruptions. Investment in digital infrastructure and skills development is also crucial to enhance productivity and adapt to changing work and trade environments.

Conclusion

This study investigated the impact of the pandemic on economic growth and trade in Sub-Saharan Africa by carrying out robust analysis that takes into cognizance both the pre-pandemic period and the during-pandemic period. The findings suggest that the pandemic had significant effects on economic growth and trade in SSA. While it had negative effects on growth, it had a positive effect on trade. Hence, it is important that country governments and policymakers map out strategies that will aid the economy in the event of future global shocks. In terms of research, this study provides a foundation for further investigations into the long-term impact of pandemics and global shocks on macroeconomic variables. Future studies could investigate the effect of the pandemic on specific sectors of the economy in order to understand the varying effects, resilience, and vulnerabilities across sectors in the economy. Furthermore, comparative analyses between regions are needed in order to quantify and identify contextual factors that increase or decrease the adverse effects of pandemics and global shocks on economic growth and trade. The mixed findings on the impact of exchange rates and domestic investment on growth and trade during the pandemic call for further inquiries into the factors that influence these relationships under economic shocks. Moreover, longitudinal studies that examine the post-COVID-19 recovery process would offer substantial information and insights into whether or not policies that were implemented during the crisis were effective, thus providing valuable lessons for managing future global disruptions. Researchers could further explore how financial development can be leveraged to enhance economic resilience during periods of global shocks and uncertainties. Lastly, exploring government spending can be an instrument for stimulating the economy during pandemics or periods of global shocks, as well as how digital technologies and financial innovation interact with trade during crises warrants deeper investigation.

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APPENDIX

Preestimations
DESCRIPTIVES

```
. asdoc sum GDPbill EXR dominvbill Trade laborforce govsizebill URPOP GDProtwbill FinDevInde
(File Myfile.doc already exists, option append was assumed)
```

Variable	Obs	Mean	Std. Dev.	Min	Max
GDPbill	507	39.16827	90.12663	.8333	535.3
EXR	502	706.0623	1323.619	1.429983	9565.082
dominvbill	489	12.10134	41.44826	3.45e-08	626.4
Trade	494	70.44776	33.23511	2.698834	222.1782
laborforce	502	63.95652	10.01427	41.416	87.642
govsizebill	505	4.784426	11.44809	7.15e-09	70.59
URPOP	506	3.625837	1.249798	-1.912491	7.210725
GDProtwbill	507	77355.44	7823.527	64523.32	90368.46
FinDevInde	469	.1563762	.1196722	.0281231	.5925185

CORRELATIONS

```
. asdoc corr lggdp EXR dominv Trade laborforce ggoveexp URPOP logGDProtw FinDevInde Covid19
(File Myfile.doc already exists, option append was assumed)
(obs=438)
```

	lggdp	EXR	dominv	Trade	laborf~e	ggoveexp	URPOP	logGDP~w	FinDev~e	Covid19
lggdp	1.0000									
EXR	0.0328	1.0000								
dominv	0.5382	0.0804	1.0000							
Trade	-0.2283	-0.0915	-0.0832	1.0000						
laborforce	0.2452	0.1651	0.1670	-0.1254	1.0000					
ggoveexp	0.5896	-0.1039	0.2648	-0.0952	0.0243	1.0000				
URPOP	0.1895	0.2269	0.1188	-0.3127	0.3217	-0.1555	1.0000			
logGDProtw	0.0701	0.0595	0.0347	-0.0957	-0.0467	0.0155	-0.0767	1.0000		
FinDevInde	0.2856	-0.2436	0.1979	0.3341	-0.0232	0.5629	-0.4232	0.0645	1.0000	
Covid19	0.0472	0.0183	0.0230	-0.0936	-0.0382	0.0159	-0.0465	0.5270	0.0346	1.0000

Click to Open File: Myfile.doc

CROSS-SECTIONAL DEPENDENCE

xtcd test on variables lggdp EXR dominv Trade laborforce ggoveexp URPOP logGDProtw FinDevInde Covid19

Panelvar: C_ID

Timevar: Year

Variable	CD-test	p-value	average joint T	mean ρ	mean abs(ρ)	
lggdp	58.28	0.000	13.00	0.59	0.78	
EXR	82.156	0.000	12.75	0.85	0.85	
dominv	26.078	0.000	12.74	0.26	0.53	38 combinations of panel units ign

> ored (insufficient joint observations).

