COMESA

Key Issues in Regional Integration Vol **X**

Rethinking Trade and Doing Business in the Wake of COVID-19 Pandemic

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Acronyms and Abbreviations

AD	Aggregate Demand
AfCFTA	African Continental Free Trade Area
ARDL	Auto-regressive Distributed Lag
ATM	Automatic Teller Machine
AUC	African Union Commission
BEC	Broad Economic Categories
BIPI	Bilateral Import Penetration Index
BOM	Bank of Mauritius
BPO	Business Process Outsourcing
CEMAC	Central African Economic and Monetary Community
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
CIT	Corporate Income Tax
COMESA	Common Market for Eastern and Southern Africa
COMTRADE	United Nations International Trade Statistics Database.
COVID	Coronavirus disease
CPI	Consumer Price Index
CUSUM	Cumulative sum
DRC	Democratic Republic of the Congo
EAC	East African Community
ECA	Economic Commission for Africa
ECM	Error Correction Model
EDD	Exporter Dynamics Database
EDI	Electronic Data Interchange
EGX	Egyptian stock exchange
ELA	Emergency Liquidity Assistance
EPA	Economic Partnership Agreement
ERF	Economic Recovery Fund
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
FDI	Foreign Direct Investment
FE	Fixed Effects
FSIN	Food Security Information Network
GDP	Gross Domestic Product
GII	Global Innovation Index
GMM	Generalized Method of Moments
GNAFC	Global Network Against Food Crises
GRFC	Global Report on Food Crises
GSI	Government Stringency Index

GVC	Global Value Chain
GWAS	Government Wage Assistance Scheme
HHRDC	Human Resource Development Council
HS	Harmonized System
ICT	Information Communication and Technology
IDE	Electronic Data Interchange
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IJFAEC	International Journal of Food and Agricultural Economics
IMF	International Monetary Fund
IT	Information Technology
ITC	International Trade Centre
KEPSA	Kenya Private Sector Association
KNBS	Kenya National Buereau of Statistic
LRR	Liquidity Reserve Requirement
MAA	Mutual Administrative Assistance
MENA	Middle East and North Africa
MPR	Monetary Policy Rate
NCES	Nested Constant Elasticity of Substitution
NEF	National Empowerment Foundation
NRI	Network Readiness Index
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PAYE	Pay-As-You-Earn
PCR	Polymerase Chain Reaction
PHSM	Public Health and Social Measures
PPML	Pseudo Poisson Maximum Likelihood
PWC	PricewaterhouseCoopers
RWF	Rwandan Franc
SA	South Africa
SACU	Southern Africa Customs Union
SADC	Southern African Development Community
SARS	Severe Acute Respiratory Syndrome
SDG	Sustainable Development Goal
SEAS	Self-Employed Assistance Scheme
SME	Small and Medium-sized Enterprises
SRM	Social Register of Mauritius
TND	Tunisian dinar
UK	United Kingdom
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNECE	United Nations Economic Commission for Europe
UPU	Universal Postal Union
US	United States
USD	United States Dollars
VAT	Value Added Tax
WCO	World Customs Organisation
WDI	World Development Indicators
WEO	World Economic Outlook
WFP	World Food Programme
WHO	World Health Organization
WIPO	World Intellectual Property Organsation
WTO	World Trade Organisation
ZEC	Zimbabwe Electoral Commission
ZRA	Zambia Revenue Authority

PREFACE

Key Issues in Regional Integration is an annual publication of the COMESA Secretariat. To date nine editions have been published. This is the tenth edition and focuses on "Rethinking Trade and Doing Business in the Wake of COVID-19 Pandemic". The COVID-19 pandemic has plunged the global economy into a deep recession comparable only to the 2008 global financial crisis and the Great Depression of the 1930's. The pandemic, though a health crisis, has devastating economic and social effects. On the supply side, infections reduce labour supply and productivity, while lockdowns, business closures, and social distancing also cause supply disruptions. On the demand side, layoffs and the loss of income and worsened economic prospects reduce household consumption and firms' investment. Economic disruptions caused by COVID-19 resulted in an unprecedented decline in international trade in 2020. The subdued trade volumes reflect in part, possible shifts in supply chains as firms restore production to reduce vulnerabilities from reliance on foreign producers. While all countries are expected to suffer

large drops in exports and imports, tourism- dependent economies will experience larger declines due to restrictions of travel and consumers fear of contagion. Oil exporters have suffered a severe terms-of-trade shock with the decline in oil prices.

This volume consists largely of empirical and policy papers under the overall theme "Rethinking Trade and Doing Business in the Wake of COVID-19 Pandemic". The papers address a wide range of topical themes namely: Intra-COMESA Trade and COVID-19; Digitalizing Trade, Trade Facilitation and COVID-19 pandemic; COVID-19 and Trade in Services in COMESA; Manufacturing, Regional Value Chains and COVID-19 in COMESA; and Agricultural Trade, Food Security and COVID-19.

The purpose of this edition is to educate the reader on the various effects of the pandemic and how COMESA could mitigate them to promote doing business within the region. It stretches the scope of readership to cover researchers on international trade, government officials in various sectors and regional integration. It provided the reader insightful dimension of issues at the frontier of trade and integration debate in the COMESA region, the African continent and across the globe.

The production of this edition commenced with the call for extended abstracts in January 2021 which culminated to presentation of select research papers at the Eighth COMESA Annual Research Forum held virtually on 13-16 September 2021. Following a rigorous peer review process, select papers were presented at the plenary session of the Forum where they were discussed and subjected to further sit-in review and comments by participants. In the final round, a small band of papers were selected for publication based on their relevance, conceptual and methodological robustness. Some good papers were dropped for lack of relevant and up to date data, and due to incomplete revisions within scheduled timelines.

The empirical papers relied on secondary sources of data. The novelty in this edition, however, is found in the empirical basis of analysis deployed and the participation of academia and industry at the research forum and the peer review process.

Several institutions and people were instrumental in the process leading to this publication and their involvement is gratefully acknowledged. The COMESA Secretariat under the leadership of the Secretary General, Chileshe Mpundu Kapwepwe, and the Division of Trade and Customs under the stewardship of Dr. Christopher Onyango deserve special mention. The support of the editorial team (Jane Kibiru, Tasara Muzorori, Frederick Msiska, Caesar Cheelo, Netta Gichuki and Mwangi Gakunga) is highly appreciated.

Effects of COVID-19 on Madagascar Agricultural Exports to the COMESA Region

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Abstract

The study estimated the effects of COVID-19 on Madagascar's agricultural exports to selected COMESA Member States using monthly exports data for the period January to December 2020. Applying a gravity model on bilateral agro-products export data from Madagascar to 16 COMESA Member States for which data is available, the study found that the provision of government income support to during COVID-19 period positively affected Madagascar's agricultural exports. Income support is more effective when work-stations are open as opposed to when they are closed. The study further reveals that provision of income support when workstations were closed reduced the country's bilateral agricultural exports. Further tightening the overall government lockdown measures when income support had been provided, stimulated bilateral agricultural exports. Moreover, the burden of COVID-19 – in terms of health and socio-economic stresses in COMESA importing countries was found to reduce Madagascar's agricultural exports. The study recommends that the country should prioritize provision of income support to farmers to increase agricultural exports during exogenous shocks.

1.0 Introduction

1.1 Background

For the past 75-years since the establishment of the United Nations, the world has never faced a health crisis as devastating as the COVID-19 pandemic. The crisis started as a cluster of cases of pneumonia in Wuhan, Hubei Province of China, in December 2019 and quickly escalated, ravaging the whole world within a few months. The first recorded cases outside China were in Thailand, on 13 January 2020, America on 23 January[2], Europe on 25 January, East Mediterranean on 29 January and Africa, on 14 February 2020[3]. On 11 March 2020, the World Health Organization (WHO) officially declared the crisis a global pandemic.

According to the European Centre for Disease Prevention and Control database, as of 29 July 2021, the world had reported 194,860,770[4] casesand 4,168,372 deaths. Africa, the second largest continent in terms of size and population, registered 6,636,897 confirmed cases and 168,524 deaths as of the same date[5]. In Africa, about 35 percent of confirmed cases and close to 40 percent of deaths were reported in COMESA. Close to 0.4 percent of the total COMESA population[6] had contracted COVID-19 as of 29 July 2021 whereas above 0.001 percent of the population had succumbed to it[7] as of the same date. Member countries relied on WHO COVID-19 prevention and management protocols along with home-grown strategies to mitigate the negative effects of the pandemic.

Madagascar recorded the first COVID-19 cases in the capital city, Antananarivo, on 20 March 2020 (Verschuur, Koks, & Hall, 2021). This was against the backdrop of stringent preventive measures to minimize the import and transmission of COVID-19 on its territory, prior to the recording of the first cases[8].

As the pandemic spread on the island country, authorities intensified transmission control measures to insulate nationals. Measures meant to restrict movement of people including closure of all air-traffic[9], curfew, stay-at home order, closure of non-essential businesses and social distancing were adopted on the very day of recording the first case. Despite all these interventions by government, statistics continued rising, reaching 42,392 confirmed cases and 928 deaths as of 12 July 2021.

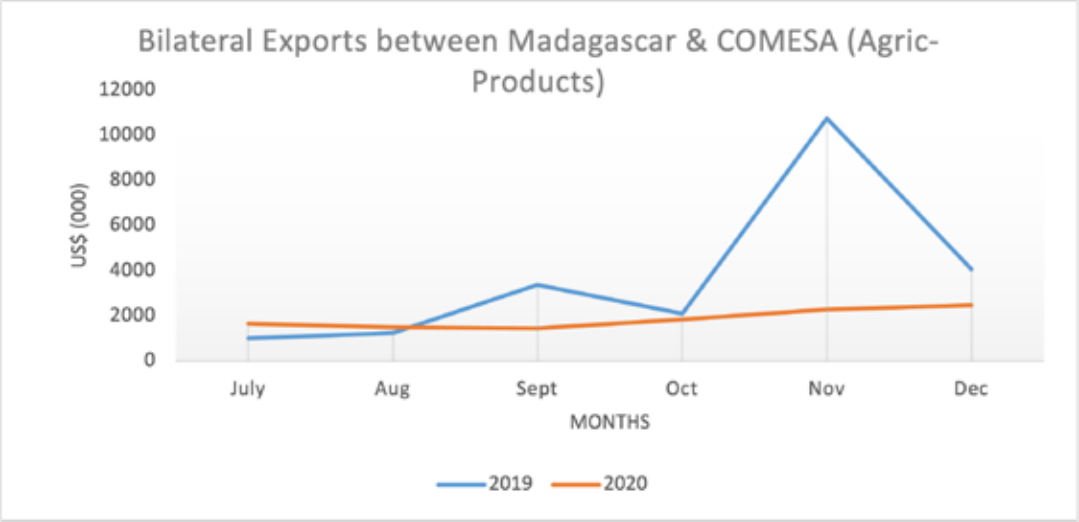
The pandemic brought more harm than good to the global, regional, and bilateral trade landscape. It may have disrupted Madagascar's export trade with its bilateral, regional, and global partners. Madagascar exports to the world, Africa, and the COMESA (all products) failed to withstand COVID-19 costs, having declined by 35.5 percent; 42.1 percent and 38.2 percent, respectively, in the last half of 2020 compared with the same period in 2019[10].

Madagascar is highly dependent on primary commodity exports, particularly agricultural products. Over 2016-2020, on average, 67 percent per year of its exports to the world were primary agricultural commodities[11]. Bilateral exports of agro-based products by Madagascar, to the world, Africa and COMESA dropped by 0.7 percent; 15.7 percent and 73.4 percent, respectively, during the first half

2 Regions according to WHO designations.
3 World Health Organization Daily Situation Reports
4 COVID-19 cases in accordance with the applied case definitions and testing strategies in the affected countries
5 https://covid.observer/africa/
6 There are 597 649 225 people in the COMESA region
7 European Centre for Disease Prevention and Control; COVID-19 situation update worldwide, as of week 29, updated 29 July 2021
8 Joint statement from the Ministry of Public Health and the Ministry of Transport, Tourism and Meteorology on 02/03/2020.
9 Statement from the President of the Republic of Madagascar on 17 March 2020
10 Author calculations, data accessed from the ITC Trade map on https://www.trademap.org/
11 Author's calculations, data accessed from UNCTAD Statistics on https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx

of 2020[12]. In the subsequent half, the same exports to the respective regions, again, declined by 20.7 percent, 66.6 percent, and 50.5 percent, respectively, in the last half of 2020 compared with the same period in 2019[13]. Figure 1 shows monthly exports of agro-products from Madagascar to COMESA for periods July-December 2019 and July-December 2020 (i.e., the pre-COVID-19 period in 2019 and during the pandemic period in 2020).

Figure 1: Bilateral exports between Madagascar and COMESA (Agro-products)



Author Compiled: Data accessed from ITC Trade map: https://www.trademap.org/

The 2020 trend is consistent with lockdown dynamics imposed in Madagascar. Bilateral exports for the period July-September declined owing to strict lockdown conditions and later rose in response to the gradual easing of the lockdown during September 2020 to early January 2021.

It is widely held that lockdown measures, though imposed primarily to curtail the further spreading of the virus, did come with economic costs. For instance, curfews negatively affected industries' capacity utilization due to short working hours and disruptions to employees access to workstations. Staying at home and social distancing, as well, affected production in industries that require physical presence of labour such as the agriculture industry.

Border closures cut off international supply chain networks and disrupt production. National total lockdowns as well as closure of land access to quarantined areas, disrupt internal supply chain networks. Closure of downstream industries deemed not essential but providing critical services to the agriculture industry also halted production during COVID-19.

The negative effects of COVID-19 on Madagascar's external trade have been further exacerbated by the country's integration into the global economy. The island country has strongest trade links with China, Italy, the United States and France, which became the epicenters of COVID-19 during the initial stages of the pandemic. The country's trade is significantly extra-African oriented. In 2019, 39.1 percent of Madagascar's exports by value were destined to European countries, 29.6 percent to Asia, 22.9 percent to North America and only 7.8 percent to fellow African countries[14].

12 Author calculations, data accessed from the ITC Trade map on https://www.trademap.org/
13 Author calculations, data accessed from the ITC Trade map on https://www.trademap.org/
14 https://www.worldstopexports.com/madagascars-top-import-partners/

Globalizing in the face of the pandemic imposed notable costs on Madagascar's trade. However, the impacts were not uniform across sectors. It is believed that highly automated sectors of the economy, manufacturing for instance, were less affected by the pandemic relative to sectors that typically require physical labour on-site such as the agriculture sector. The sector is key in Madagascar's national economy and is ranked as the second highest contributor to GDP after the service sector; it generates 30 to 40 percent of total exports and accounts for 80 percent of Malagasy employment[15]. As a result, anything that threatens to weaken the sector's performance is a threat to the country's growth and development.

This study is timely as it was undertaken at a time when the world was still battling with the COVID-19 pandemic and its health, economic and trade effects. It examines trade damage caused to Madagascar's agricultural exports by the COVID-19 pandemic. As such its contribution from a developing African country perspective and focusing on key sector-specific dimensions is salient.

1.2 Problem Statement

The COVID-19 pandemic has taken its toll on global, regional, and bilateral trade. Statistics indicate that global trade registered a 14 percent year-on-year decline in the first half of 2020 which was 15 percent lower than trade in the second half of 2019[16]. Regional and bilateral trade trends for the same period had similar experiences. Madagascar's bilateral exports to the COMESA region[17] for instance, shrank by 37.5 percent in the last half of 2020 relative to the same period in 2019. Bilateral exports in agricultural products to COMESA contracted by 61.1 percent in the same period. Besides, nonpharmaceutical COVID-19 transmission control measures meant to insulate Malagasy nationals from the virus disrupted the trading ecosystems of the country. For instance, border closures cut-off international supply chain networks and disrupted production.

Regional total lockdowns and closure of land access to quarantined areas, also disrupted internal supply chain networks. Curfews shortened working hours and law enforcement check points disrupted labour mobility. As a result, sectors that require close human contact, monitoring and cannot be operated remotely such as tourism and agriculture, are likely to have tolerated more impacts than others. Given that agriculture sectors of developing economies, COMESA countries included, are engines of growth and development, weakening them threatens major arteries of the economy. This study, therefore, seeks to investigate the impact of COVID-19 on Madagascar's agriculture exports to the COMESA region.

1.3 Objectives of the Study

The study sought to investigate the effects of COVID-19 on Madagascar's agricultural exports to COMESA Member States. The specific objectives were to:

- Investigate the effects of COVID-19 infections and deaths on Madagascar's agricultural exports to COMESA Member States;
- Analyze the effects of government-imposed nonpharmaceutical transmission control measures on Madagascar's agricultural exports to COMESA Member States;
- Examine the effects of economic stimulus in abating COVID-19 effects on Madagascar's agricultural exports to the COMESA region.

15 https://www.ifad.org/en/web/operations/w/country/madagascar
16 WTO December 2020 Information Note
17 Due to data limitation, only 16 COMESA Member States namely: Comoros; DRC; Egypt; Ethiopia; Eswatini; Kenya; Libya; Malawi; Mauritius; Rwanda; Seychelles; Sudan; Tunisia; Uganda; Zambia and Zimbabwe were considered in this study.

2.0 Literature Review

2.1 Conceptual Framework

This section conceptualizes how COVID-19 affects international trade between countries. The spread of this novel infectious disease is complex. No infectious disease had ever caused the sort of global economywide shutdowns than COVID-19 did. The struggle to contain COVID-19 resulted in the closure of businesses, imposition of curfews, restriction of movement of people, streamlining of trading systems and sometimes retrenchment of workers as business found innovative ways of replacing labour. These reactive artificial strategies affected the usual socio-economic functioning of economies and societies.

As shown in Figure 2, the effects of COVID-19 on Madagascar's agricultural exports can be analyzed from two perspectives, the supply-side and demand side perspectives.

Supply-side Perspective

This perspective envisages two factors determining the elasticity of agriculture export supply during COVID-19. First is Madagascar's response to the pandemic. Second, is the industry or sector's ability to apply remote operations in production. Since remote operation is less feasible in the agriculture sector, export supply is expected to be elastic.