Trade	9.517	0.000	13.00	0.09	0.37	38 combinations of panel units ign

> ored (insufficient joint observations).

laborforce	29.193	0.000	12.74	0.30	0.58	
ggoveexp	24.601	0.000	12.90	0.25	0.61	
URPOP	12.314	0.000	12.95	0.13	0.60	
logGDProtw	98.148	0.000	13.00	1.00	1.00	
FinDevInde	23.073	0.000	12.00	0.24	0.45	
Covid19	98.148	0.000	13.00	1.00	1.00	

Notes: Under the null hypothesis of cross-section independence, CD ~ N(0,1)

P-values close to zero indicate data are correlated across panel groups.

BASELINE ESTIMATES USING OLS
GDP

```
. reg lggdp  EXR dominv Trade laborforce ggoveexp URPOP Covid19
```

Source	SS	df	MS	Number of obs	=	468
				F(7, 460)	=	87.04
Model	446.943085	7	63.8490122	Prob > F	=	0.0000
Residual	337.43256	460	.733549044	R-squared	=	0.5698
				Adj R-squared	=	0.5633
Total	784.375646	467	1.67960524	Root MSE	=	.85647

lggdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
EXR	-.0000102	.0000303	-0.34	0.736	-.0000698	.0000493
dominv	.1391163	.0126577	10.99	0.000	.1142421	.1639904
Trade	-.0030662	.0013788	-2.22	0.027	-.0057758	-.0003566
laborforce	.0141758	.0041784	3.39	0.001	.0059647	.022387
ggoveexp	6.12e-11	3.93e-12	15.57	0.000	5.35e-11	6.89e-11
URPOP	.1733164	.036886	4.70	0.000	.1008305	.2458023
Covid19	.1394088	.0972344	1.43	0.152	-.05167	.3304875
_cons	18.61911	.3703839	50.27	0.000	17.89126	19.34697

TRADE

```
. reg Trade EXR dominv lggdp logGDProtw FinDevInde Covid19
```

Source	SS	df	MS	Number of obs	=	442
				F(6, 435)	=	28.64
Model	139273.632	6	23212.272	Prob > F	=	0.0000
Residual	352565.293	435	810.494927	R-squared	=	0.2832
				Adj R-squared	=	0.2733
Total	491838.925	441	1115.28101	Root MSE	=	28.469

Trade	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
EXR	.0007955	.0010266	0.77	0.439	-.0012223	.0028133
dominv	.3248714	.4921319	0.66	0.510	-.6423806	1.292123
lggdp	-10.24457	1.260455	-8.13	0.000	-12.72191	-7.767232
logGDProtw	-31.2822	17.01721	-1.84	0.067	-64.72838	2.163975
FinDevInde	129.4269	12.03545	10.75	0.000	105.772	153.0818
Covid19	-3.203568	4.327935	-0.74	0.460	-11.70983	5.302695
_cons	1280.078	542.7197	2.36	0.019	213.3988	2346.757