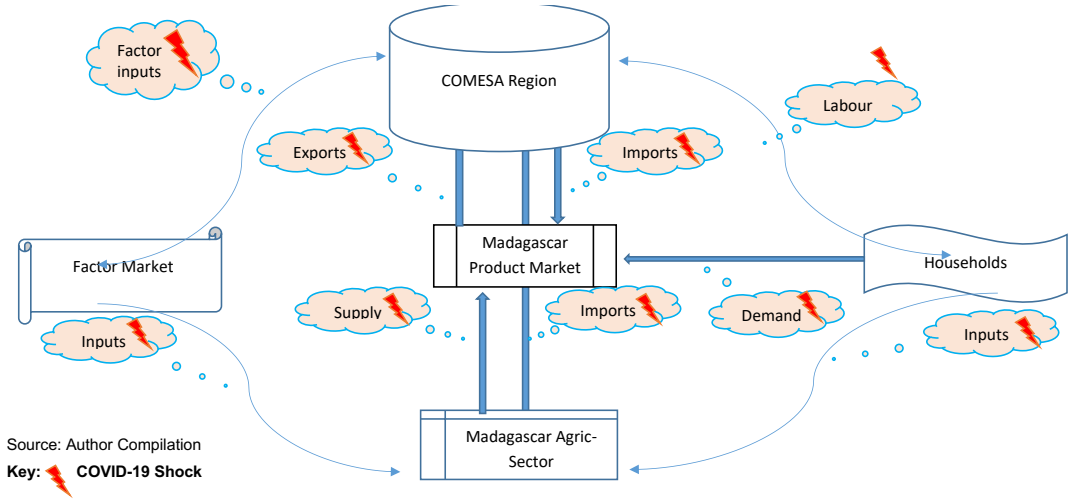
The net effect of COVID-19 on agricultural exports can take the following channels. First is the fall in aggregate working hours. This would directly affect agricultural production. Fall in aggregate working hours may be because of reduced working time due to curfews. Production, supply, and exports may also be stalled because of temporary layoffs and job-search discouragement due to lockdown restrictions and fear of the infectious disease (UNCTAD, 2020).

Second is the ability of the sector to sustain production through remote operations during lockdown period. Provided these systems improve productivity and efficiency, exports are bound to increase[18] (Hayakawa & Mukunoki, 2020). In the agricultural sector where remote work is less feasible, production is expected to decrease. By nature, the agricultural sector is labour-intensive and requires an in-person presence for production[19]. Besides, remote operation is less feasible in Madagascar due to underdeveloped Information Technology (IT) infrastructure. As a result, exports are likely to decrease due to decreased efficiency.

18 Note that the relationship between remote operation and productivity is not straightforward as established by Dutcher (2012) in an experimental study. Dutcher find out a positive and negative effect of remote work on productivity of creative tasks and dull tasks respectively.

19 Only 5percent of agriculture, forestry, fishing and hunting-jobs can be performed at home compared to 22percent for manufacturing jobs (Dingel and Neiman 2020).

Figure 2. Conceptual framework of the implications of COVID-19 on Madagascar agriculture exports to the COMESA Region



Source: Author Compilation

Key: COVID-19 Shock

Demand-Side Perspective

COVID-19 transmission control measures meant to reduce the spread of the infectious disease may have a contractionary effect on domestic aggregate demand of exportable agriculture goods. All things equal, such a situation could lead to an increase in the exports of agriculture goods.

As a result of COVID-19 some companies temporarily closed and forced workers to take unpaid leave, as a strategy for survival. For the same reason, other companies began paying their workers on pro-rata basis[20]. Workers were required to alternate in compliance with the national government's telecommuting policies, while others were retrenched. All these policies resulted in decreased Aggregate Demand (AD), including demand for agriculture goods, especially in developing countries where social safety nets are low and sometimes non-existent.

In some cases, people's fear of infection with COVID-19, even those with uninterrupted earnings, would reduce their visits to retail shops or supermarkets, resulting in decreased demand for agriculture goods. Consumers as rational agents, in times of negative demand shocks, may reduce spending on "postpone-able" durable goods relative to non-durable goods (Baldwin & Mauro, 2020; Eaton, Kortum, Neiman, & Romalis, 2016).

Besides, regulatory related effects on aggregate demand, death itself may have a direct and immediate effect on AD of agriculture goods. For instance, the death of a breadwinner would cut household demand for almost all goods to close to zero. It is the view of this paper that the initial COVID-19 infections and deaths in many countries were dominated by family breadwinners who got infected while fending for the family in or outside their respective countries. The resultant effect was reduced aggregate demand due to loss of earnings and decreased market. A greater decrease in domestic

20 Proportionate to number of days worked for the month.

demand relative to decrease in production increases exports as surplus is diverted to the export market (Hayakawa & Mukunoki, 2020).

Madagascar's agricultural exports are affected not only by own COVID-19 burden, but also by COVID-19 burden in other countries which could be within or outside the COMESA region (Hayakawa & Mukunoki, 2020). Thus, the COVID-19 burden in China in December 2019 (when it was first reported) affected not only China and its trading partners, but the entire world including Madagascar trade. The effects can be transmitted in the following channels:

Decreased exports by China to other countries, for instance, may create an export opportunity for Madagascar as regional partners that were relying on China for imports may change their import source. Thus, COVID-19 in this scenario would have created demand for Madagascar's exports. Also, reduced demand for imports by infected global and regional partners may lower international market prices and influence Madagascar's exports.

Again, regional production and supply shocks induced by the pandemic may negatively influence Madagascar's exports (costs of globalization). This could be through reduction in imported inputs translating into low production and exports as well (Halpern, Koren, & Szeidl, 2015).

The COVID-19 pandemic can, therefore, affect agricultural exports through the household demand and disruptions in the factor market, which then would transmit effects to production, product market as well as bilateral trade. Thus, exports and imports of agricultural goods in this framework are factors of demand (measured in terms of COVID-19 related deaths and infections) and supply (measured by artificial COVID-19 control measures' effects on supply). Mathematically, trade can be expressed as factors of demand and supply as follows:

$$T_{ij} = f(demand; supply) \ldots\ldots\ldots\ldots \quad (1)$$

Where T_{ij} stand for trade (exports or imports) from country *I* to country *j* or *j* to *i*; demand = COVID-19 related deaths and infections and supply= COVID-19 control measures.

2.2 Empirical Literature Review

COVID-19 and its impact on international trade has been a hot topic in several virtual trade seminars, policy dialogues and research conferences in 2020. Several studies, Hayakawa & Mukunoki, (2020), UNCTAD, (2020), Maliszewska, Mattoo, & Mensbrugghe, (2020) among others, provide early evidence on the nexus between COVID-19 and trade.

Hayakawa & Mukunoki (2020) investigated the impact of COVID-19 on international trade among 186 countries in the first quarter of 2020. The study used the standard gravity model to regress trade values for 186 countries. The study used the number of cases and deaths to measure the disease burden of COVID-19 and found that the COVID-19 burden in exporting countries only, had a significant and negative effect on trade. Their study further indicates that importers' COVID-19 burden had positive effects on trade in the agricultural industry, whereas exporters' COVID-19 burden had negative effects, particularly in the textile, footwear, and plastic industries.

Mold & Mveyange, (2020) investigated the impact of the COVID-19 crisis on regional trade in the East African Community (EAC). Using Kenyan trade data published through May 2020, Mold and Mveyange

found that Kenya experienced a significant improvement in exports in the first quarter of 2020. The study revealed that exports like tea and fruit surpassed levels of past years. Their findings further revealed imports being principal victim of the crisis, declining by a quarter between March and May 2020.

Maliszewska, Mattoo, & Mensbrugghe, (2020) studied the potential impact of COVID-19 on GDP and trade. Using simulation method on a global pandemic scenario and a standard global computable general equilibrium model, the study found negative impacts of COVID-19 on exports across all economic sectors. Their study revealed an estimated decline in US exports of $85 billion (2014 dollars) with exports of services, mostly those requiring face-to-face interaction, such as tourism, impacted most. In the case of China, the biggest decline was registered in manufactured goods principally directed to United States, Europe, and Economic Partnership Agreement (EPA) countries. However, results show expected increase in exports to Economic Commission for Africa (ECA) and Middle East and North Africa (MENA) countries.

Verschuur, Koks, & Hall, (2021) studied the global economic impacts of large-scale containment measures by governments to contain the spread of the COVID-19 during the first eight months of the pandemic. The study applied reduced-form econometric techniques to estimate the effects of different containment policies on exports across a balanced sample of 122 countries. Using empirical vessel tracking data to estimate the global maritime trade losses, the study found that global maritime trade reduced by -7.0 to -9.6 percent. Expressed in volume and value terms, the study indicates that global loses were equal to around 206–286 million tonnes and up to $225–412 billion, respectively.

The results further indicate widespread port-level trade losses for ports in China, the Middle East, and Western Europe. These loses were associated with the collapse of specific supply-chains such as oil and vehicle manufacturing. The results also indicated large sectoral and geographical disparities in impacts. Whilst some small islands developing states and low-income economies suffered the largest relative trade losses, manufacturing sectors were hit hardest, with losses up to 11.8 percent. Measures such as school and public transport closures were also found negatively impacting country-wide exports.

Socrates, (ud[21]) investigated the effects of lockdown policies (imposed by Kenya's trading partner countries to contain the spread of the virus) on Kenya's bilateral trade flows for the period July 1, 2019, to June 30, 2020. Using an event-study analysis based on a weekly series of product-by-country data (at HS-6-digit level) for the universe of import and export trade, the study finds that the introduction of lockdown policies by Kenya's trading partners led to an average increase and decline of weekly exports and imports by 12 percent and 28 percent, respectively.