GMM ESTIMATES
GDP AND COVID OVERALL

```
. xtabond2 lggdp l.lggdp EXR dominv Trade laborforce ggoveexp URPOP Covid19 Year, gmm(l.lggdp l(0/1).EXR l(0/1).do
> minv l(0/1).Trade l(0/1).laborforce l(0/1).ggoveexp l(0/1).URPOP, lag (1 1) collapse) iv(Year Covid19, eq(diff))
>  nodiffsargan twostep small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: C_ID                            Number of obs      =       432
Time variable : Year                            Number of groups   =        37
Number of instruments = 29                      Obs per group: min =         8
F(9, 36)      =  4.14e+06                                      avg =     11.68
Prob > F      =     0.000                                      max =        12
------------------------------------------------------------------------------
      lggdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
      lggdp |
        L1. |   1.034397   .0148267    69.77   0.000     1.004327   1.064467
            |
        EXR |   .0000172   5.87e-06     2.93   0.006     5.32e-06   .0000291
     dominv |   .0091934    .002826     3.25   0.002     .0034621   .0149247
      Trade |   .0012263   .0001328     9.24   0.000      .000957   .0014956
 laborforce |  -.0066694   .0021512    -3.10   0.004    -.0110322  -.0023066
   ggoveexp |  -1.12e-12   9.44e-13    -1.19   0.242    -3.04e-12   7.91e-13
      URPOP |   .0171095   .0052801     3.24   0.003      .006401    .027818
    Covid19 |  -.0492644   .0042753   -11.52   0.000    -.0579352  -.0405936
       Year |    .001852   .0010332     1.79   0.081    -.0002434   .0039474
      _cons |  -4.412018   2.117196    -2.08   0.044     -8.70589  -.1181457
------------------------------------------------------------------------------
Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  Standard
    D.(Year Covid19)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.(L.lggdp EXR L.EXR dominv L.dominv Trade L.Trade laborforce L.laborforce
    ggoveexp L.ggoveexp URPOP L.URPOP) collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.lggdp EXR L.EXR dominv L.dominv Trade L.Trade laborforce L.laborforce
    ggoveexp L.ggoveexp URPOP L.URPOP) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.98  Pr > z =  0.047
Arellano-Bond test for AR(2) in first differences: z =  -1.68  Pr > z =  0.094
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(19)   = 120.43  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(19)   =  17.19  Prob > chi2 =  0.577
  (Robust, but weakened by many instruments.)
```

PRE COVID AND GDP

```
. ***PRE-COVID
. xtabond2 lggdp l.lggdp EXR dominv Trade laborforce ggoveexp URPOP Year if Covid19 ==0, gmm(l.lggdp l(0/1).EXR l(
> 0/1).dominv l(0/1).Trade l2.laborforce l(0/1).ggoveexp l(0/1).URPOP, lag (1 2) collapse) iv(Year, eq(diff)) nodi
> ffsargan orthog twostep small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: C_ID                            Number of obs      =       331
Time variable : Year                            Number of groups   =        37
Number of instruments = 33                      Obs per group: min =         7
F(8, 36)      =  3.28e+06                                      avg =      8.95
Prob > F      =     0.000                                      max =         9
------------------------------------------------------------------------------
      lggdp |      Coef.   Std. Err.      t    P>|t|    [95% Conf. Interval]
------------+-----------------------------------------------------------------
      lggdp |
        L1. |   .9913305   .0078193  126.78   0.000    .9754721   1.007189
            |
        EXR |  6.92e-06   2.33e-06    2.97   0.005    2.19e-06   .0000116
     dominv |   .0105416   .0044625    2.36   0.024    .0014913    .019592
      Trade |    .000589   .0000888    6.63   0.000    .0004089   .0007691
 laborforce |  -.0061494    .000722   -8.52   0.000   -.0076136  -.0046852
   ggoveexp |  1.32e-12   4.57e-13    2.89   0.007    3.94e-13   2.25e-12
      URPOP |   .0325339   .0032967    9.87   0.000    .0258478   .0392199
       Year |  -.0017458   .0003136   -5.57   0.000   -.0023819  -.0011098
      _cons |   3.737472   .6821616    5.48   0.000    2.353984    5.12096
------------------------------------------------------------------------------
Warning: Uncorrected two-step standard errors are unreliable.

Instruments for orthogonal deviations equation
  Standard
    FOD.Year
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/2).(L.lggdp EXR L.EXR dominv L.dominv Trade L.Trade L2.laborforce
    ggoveexp L.ggoveexp URPOP L.URPOP) collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.lggdp EXR L.EXR dominv L.dominv Trade L.Trade L2.laborforce ggoveexp
    L.ggoveexp URPOP L.URPOP) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.27  Pr > z =  0.024
Arellano-Bond test for AR(2) in first differences: z =  -1.82  Pr > z =  0.068
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(24)   = 111.40  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(24)   =  26.61  Prob > chi2 =  0.323
  (Robust, but weakened by many instruments.)
```

DURING COVID ERA

```
. ***DURING-COVID
. xtabond2 lggdp l.lggdp EXR dominv Trade laborforce ggoveexp URPOP Year if Covid19 ==1, gmm(l.lggdp l(0/1).EXR l(
> 0/1).dominv l(0/1).Trade l2.laborforce l(0/1).ggoveexp l(0/1).URPOP, lag (1 2) collapse) iv(Year, eq(diff)) nodi
> ffsargan twostep small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: C_ID                            Number of obs      =       101
Time variable : Year                            Number of groups   =        36
Number of instruments = 33                      Obs per group: min =         1
F(8, 35)      =  8.73e+06                                      avg =      2.81
Prob > F      =     0.000                                      max =         3
------------------------------------------------------------------------------
      lggdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
      lggdp |
        L1. |   1.006208   .0069725   144.31   0.000     .9920528   1.020363
            |
        EXR |   4.29e-06   1.57e-06     2.73   0.010     1.10e-06   7.47e-06
     dominv |  -.0075375   .0022386    -3.37   0.002     -.012082   -.0029929
      Trade |  -.0000203   .0001528    -0.13   0.895    -.0003305   .0002899
 laborforce |  -.0038911   .0005535    -7.03   0.000    -.0050147   -.0027675
   ggoveexp |   2.73e-12   1.22e-12     2.24   0.032     2.54e-13   5.22e-12
      URPOP |   .0192013   .0089749     2.14   0.039     .0009813   .0374214
       Year |   .0033366   .0005611     5.95   0.000     .0021974   .0044758
      _cons |  -6.531937   1.120503    -5.83   0.000    -8.80668   -4.257194
------------------------------------------------------------------------------
Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  Standard
    D.Year
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/2).(L.lggdp EXR L.EXR dominv L.dominv Trade L.Trade L2.laborforce
    ggoveexp L.ggoveexp URPOP L.URPOP) collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.lggdp EXR L.EXR dominv L.dominv Trade L.Trade L2.laborforce ggoveexp
    L.ggoveexp URPOP L.URPOP) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.40  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =   0.26  Pr > z =  0.792
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(24)   =  34.78  Prob > chi2 =  0.072
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(24)   =  27.81  Prob > chi2 =  0.268
  (Robust, but weakened by many instruments.)
```

TRADE AND COVID OVERALL

```
. xtabond2 Trade l.Trade EXR dominv lggdp logGDProtw FinDevInde Covid19 Year, gmm(l.Trade l(0/1).EXR l(0/1).dominv
>  l(0/1).lggdp l(0/1).logGDProtw l(0/1).FinDevInde, lag (1 2) collapse) iv(Year Covid19, eq(diff)) nodiffsargan t
> wostep small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: C_ID                            Number of obs      =       405
Time variable : Year                            Number of groups   =        37
Number of instruments = 31                      Obs per group: min =         9
F(8, 36)      =  5820.46                                       avg =     10.95
Prob > F      =     0.000                                      max =        12
------------------------------------------------------------------------------
       Trade |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       Trade |
         L1. |   .6683382    .018748    35.65   0.000     .6303155    .7063609
             |
         EXR |   .0024718   .0002518     9.82   0.000     .0019611    .0029824
      dominv |   .3258026   .5876656     0.55   0.583    -.8660385    1.517644
       lggdp |   -6.31768   .8789799    -7.19   0.000    -8.100334   -4.535026
  logGDProtw |   272.6117   28.07338     9.71   0.000     215.6763    329.5472
  FinDevInde |   54.74754   10.13572     5.40   0.000     34.19135    75.30373
     Covid19 |   13.68939    1.50308     9.11   0.000       10.641    16.73777
        Year |  -8.671803   .8835361    -9.81   0.000    -10.4637   -6.879909
       _cons |   8914.575    895.334     9.96   0.000     7098.754    10730.4
------------------------------------------------------------------------------
Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  Standard
    D.(Year Covid19)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/2).(L.Trade EXR L.EXR dominv L.dominv lggdp L.lggdp logGDProtw
    L.logGDProtw FinDevInde L.FinDevInde) collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.Trade EXR L.EXR dominv L.dominv lggdp L.lggdp logGDProtw L.logGDProtw
    FinDevInde L.FinDevInde) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.85  Pr > z =  0.004
Arellano-Bond test for AR(2) in first differences: z =  -1.62  Pr > z =  0.106
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(22)  =  60.08  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(22)  =  29.22  Prob > chi2 =  0.139
  (Robust, but weakened by many instruments.)
```