Results further reveal that, because of lockdown measures in partner countries, Kenya's food exports and imports increased by an average of 18 percent and 25 percent, respectively. However, the study found scant evidence on the effects of lockdown policies on trade in medical goods relevant for the prevention and treatment of COVID-19.

21 Means undated

2.3 Overview of Empirical Literature

The examined empirical literature indicates that studies dominating in this area are mostly from the developed world. Few studies have so far been conducted from the developing world. Why the developed world has received greater attention relative to developing counterparts is a cause of concern. Maybe it is because they are pioneers in the COVID-19 history and have been the hardest hit by the pandemic.

Pioneer studies do concur that COVID-19 has affected international trade. However, these studies sometimes diverge on the direction of effects and measurement of COVID-19. Several studies conducted at the global level (Hayakawa & Mukunoki, 2020, Verschuur, Koks, & Hall, 2021 Maliszewska, Mattoo, & Mensbrugghe, 2020) concur that COVID-19 negatively affects exports, whereas country-specific, Kenyan study by Mold & Mveyange, (2020), for instance, produced opposite results.

Other studies measured COVID-19 using number of cases and deaths whereas others focused on impacts of COVID-19 induced transmission control measures. Whereas this paper is similar with previous studies, it differs in several respects. First, unlike Hayakawa and Mukunoki (2020) study which captures disease burden using number of confirmed cases and deaths exclusively, this paper aggregated number of confirmed cases and deaths to measure the disease burden. Arguments are that the economic effects of COVID-19 infections and COVID-19 deaths on trade are similar. Hence regressing them as an aggregate will reduce chances of multicollinearity.

Second, this study, like Socrates, (ud[22]) examines the impact of government transmission control policies on trade. Although both studies have been conducted in developing countries, this study considered the impacts of exporter's transmission control measures on its exports unlike Socrates who examined impacts of the importer's transmission control measures on other countries' exports.

Given that exporter countries have little control over the importing country policies, examining implications of their transmission control policies on partners' trade may be less important. Of course, bilateral engagements can possibly influence importer policy, but often they require lengthy negotiations. For matters that does not have definite end time, but with devastating results like pandemics, putting policy options rightfully into the hands of victimized agents (countries) would prompt them to act and avert and/or reduce negative effects.

Third, this study considered 12 months, compared to pioneer studies, which were based on shorter periods.

22 The Effect of Lockdown Policies on International Trade Flows from Developing Countries: Evidence from Kenya

3.0 Methodology

3.1 Model Specification

To empirically estimate the effects of COVID-19 on bilateral Madagascar agricultural exports (see Annexure A for list of agric-products considered in this study), the study adopted the gravity model approach. The empirical model used in this study follows Santos, Silva & Tenreyro's (2006) model specified as follows:

$$y_i = \exp(x_i\beta) + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where y_i stands for trade values (imports/exports), x_i is a vector of standard gravity variables, $\boldsymbol{\beta}$ is a vector of parameters to be estimated and ε_i is the white noise error term. The study adopts the standard gravity variables proposed in the gravity model.

As a result, this study augmented equation 2 with a vector of variables of interest (COVID-19 variables) as follows:

$$X_{ijt} = exp(\sum\delta + \sum\varphi) + \mu_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3$$

Where X_{ijt} represents bilateral export flows from country i to country j, at time t, $\sum\delta$ is a vector of COVID-19 variables and $\sum\phi$ is a vector of traditional gravity variables and μ_{it} is the white noise error term. The inclusion of COVID-19 variables has been conceptually informed.

The regression used the PPML estimator to estimate equation (3) in a multiplicative form as given below:

$$\begin{aligned} X_{itj} = Exp\big(\, & \beta_0 + \beta_2 GDP_{it} + \beta_3 GDP_{jt} + \beta_4 Dist_{ij} + \beta_5 CL_{ij} + \beta_6 CC_{ij} + \beta_7 covid_{it} + \beta_8 covid_{jt} \\ & + \beta_9 Gstring_{it} + \beta_{10} Gst_{it} * Incsupp_{it} + \beta_{11} Incsupp_{it} + \beta_{12} Incsupp_{jt} \\ & + \beta_{13} WPC_{it} + \beta_{14} WPC_{it} * Incsupp_{it}\big) + \mu_{ijt} \ldots\ldots\ldots\ldots\ldots\ldots (4) \end{aligned}$$

The variables in equation 4 are defined in Table 1:

Table 1: Variable definition

Variable Symbol	Name	Description	Measurement	Expected Sign
X_{itj}	Bilateral Exports	Madagascar bilateral exports to COMESA Member States	US$	
GDP_{it}	Gross domestic product of the exporting country	Economic mass of (Madagascar) exporting country	US$	Positive
GDP_{it}	Gross domestic product of the importing country	Market potential of the importing country	US$	Positive
$Dist_{ij}$	Distance	Geographical distance between the capital cities of bilateral trading partners	Kilometers	Negative

Variable Symbol	Name	Description	Measurement	Expect-ed Sign
CL_{ij}	Common Official Language	Common official language between bilateral trading partners	1, for common language, 0 otherwise	Positive
CC_{ij}	Common Colonizer	Countries colonized by the same colonial masters	1 for common colonizer, 0 otherwise	Positive
$covid_{it}$	COVID-19 deaths and Infections	Total COVID-19 deaths and infections in Madagascar	Numerical Numbers	Negative
$covid_{it}$	COVID-19 deaths and Infections	Total COVID-19 deaths and infections in the importing country	Numerical Numbers	Negative
$Gstring_{it}$	Stringency Index	Strictness of 'lockdown style' policies	Numerical Numbers from 0-100	Negative
$Incsupp_{it}$	Income Support	Provision of income support in Madagascar, the exporting country	Ordinal Scale	Positive/ Negative
$Incsupp_{it}$	Income Support	Provision of income support in the importing country	Ordinal Scale	Positive/ Negative
$Gst*Icc_{it}$	Interaction between Stringency index & Income support	Provision of income support in Madagascar, the exporting country during varied lockdown levels	Numerical Numbers	Negative
WPC_{it}	Workplace Closures	Workplace closures in Madagascar, the exporting country	Ordinal Scale	Negative
$WPCit *Incsupp_{it}$	Interaction between workplace closures and income support	Provision of income support in Madagascar, the exporting country when workplaces are closed.	Numerical Numbers	Negative

Note that the expected signs of the variables have been theoretically informed.

3.2 Modelling and Econometric Issues

Trade data usually comprises of zero trade flows in some years. Of the exports data used in this study, close to 70 percent of the total observations contains zero trade flows. These zeros are common because of rounded trade flows or countries do not trade with each other (Fink & Primo Braga, 1999). Exclusion of these zeros is not recommended as this would lead to a potential sample selection bias. Cognizant of the zero trade flows problem, the study used the PPML estimator which addresses the problem of zero trade flows.

Trade data are commonly plagued with heteroscedasticity (Santos Silva & Tenreyro, 2006). Besides, heteroskedasticity arises most often with cross-sectional data. Country specific attributes such as geography, differences in trade policies among others explains the existence of country heterogeneity. This paper addressed the heteroscedasticity problem and the issues of unobservable multilateral resistances using the importer-and–exporter time and pair fixed effects.

To understand association between variables of the model, a correlation analysis was conducted (see Annexure D). The Hausman test was also performed to ensure the robustness of the results and appropriateness of using either the Fixed Effects or Random Effects model (Carrere, 2004). The test results indicated that fixed effects are most appropriate.

3.3 Data Types and Sources

The paper used monthly Madagascar's agricultural exports to 16 COMESA countries[23] (for which data is available) for the period January 2020 to December 2020. Monthly data on exports were obtained from the Global Trade Atlas maintained by HIS Markit[24]. Data on government COVID-19 transmission control measures, i.e., stringency index[25], workplace closure[26] and income support[27] were obtained from the Oxford COVID-19 Government Response Tracker, Blavatnik School of Government. COVID-19 confirmed cases and deaths were obtained from Johns Hopkins Coronavirus COVID-19 Dashboard. Variables that capture distance, common colony, and common language were accessed from *Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).* However, common border was excluded from the model as Madagascar does not share a land border. GDP data for all countries were downloaded from World Development Indicators (WDI).

The paper used yearly GDP as follows, 2019-2008 GDP figures for Jan-Dec 2020 monthly GDP figures. The first reason for this inconsistence is data limitation. Monthly data on GDP is not available. Further, GDP data for 2020 was yet to be published as of the time of drafting this paper. The second reason is to avert using GDP variables containing the impacts of COVID-19 which should solely be captured by the COVID-19 variable.

3.4 Robustness Checks

To check the robustness of the results, the dependent variable was lagged by two months. Arguments are that trade contracts fulfilled in January might have been made in November 2019, during which time most of countries were still unaware of the impact of COVID-19 (Hayakawa & Mukunoki, 2020). Such a time lag is likely because trade may not be realized in the same month with the contract. The results of all the variables in both regression models i.e., the baseline model and the robustness check model indicate similar results except that importer income support turns significant in the robust check model, a sign which was expected (see Annexure B).

23 Comoros; DRC; Egypt; Ethiopia; Eswatini; Kenya; Libya; Malawi; Mauritius; Rwanda; Seychelles; Sudan; Tunisia; Uganda; Zambia and Zimbabwe

24 https://connect.ihsmarkit.com/gta/home

25 Is a simple additive score of nine indicators measured on an ordinal scale, rescaled to vary from 0 to 100. Note that a high score – meaning a high level of government measures – does not imply that a state has necessarily been more appropriate or effective in its response.