PRE COVID AND TRADE

```
. est sto OverallTRADE

. xtabond2 Trade l.Trade EXR dominv lggdp logGDProtw FinDevInde Year if Covid19==0, gmm(l.Trade l(0/1).EXR l(0/1).
> dominv l(0/1).lggdp l(0/1).logGDProtw l(0/1).FinDevInde, lag (2 2) collapse) iv(Year, eq(diff)) nodiffsargan two
> step small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: C_ID                            Number of obs      =       333
Time variable : Year                            Number of groups   =        37
Number of instruments = 24                      Obs per group: min =         9
F(7, 36)      =  11360.86                                      avg =      9.00
Prob > F      =     0.000                                      max =         9
------------------------------------------------------------------------------
       Trade |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       Trade |
         L1. |   .9494095   .0402578    23.58   0.000     .8677629   1.031056
             |
         EXR |  -.0001718   .0001495    -1.15   0.258    -.0004749   .0001314
      dominv |   3.305912   .8698676     3.80   0.001     1.541739   5.070086
       lggdp |  -5.960619   2.571146    -2.32   0.026    -11.17514   -.7460938
  logGDProtw |   505.0369   143.1839     3.53   0.001     214.6465   795.4274
  FinDevInde |   1.029803   6.850654     0.15   0.881    -12.86397   14.92357
        Year |  -15.23686   4.269192    -3.57   0.001    -23.89518   -6.578534
       _cons |   14634.04   4042.267     3.62   0.001     6435.941   22832.14
------------------------------------------------------------------------------
Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  Standard
    D.Year
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L2.(L.Trade EXR L.EXR dominv L.dominv lggdp L.lggdp logGDProtw
    L.logGDProtw FinDevInde L.FinDevInde) collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.(L.Trade EXR L.EXR dominv L.dominv lggdp L.lggdp logGDProtw
    L.logGDProtw FinDevInde L.FinDevInde) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.77  Pr > z =  0.006
Arellano-Bond test for AR(2) in first differences: z =  -1.45  Pr > z =  0.148
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(16)   =  22.71  Prob > chi2 =  0.122
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(16)   =  13.38  Prob > chi2 =  0.645
  (Robust, but weakened by many instruments.)
```

DURING COVID AND TRADE

```
. xtabond2 Trade l.Trade EXR dominv lggdp logGDProtw FinDevInde Year if Covid19==1, gmm(l.Trade l(0/2).EXR l(0/1).
> dominv l(0/2).lggdp l(0/1).logGDProtw l(0/1).FinDevInde, lag (2 2) collapse) iv(Year, eq(diff)) nodiffsargan two
> step small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: C_ID                            Number of obs      =        72
Time variable : Year                            Number of groups   =        36
Number of instruments = 28                      Obs per group: min =         1
F(7, 35)      =  2365.79                                       avg =      2.00
Prob > F      =     0.000                                      max =         3
------------------------------------------------------------------------------
       Trade |      Coef.   Std. Err.      t    P>|t|    [95% Conf. Interval]
-------------+----------------------------------------------------------------
       Trade |
         L1. |   .8934375   .0712111    12.55   0.000     .7488712   1.038004
             |
          EXR |   .0027378   .0004798     5.71   0.000     .0017638   .0037118
       dominv |   .1167688   .6387049     0.18   0.856    -1.179871   1.413409
        lggdp |  -4.399409   1.929919    -2.28   0.029    -8.317352  -.4814656
   logGDProtw |    126.189   11.56147    10.91   0.000      102.718    149.66
   FinDevInde |   39.21597   16.42444     2.39   0.022     5.872589   72.55936
         Year |   1.010046   .4669449     2.16   0.037      .062098   1.957995
        _cons |  -5989.447   820.9982    -7.30   0.000    -7656.162  -4322.732
------------------------------------------------------------------------------
Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  Standard
    D.Year
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L2.(L.Trade EXR L.EXR L2.EXR dominv L.dominv lggdp L.lggdp L2.lggdp
    logGDProtw L.logGDProtw FinDevInde L.FinDevInde) collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.(L.Trade EXR L.EXR L2.EXR dominv L.dominv lggdp L.lggdp L2.lggdp
    logGDProtw L.logGDProtw FinDevInde L.FinDevInde) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.36  Pr > z =  0.018
Arellano-Bond test for AR(2) in first differences: z =  -0.78  Pr > z =  0.438
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(20)  =  37.95  Prob > chi2 =  0.009
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(20)   =  22.37  Prob > chi2 =  0.321
```