26 Is a sub-index component which takes ordinal scale between 0 and 2 with zero indicating no income support, 1 - government is replacing less than 50percent of lost salary (or if a flat sum, it is less than 50percent median salary) and 2 - government is replacing 50percent or more of lost salary (or if a flat sum, it is greater than 50percent median salary).

27 Is a sub-index component which takes ordinal scale between 0 and 3 with values 0 indicating no measures, 1 - recommend closing (or recommend work from home), 2 - require closing (or work from home) for some sectors or categories of workers and 3 - require closing (or work from home) for all-but-essential workplaces (e.g., grocery stores, doctors)

4.0 Presentation and Discussion of Results

4.1 Descriptive Statistics

As shown in annexure C, Madagascar, on average recorded $98,680 worth of agricultural exports from January to December 2020. To some countries, Madagascar registered a maximum of $1.8 million worth of exports whereas in other countries, the country recorded zero exports.

The country also recorded, on average, 8,232 confirmed cases and deaths throughout the year whereas all importing countries recorded on average, 14,629, confirmed cases and deaths. However, there is greater variability in the rate of infections and deaths in Madagascar and across COMESA Member States as indicated by standard deviation from means of 7,927 and 30,846 confirmed cases and deaths.

The average distance between Madagascar and its COMESA trading partners is 3,113km. The distance greatly varies from one country to another as shown by a standard deviation of 1,919km with a minimum distance of 921km from the nearest trading partner and 7,332km to the distant partner.

On average, 67 percent of the population in Madagascar received income support in the form of direct cash payments from the government for loss of jobs or failure to work because of COVID-19 whereas on average, 51 percent of Madagascar's COMESA trading partners also provided similar incentives. Descriptive statistics also indicate that, on average, 67 percent of workplaces in Madagascar were closed due to COVID-19 lockdown measures. Within the same period, Madagascar recorded, on average, 50 scores on the stringency index and the scores slightly varies from the mean as shown by a standard deviation of 27 scores.

4.2 Gravity Model Regression Results

Table 3 shows the results from the regression model.

Table 3: Gravity model results

Variable	Estimated Coefficient	Robust Standard Errors
GDP_{it}	4.81**	2.36
GDP_{jt}	3.00***	6.16
$Dist_{ij}$	-.002***	.0003
CL_{ij}	-1.81***	.31
CC_{ij}	-1.57***	.22
$covid_{it}$	-.00004	.00005
$covid_{it}$	-.00002**	7.67
$Gstring_{it}$	-.01	.008
$Incsupp_{it}$	1.19***	.36
$Incsupp_{it}$	.85	.64
$WPCit * Inc_{it}$	-1.33**	.67
$Gst*Icc_{it}$	.02***	.008
β_0	5.24	2.38
Observations	57	
Adjusted R-Squared	.77	

Note: ***p<0.01; **p<0.05; *p<0.1

Discussion of Results

The results show that all control variables, save for distance are significant in influencing Madagascar's agricultural exports. Common colony and common language, however, exhibit theoretically contrasting signs. The results, further indicate that COVID-19 burden measured by total number of confirmed cases and deaths in the importing COMESA country negatively affects Madagascar's agricultural exports. A 1 percent increase in the number of confirmed cases and deaths in importing COMESA countries would reduce Madagascar's agricultural exports by 0.002 percent.

Provision of income support, covering the salaries or providing direct cash payments, universal basic income, or similar to people who lose their jobs or cannot work has a positive and statistically significant coefficient at 1 percent level. A 1 percent increase in government income support in Madagascar (exporting country) was associated with a 1.19 percent increase in Madagascar agricultural exports.

From a Keynesian perspective, consumptive income support is expected to induce domestic aggregate demand. Given that the agricultural sector in Madagascar was exempted from COVID-19 lockdowns and allowed to operate during COVID-19, surges in demand were expected to motivate production, and where aggregate supply outstripped aggregate demand, agricultural exports were expected to increase.

Government policies meant to control the spread of COVID-19 (strictness in the application and implementation of government COVID-19 overall controls), when interacted with government income support of the exporting country, had a positive effect with a statistically significant coefficient at 1 percent significant level. An upward movement in government stringent index, by 1 percent, complemented with provision of income support would lead to 0.02 percent increase in Madagascar agricultural exports.

The provision of income support, though consumptive[28] in nature, presumably induced demand and according to the Keynesian concepts stimulated production. Thus, increase in government financial support while workplaces were open but operated under strict COVID-19 control systems would stimulate Madagascar agricultural exports to its COMESA Member States.

However, workplace closures in Madagascar, a government policy meant to control the spreading of COVID-19, if interacted with government income support, produces negative results, with a statistically significant coefficient at 5 percent significant level. A 1 percent increase in workplace closures complemented with government income support in the exporting country would reduce Madagascar agricultural exports by 1.33 percent.

The negative effect of exporter financial support to Madagascar agricultural exports during COVID-19, when workplaces were closed is not surprising. It is just a reflection of the kind of support given in Madagascar which is highly consumptive in nature. Given that Madagascar (the exporting country) closes workplaces but at the same time avail consumptive financial support, domestic aggregate demand were expected to increase, and exports decrease.

4.3 Comparison with Related Studies

Findings from this study concur with results obtained in previous studies. Hayakawa & Mukunoki, (2020) found that COVID-19 burden in exporting countries negatively affected trade. However, while this study found a negative and statistically significant effect of importing country COVID-19 burden on

28 covering salaries or providing direct cash payments, universal basic income, or similar, of people who lose their jobs or cannot work during COVID-19

Madagascar's agricultural exports, Hayakawa and Mukunoki found that similar burden positively affect trade in the agricultural industry.

Differences in the results could be due to the following: first, this study focused on developing country exports to other developing countries, COMESA Member States in particular, whereas Hayakawa and Mukunoki's study focused on a mixed sample of trading countries but dominated by developed countries[29]. Second, it could be differences in time periods, this study considered a period of 12 months, compared to three months period of analysis.

Findings from this study also concur and contrast with findings from Maliszewska, Mattoo, & Mensbrugghe (2020) study on the potential impact of COVID-19 on GDP and trade, and Mold & Mveyange (2020) study on the impact of COVID-19 crisis on regional trade in the East African Community (EAC) respectively. Despite having conducted both in Africa, the EAC study and this study produced contrasting results. This could be explained by differences in methodologies and period of analysis. Notwithstanding differences in methodologies between this study and that of Maliszewska, Mattoo, & Mensbrugghe, (2020) the findings are similar.

Results from this study also concur with Verschuur, Koks, & Hall, (2021) and Socrates, (ud) who found that measures imposed by governments to curb further spread of COVID-19 negatively impacted trade. Although results are similar, the methodologies used, and study settings differ. Whilst this study focused on intra-COMESA trade, Verschuur, Koks, & Hall, (2021) focused on global maritime trade and Socrates's study on Kenya's bilateral trade with the rest of the world. Whereas Socrates's study used weekly product data for the period 01 July 2019 to June 30, 2020, this study used monthly sectoral data for the period January 2020 to December 2020 and Verschuur, Koks & Hall, (2021) used vessel tracking data during the first eight months of the pandemic.

29 25 out of 26 reporting countries were developed countries. Only South Africa which is highly debatable regarding its development classification is from the developing Africa.

5.0 Conclusion and Policy Implications

5.1 Conclusion

The study examined the impact of COVID-19 on Madagascar's agricultural exports. Findings indicate that COVID-19 negatively impacted Madagascar's agricultural exports to the COMESA region. Negative impacts of COVID-19 in Madagascar's exports may be reduced through provision of income support in the country. However, the policy should be implemented with caution, for instance, when workplaces are closed, it may have a detrimental effect on Madagascar's agricultural exports. If, on the other hand, the policy is applied when workstations are open but operating under strict lockdown control system (government stringency), agricultural exports are expected to increase.

6.2 Policy Implications

Based on the study results, the following are the implications for policy:

a) Madagascar should consider implementing policies that support the provision of income when workstations are open to reduce the negative impacts of COVID-19.

b) COVID-19 induced policy restrictions in Madagascar should be implemented together with the provision of income support to the most affected households to minimize the negative income-effects of COVID-19 in agriculture exports.

c) Madagascar should consider diversifying its export products as well as export and import markets.

d) Madagascar should consider exploiting its agricultural export potential with COMESA in order to strengthen its economy.

e) COMESA Member States to minimize COVID-19 induced trade restrictive measures to promote intra-regional trade.

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Annexure A: Product list

Code	Product Name
01	Live Animals
02	Meat and Edible Meat offal
03	Fish and crustaceans, molluscs, and other aquatic invertebrates
04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included
05	Products of animal origin, not elsewhere specified or included
06	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage
07	Edible vegetables and certain roots and tubers
08	Edible fruit and nuts; peal of citrus fruit or melons
09	Coffee, tea, mate' and spices
10	Cereals
11	Products of the milling industry; malt; starches; inulin; wheat gluten
12	Oil seeds and oleaginous fruits; miscellaneous grains; seeds and fruit; industrial or medicinal plants; straw and fodder
13	Luc; gums, resins and other vegetable saps and extracts
14	Vegetable plaiting materials: vegetable products not elsewhere specified or included
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes
17	Sugars and sugar confectionery
18	Cocoa and cocoa preparations
24	Tobacco and manufactured tobacco substitutes
31	Fertilizers

Annexure B: Gravity model results (lagged results)

Variable	Estimated Coefficient	Robust Standard Errors
GDP_{it}	2.30	1.57
GDP_{jt}	4.23***	1.20
$Dist_{ij}$	-.003***	.0006
CL_{ij}	-1.05**	.48
CC_{ij}	-2.50***	.35
$covid_{it}$	-.0001	.00006
$covid_{it}$	-.00002**	9.29
$Gstring_{it}$	-.001	.004
$Incsupp_{it}$	1.33**	.46
$Incsupp_{it}$	-1.18***	0.25
$WPCit * Inc_{it}$	-.55***	.15
$Gst * Icc_{it}$	.01*	.008
β_0	13.79	2.01
Observations	57	
Adjusted R-Squared	.77	

Note: ***p<0.01; **p<0.05; *p<0.1

Annexure C: Descriptive statistics

Variable	Name	Units	Mean	Std Dev	Min	Max
X_{itj}	Bilateral Exports	USD (000)	98.68	280.43	0	1768
GDP_{it}	Exporter's Gross Domestic Product	USD	1.12	1.14	9.92	1.35
GDP_{jt}	Market potential of the importing country	USD	3.94	3.94	8.48	3.02
$Dist_{ij}$	Geographical distance between bilateral trading partners	Kilometres	3112.93	1919.2	921.11	7331.65
CL_{ij}	Common Official Language	Dummy	0.38	0.49	0	1
CC_{ij}	Countries colonized by the same colonial masters	Dummy	0.13	0.13	0	1
$covid_{it}$	Total COVID-19 deaths and infections in Madagascar	Number of people	8232.08	7926.83	0	17975
$covid_{it}$	Total COVID-19 deaths and infections in the importing country	Number of people	14629.78	30845.72	0	145693
$Gstring_{it}$	Strictness of 'lockdown style' policies	Index ranging from 0-100	50.43	26.62	0	85.46
$Gst*Icc_{it}$	Provision of income support in Madagascar, the exporting country during varied lockdown levels	Numerical values	37.71	29.07	0	70.18
$Incsupp_{it}$	Provision of income support in Madagascar, the exporting country	Ordinal Scale	0.67	0.47	0	1
$Incsupp_{it}$	Provision of income support in the importing country	Ordinal Scale	0.51	0.68	0	2
WPC_{it}	Workplace Closures in Madagascar, the exporting country	Ordinal Scale	0.67	0.47	0	1
$WPC_{it}*Incsupp_{it}$	Provision of income support in Madagascar, the exporting country when workplaces are closed	Ordinal Scale	0.47	0.67	0	2

Annexure D: Correlation analysis

Variable														
X_{itj}	1.0000													
GDP_{it}	0.0832	1.0000												
GDP_{jt}	-0.0105	0.0833	1.0000											
CL_{ij}	0.1702	0.0000	-0.3189	1.0000										
CC_{ij}	-0.0067	0.0000	-0.1038	0.4880	1.0000									
$Dist_{ij}$	-0.2501	-0.0000	0.5548	-0.0694	0.2001	1.0000								
$covid_{it}$	0.0714	0.5066	0.5968	-0.2080	0.0000	-0.0000	1.0000							
$covid_{it}$	0.0641	0.9183	0.0779	-0.0000	-0.0074	0.3740	0.4632	1.0000						
$Gstring_{it}$	-0.0279	-0.0795	0.0052	0.0000	0.0000	0.0000	0.0271	-0.0457	1.0000					
$Gst*Icc_{it}$	0.0277	0.3638	0.0396	-0.0000	0.0000	0.0000	0.4764	0.1614	0.4690	1.0000				
$Incsupp_{it}$	0.0580	0.6890	0.0655	0.0000	0.0000	0.0000	0.7321	0.3222	0.3264	0.9194	1.0000			
$Incsupp_{it}$	0.1695	0.2795	-0.0365	0.3218	0.1338	-0.1936	0.3120	0.0050	0.2422	0.3760	0.4026	1.0000		
WPC_{it}	0.0580	0.6890	0.0655	0.0000	0.0000	0.0000	0.7321	0.3322	0.3264	0.9194	1.0000	0.4026	1.0000	
$WPCit*Inc_{it}$	0.1520	0.3423	-0.0106	0.2776	0.1119	-0.1679	0.3798	0.0342	0.1683	0.4618	0.4958	0.9445	0.4958	1.0000

Digitalizing Trade in COMESA in the Wake of COVID-19 Pandemic

Adam Willie

Abstract

This study investigated whether digitalisation could reduce the adverse effect of the Coronavirus (COVID-19) on trade in the COMESA region. An assessment was conducted on the extent to which intra-COMESA exports were affected by COVID-19 in 2020. A gravity model was applied on 2020 trade data for the 21 COMESA Member States. The study found that a 10 percent increase in the exporter stringency index leads to 0.72 percent decline in intra-COMESA exports. However, if COVID-19 response measures were implemented together with trade digitalisation, the adverse effects of COVID-19 on intra-COMESA exports could be minimised. As such, Member States need to effectively address the spread of COVID-19 through mass vaccination and strict adherence to WHO protocols, given that it is likely to persist and continue to hurt intra-COMESA trade. In addition, there is need to increase internet connectivity (availability, accessibility and reliability), and enhance digitalization of trading instruments to increase efficiency and reduce transaction costs in the region.

1.0 Introduction

The Coronavirus (COVID-19) which was reported in China in December 2019, spread throughout the world in less than three months severely disrupting international business. The COVID-19 pandemic became the new norm and countries had to find ways to minimise its effects on trade. The COVID-19 is mostly transmitted through physical contacts, including exchange of documents. These circumstances are common in cross border trading environments. Thus, the response measures instituted by various governments were targeted to reduce human-to-human contact. Unfortunately, these measures introduced both supply and demand shocks to international trade. This paper, therefore, seeks to investigate whether digitalising trade can abate the trade effects of COVID-19.

1.1 Background to the Study

COVID-19 was declared a pandemic by the World Health Organization (WHO) on 11 March 2020. As of 9 August 2021,[30] a total of 202.7 million confirmed cases and 4.2 million deaths had been reported. By 18 April 2020, Africa had reported 19,895 confirmed cases from 52 countries with a mortality rate of 5.1 percent, (Shabir & Aijaz, 2020). At regional level, the COMESA region had recorded a cumulative total of 1,975,074 cases by 6 July 2021,(COMESA, 2021). The recorded cases were approximately 34.38 percent of the total cases in Africa.

COMESA experienced a surge in new cases between May and June 2021 totalling 401,332. The proliferation of new cases was attributed to relaxation of measures, heightened political activities, emergence of new variants and the cold weather conditions experienced in some Member States (COMESA, 2021).

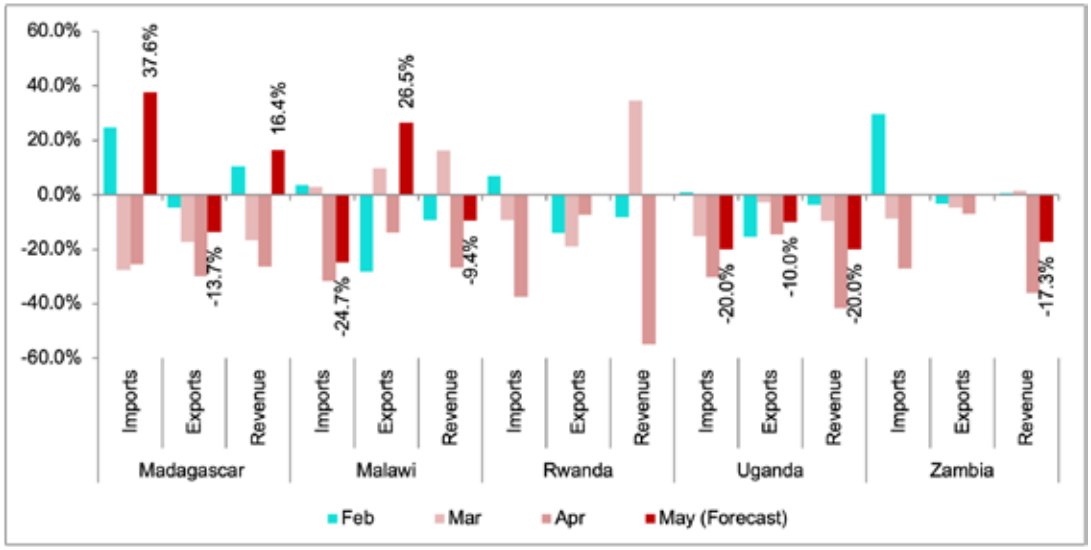
In attempts to contain the spread of the virus, several countries implemented various policy measures including, border controls, bans on gatherings for entertainment and recreational activities, travel restrictions, social distancing and national lockdowns. COMESA Member States also responded to the COVID-19 pandemic by instituting similar measures (COMESA, 2020).

The COVID-19 response measures implemented by COMESA Member States, like those implemented by other countries, disrupted the smooth flow of goods and services across borders resulting in a decrease in trade and customs revenue within the region. COMESA (2020) surveyed selected Member States (Madagascar, Malawi, Rwanda, Uganda, and Zambia) and found that between March and April 2020, the loss in imports, exports and customs revenue ranged from 26 to 37 percent, 7 to 30 percent, and 20 to 55 percent, respectively.