IV-FE ROBUSTNESS ESTIMATES

```
. xtreg plggdp pEXR pdominv pTrade plaborforce pggoveexp pURPOP Covid19 Year, fe

Fixed-effects (within) regression               Number of obs      =       437
Group variable: C_ID                            Number of groups   =        37

R-sq:                                           Obs per group:
     within  = 0.7229                                         min =         8
     between = 0.4030                                         avg =      11.8
     overall = 0.4033                                         max =        12

                                                F(8,392)           =    127.81
corr(u_i, Xb)  = 0.2140                         Prob > F           =    0.0000
```

plggdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pEXR	.0000468	.0000152	3.07	0.002	.0000169	.0000767
pdominv	.1501787	.0147566	10.18	0.000	.1211668	.1791906
pTrade	-.0007777	.0004749	-1.64	0.102	-.0017113	.000156
plaborforce	-.011227	.0029797	-3.77	0.000	-.0170852	-.0053688
pggoveexp	2.03e-11	4.58e-12	4.42	0.000	1.13e-11	2.93e-11
pURPOP	.0013515	.0103872	0.13	0.897	-.0190701	.0217732
Covid19	-.027168	.0130433	-2.08	0.038	-.0528116	-.0015244
Year	.0224734	.0020424	11.00	0.000	.018458	.0264888
_cons	-24.647	4.068915	-6.06	0.000	-32.64663	-16.64737
sigma_u	1.0362859					
sigma_e	.07758852					
rho	.99442547	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(36, 392) = 1422.16                     Prob > F = 0.0000
```

IV-FE ROBUSTNESS ESTIMATES FOR TRADE

```
. xtreg pTrade pEXR pdominv plggdp plogGDProtw pFinDevInde Covid19 Year, fe

Fixed-effects (within) regression               Number of obs      =       441
Group variable: C_ID                            Number of groups   =        37

R-sq:                                           Obs per group:
     within  = 0.2364                                         min =        10
     between = 0.0000                                         avg =      11.9
     overall = 0.0004                                         max =        12

                                                F(7,397)           =     17.55
corr(u_i, Xb)  = -0.6413                        Prob > F           =    0.0000
```

pTrade	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pEXR	.0065608	.0015889	4.13	0.000	.003437	.0096846
pdominv	8.44736	1.641808	5.15	0.000	5.219634	11.67509
plggdp	-8.279517	5.210061	-1.59	0.113	-18.52228	1.963241
plogGDProtw	44.67241	33.74031	1.32	0.186	-21.65961	111.0044
pFinDevInde	17.34859	25.62324	0.68	0.499	-33.02561	67.72279
Covid19	1.65239	1.655172	1.00	0.319	-1.601608	4.906388
Year	-2.604105	.9765688	-2.67	0.008	-4.523997	-.6842119
_cons	3895.341	941.3729	4.14	0.000	2044.642	5746.04
sigma_u	41.022756					
sigma_e	8.3042243					
rho	.96063529	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(36, 397) = 119.62                     Prob > F = 0.0000
```