The performance of imports, exports and customs revenue between March and April 2020 is shown in Figure 1. Madagascar had the least loss of imports of 26 percent whilst Uganda had the highest at 37 percent. Regarding exports, Uganda and Zambia had the least loss of 7 percent whilst Madagascar had the highest at 30 percent. Madagascar had the least loss of customs revenue of 20 percent while Rwanda had the highest at 55 percent.

30 https://www.bbc.com/news/world-51235105

Figure 1: Performance of exports, imports and customs revenue (March and April 2020)



Source: COMESA (2020)

1.2 Trade Digitalisation

The digitalisation of trade is argued to provide a policy option that minimises the negative effect of COVID-19 response measures on trade within COMESA region. Digital technologies can be leveraged to enable more efficient movement of goods, including parcels, across borders. Digital technologies can ensure that border processes are transparent and accessible to traders, procedures are expedited, and processes at the border involve less physical contact (OECD, 2020). Generally, trade digitalisation encompasses electronic transactions of goods and services. Digital trade enablers include hard and soft infrastructure such as cables, wires and data flow regulations, (López González & Jouanjean, 2017, p. 12-13). UNECE (2018, p. 6) proposed that digitalising trade include enabling cross border paperless trade which automates trade-supporting data flow, making available and enabling cross-border exchange of trade related data and documents electronically. In this study, digitalising trade is construed as enabling cross border trade in goods and services, including their import, export, transit and related services, on the basis of electronic communications, including exchange of trade related data and documents in electronic form, (Mitchell & Neha, 2017, p. 1).

Digitalisation of trade is a form of trade facilitation reform. It plays an important role in improving efficiency at border posts and along transit corridors by enabling application of modern customs procedures such as: electronic risk management; pre-arrival electronic submission of customs declarations and supporting documents; application and issuance of e-licences and digital certificates of origin and sanitary and phytosanitary; use of non-intrusive inspection, electronic tracing and tracking of cargo. Digital initiatives such as the electronic single window system generally improves the coordination and flow of information across a multitude of stakeholders within and across the borders.

Digitalising trade provides the means through which customs administrations can streamline and standardise procedures and eliminate the requirements for physical documents consequently saving on costs of preparing, printing, delivering and collection of documents, (OECD, 2005). Recent developments in trade transaction theories indicate that digital reforms reduce the trade transaction

costs, leading to an increase in trade flows. The most important virtues of digitalising trade relevant to this study is that it significantly minimises human interface and handling of papers, thus improving trade efficiency.

The fundamental enablers of trade digitalisation are robust legal framework and hard infrastructure. Trade digitalisation must be based on a robust legal framework (Han & McGauran, 2014). According to (World Customs Organisation, 2014; Yasui, 2011 and United Nations Economic Commission for Europe & World Economic Forum, 2017) a robust legal framework should provide for key attributes of trade digitalisation that include:

i. Implementation of automated customs systems;

ii. Interfacing of automated customs systems;

iii. Electronic data exchange;

iv. Automatic exchange of trade data;

v. Advance exchange of information;

vi. Use of international standards;

vii. Limitations in the use of exchanged information;

viii. Confidentiality of information;

ix. Data protection;

x. Data authentication;

xi. Functional equivalence of electronic data/information as with paper-based;

xii. Technological neutrality; and

xiii. Non-discrimination between paper based and electronic based data/information.

A review of international and regional legal framework guiding international trade reveals disparity in providing for the above attributes of trade digitalisation. COMESA's legal framework provides only 31 percent of the attributes relative to the Africa Continental Free Trade Area (AfCFTA), East African Community (EAC) and Southern Africa Customs Union (SACU) legal frameworks which provide 62 percent; 46 percent; and 54 percent respectively as shown in Table 1. This shows fundamental gaps in the COMESA legal framework, which need to be addressed in order to enhance digitalisation of trade.

Table 1: Attributes of a robust trade digitalisation framework

Attribute	AfCFTA Annex 3 on Customs cooperation and MAA, Protocol on Trade in Goods	AfCFTA Annex 4 on Trade facilitation, Protocol on Trade in Goods of the AfCFTA	WCO WCO model Bilateral MAA	WTO WTO Trade Facilitation Agreement	COMESA Chapter Seven (Common Market Customs Cooperation) of the Treaty Establishing the Common Market for Eastern and Southern Africa (COMESA); Official Gazette of the COMESA Volume 15 No. 2, Issued on 9th June 2009, section 55 -59	EAC Protocol establishing the East African Community Customs Union; the EAC Customs Man-agement Act (2004) and the EAC Compliance and Enforcement Regulations.	Annex E to the SACU Agreement of 2002 (Mutual Administrative Assistance)
Implementation of automated customs systems	*	*			*		
Interfacing of automated customs systems	*	*					
Electronic data exchange	*	*			*	*	*
Automatic exchange of data			*			*	*
Advance exchange of Information	*		*			*	*
Use of international standards	*				*		*
Limitations in the use of exchanged information	*		*	*		*	*
Confidentiality of information	*		*	*		*	*
Data protection	*		*	*		*	*
Data Authentication							
Governance Framework of data exchange							
Functional equivalence of electronic data/information as with paper-based					*		
Technological neutrality							
Non-discrimination between paper based and electronic based data/information							

Source: Author Compiled; data accessed from (Mukupa & Willie, 2020)

1.4 Objectives of the study

The main objective of the study is to empirically investigate whether digitalising trade can reduce the effect of COVID-19 on trade in the COMESA region. In particular, the study seeks to:

i. Analyse the effects of COVID-19 on intra-COMESA exports;

ii. Analyse the effects of digitalising trade on intra-COMESA exports; and

iii. Assess the effects of trade digitalisation on intra-COMESA exports in the presence of COVID-19.

2.0 Literature Review

2.1 Theoretical Literature

Trade flows are generally explained through the Gravity Theory of international trade. The theory postulates that trade flows are explained by economic size and distance between countries. It hypothesises a positive relationship between trade and economic size and a negative relationship between trade and distance between countries. Large economies produce goods and services for domestic and foreign markets relative to small economies. Arguing in the perspective of the gravitation thesis, Verter (2015) posits that big economies have high propensity to import using revenue obtained from exporting. The distance between trading countries is construed as a proxy for trade costs. Countries close to each other experience relatively less trade costs than those far apart, hence, less is traded between countries far apart and vice versa (Groenewald, 2014).

COVID-19 response measures increase the time spent to clear goods at border posts and in transit between countries. This is equivalent to increasing the distance between countries, thus, COVID-19 enters the gravity model as a trade cost variable. Therefore, it can be concluded that the gravity theory predicts an inverse relationship between trade and COVID-19.

The trade transaction cost theory argues that costs are incurred as goods move from the exporting country to the importing country. These costs are expressed as a proportion of the exported goods such that reducing the costs would increase the volume of goods reaching the importing country and vice versa, (Hewitt & Gillson, 2003). The theory is analogous to the conception of the Samuelson's iceberg model of trade costs that a portion of the exported goods is spent in meeting trade transaction costs, (Hewitt and Gillson, 2003). Reducing trade transaction costs increases the amount of trade reaching the foreign destination. Trade transaction costs include transport costs, customs controls, policy and regulations compliance costs, standards and corruption. COVID-19 and the associated government response measures have either direct or indirect influence on various costs elements considered under the trade transaction costs theory.

Studies on previous epidemics indicate that the bulk of the economic costs arise from the preventive behaviour of individuals and the transmission control policies of governments (Brahmbhatt & Datta, 2008). The COVID-19 response measures disrupt regional and global value chains which in turn induces a supply shock as firm's production is interrupted. Aaron & Jonathan (2020) represent firm's output in a Nested Constant Elasticity of Substitution (NCES) function and identified factors of firm output as labour, capital and intermediate inputs. Intermediate products are moved across international borders forming a regional or international production network. In that regard, closure of borders, cross border movement restrictions of people, mandatory testing and quarantine of truck drivers delay the movement of intermediate goods across borders resulting in production stoppages accompanied by huge costs especially for firms using just-in-time production scheduling. The lockdown policies of many countries allowed the cross-border movement of cargo, albeit, with strict border crossing regulations.

The thickness of borders resulting from COVID-19 response measures raise international trade transaction costs as goods cross borders. These are transport and transactions costs driven by additional physical inspections, reduced hours of border operation, border dwell time, roadblocks, border closures, demurrage costs, among others. Increase in trade transaction costs will not only

render exports uncompetitive but also reduce industry productivity as costs of imported raw material increase. Increasing trade costs also represent a loss in investment since additional inputs are needed to bring goods to their consumers, instead of being available for investment.

The inquiry on trade effects of COVID-19 is aligned with the gravity theory of international trade as explained above. Thus, COVID-19 response measures affect the supply potential of exporters, absorption (demand) potential of importers and reduces competitiveness in foreign markets due to low firm productivity. COMESA enterprises that highly depend on export revenues and imported inputs are likely to suffer from measures they implement and those implemented by other countries, (PWC, 2020).

Whilst the gravity model presented in this paper argues that COVID-19 increases trade costs and hence reduces trade, the trade transaction costs theory predicts that reducing bilateral trade costs is equivalent to increasing trade between the trading partners. Digitalising trade has an effect of introducing efficiency in the coordination of international trade whilst at the same time minimising the need for physical contact, handling of papers and promoting social distance. This demonstrates a great potential for digital trade to reduce bilateral trade costs and increase international trade as predicted by the trade transactional costs theory.

2.2 Empirical Literature

Empirical work has shown that COVID-19 adversely affects trade. Serhan (2020) investigated the impact of infectious diseases on tourism sector for a sample of more than 200 countries using 1995 to 2017 data. He applied the gravity model and found strong evidence that international tourism is adversely affected by the risk of infectious diseases. In the case of SARS, he established that, a 10 percent increase in the number of confirmed cases leads to, on average, a reduction of about 9 percent in international tourist arrivals.

The effects of COVID-19 on international trade vary from one sector to another. Those sectors amenable to remote work had minimal impact whilst pharmaceutical sectors had a boost in trade. Espitia, Mattoo, Rocha, Ruta, & Winkler (2020) investigated the impact of COVID-19 on trade. They employed the gravity model on monthly sectoral data of 28 exporting countries Japan, the United States and all European Union countries excluding Cyprus. They established that product characteristics matter in how COVID-19 affects trade. They also found out that sectors that allowed remote work suffered minimal adverse effect. This finding gives credence to the hypothesis of this study that digitalising trade minimises the adverse effect of COVID-19 on trade.

The adverse effect of COVID-19 on international trade is also established to vary from one country to another due to differences in country's level of development, severity and duration of the disease. Hubert & Sangeeta (2021) established that though the Commonwealth trade is adversely affected by COVID-19, the effects vary between developed and developing countries and that severity and duration of the disease are also key factors.

Given how COVID-19 spreads, leveraging on digital technologies minimises human interface whilst increasing the efficiency of movement of goods, including parcels, across borders. Digitalising trade in the form of automated customs information technology system which enables trade control agencies and traders to electronically submit and exchange data and documents reduces to a greater extent the need for face-to-face interaction (UNCTAD, 2020). This paper therefore proposes that digitalising trade diminishes the adverse effect of COVID-19 on trade.

3.0 Methodology

3.1 Theoretical Framework of Analysis

The arguments provided in this paper so far are that COVID-19 has an adverse effect on international trade. However, this effect can be dampened by digitalising trade which is a trade facilitation intervention. The postulated relationships can be expressed in an exact form as follows:

$$X_{ij} = f(\gamma; Covid19; Digitalising\ trade; Covid19 * Digitalising\ trade) \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where X_{ij} are exports from country *i* to *j*;

$Covid19$ is a vector of variables that proxy COVID-19 pandemic;

$Digitalising\ trade$ is a vector of variables that proxy application of digital solutions to trade;

$Covid19*Digitalising\ trade$ is an interaction variable of proxy for COVID-19 pandemic and trade digitalisation;

γ is a vector of other determinants of exports.

Equation 1 predicts that export flows are a function of the COVID-19 pandemic; digitalising trade; the interaction of COVID-19 pandemic and digitalising trade and other variables. Literature predict that the coefficient of the COVID-19 pandemic variable should carry a negative sign whilst that of digitalising trade variable carries a positive sign. The expected sign of the coefficient of the interaction variable depends on which force is dominant. If the trade digitalisation effect is dominant relative to the COVID-19 effect, the interaction variable coefficient will have a positive sign. Alternatively, if the effects of COVID-19 is dominant relative to trade digitalisation, the coefficient of the interaction variable is expected carry a negative sign.

In order to empirically quantify the effects of COVID-19 on intra-COMESA exports and test the hypothesis that digitalising trade will dampen the adverse effect of COVID-19 on trade, a gravity model of trade was applied. A theoretical gravity model is presented as follows:

$$X_{ij} = g\frac{GDP_i GDP_j}{D_{ij}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where X_{ij} is as explained in (1);

GDP_i is the national output of the exporting country, a proxy of a country's supply potential;

GDP_j is the national output of the importing country, a proxy for a country's absorption potential;

D_{ij} is distance, proxy for bilateral costs; and is the inverse of the world output.

In empirical work, equation (2) is estimated in linear form and is linearised by taking logs of both sides as follows:

$$LogX_{ij} = \beta_0 + \beta_1 LogGDP_i + \beta_2 LogGDP_j + \beta_3 D_{ij} + \varepsilon_{ij} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where ε_{ij} is the error term. All other variables are as defined in equation (2)

The work of Anderson & Wincoop (2003) argued that equation (3) is not correctly specified. They submitted that there is need to control for multilateral resistance. Furthermore, Silva & Tenreyro (2006) proposed that equation (3) may not be estimated in log form especially for developing countries trade data that contains zero trade flows. Instead, they suggested to estimate the equation in its multiplicative form. Thus, the PPML estimator is preferred in this study because the exports data set used have zero flows rendering log linearising equation (3) not feasible and therefore the use of Ordinary Least Squares (OLS) estimator not plausible. Silver & Tenreyro (2006, p. 643) argued that due to Jensen's inequality, estimating a log linearised gravity model with the OLS estimator in the presence of heteroscedasticity will yield biased and inconsistent results.

Accounting for the above contributions, equation (3) is re-specified as:

$$X_{ij} = exp\big(\beta_0 + \beta_1 GDP_i + \beta_2 GDP_j + \beta_3 D_{ij} + \beta_4 \delta_i + \beta_5 \delta_j +\big) + \varepsilon_{ij} \text{ .... (4)}$$

Where δ_i and δ_j are exporter and importer fixed effects respectively, (proxy for multilateral resistance). β_0 to β_5 are parameters to be estimated.

Following the theoretical arguments presented in this paper, the COVID-19 and digitalising trade enter into equation (4) as trade costs. Thus, the trade costs term (D_{ij})) is re-modelled as follows:

$$D_{ij} = f(Dist; Contig; Comlang - off; Comcol; Covid19; Digitalising\ trade; Covid19 * Digitalising\ trade) \text{ .... (5)}$$

Where *Dist* is the distance between trading countries, *Contig* is sharing common border, *Comcol* is having similar colonial history, *Comlang-off* is the common official language.

Inserting (5) in (4) we have:

$$X_{ij} = exp\big(\beta_0 + \beta_1 GDP_i + \beta_2 GDP_j + \beta_3 Dist_{ij} + \beta_4 Contig_{ij} + \beta_5 Comlang - off_{ij} + \beta_6 Comcol_{ij} + \beta_7 Covid_{19} + \beta_8 Digitalising\ tradet + \beta_9 Covid_{19} * Digitalising\ trade + \beta_{10}\delta_i + \beta_{11}\delta_j +\big) + \varepsilon_{ij} \text{ .... (6)}$$

Equation (6) is the estimated empirical model. Following Silva & Tenreyro (2006), the empirical model was estimated in its multiplicative form using the Pseudo Poisson Maximum Likelihood (PPML) estimator.

Table 2: Summary of variable definitions, expected signs and data sources

Variable	Definition	Expected sign	Data Source
X_{ij}	Are 2020 intra-COMESA bilateral exports. This is the dependent variable of the model. Measured in US$ (million).		IMF direction of trade data. Retrieved from:https://data.imf.org/regular.aspx?key=61726508
GDP_i	Exporting country gross domestic product. A proxy for export supply potential. Measured in US$.	+	World Development Indicators

GDP_j	Importing country gross domestic product. A proxy of import demand potential. Measured in US$.	+	World Development Indicators
$Dist_{ij}$	Distance between the capital cities of exporting and importing countries. Measured in KM.	-	CEPII
$Contig_{ij}$	A dummy variable taking on 1 if trading countries share a common border and zero otherwise.	+	CEPII
$Comlang\text{-}off_{ij}$	A dummy variable taking on 1 if trading countries share a common official language and zero otherwise.	+	CEPII
$Comcol_{ij}$	A dummy variable taking on 1 if trading countries share a common colonial history and zero otherwise.	+	CEPII
$Covid19ij$	The COVID-19 variable. The COVID-19 Government Response Stringency Index was used as proxy of COVID-19 variable in this study. This is a composite measure of several indicators measured on an ordinal scale varying from 0 (zero measure) to 100 (total lockdown). This measure is for comparative purposes only, and should not be interpreted as a rating of the appropriateness or effectiveness of a country's response (Hale, Petherick, Phillips, & Webster, 2020). In the empirical estimates, this paper separated importer from exporter Stringency Index. Importer Stringency Index is coded () whilst exporter index is coded ()	_	Oxford COVID-19 Government Response Tracker. Data retrieved from: https://covidtracker.bsg.ox.ac.uk/

Trade digitalisation	Use of internet as a percentage of the population and implementation of electronic data interchange (EDI) systems were used as proxy for the digitalising trade variable, the EDI implementation scores are adopted from (Willie, 2018). Importer and exporter variables for internet use are used in the regression. The following codes are used in the regression model: Importer Internet use:- Exporter internet use:- Exporter EDI implementation:- Importer EDI implementations:-	+	World Development Indicators and the World Bank Trading across borders digital platform data set; https://www.comesa.int/wp-content/uploads/2020/09/Key-Issues-in-Regional-Intergration-Vol-7.pdf
(Covid19 Digitalising trade)*	An interaction variable between COVID-19 and digitalising trade variables. This is the variable of interest in this study.	+/-	World Development Indicators and the World Bank Trading across borders digital platform data set; https://www.comesa.int/wp-content/uploads/2020/09/Key-Issues-in-Regional-Intergration-Vol-7.pdf
δ_i	A dummy variable capturing exporter unobserved heterogeneity (multilateral resistance term)		
δ_j	A dummy variable capturing importer unobserved heterogeneity (multilateral resistance term).		
ε_{ij}	Is the stochastic error term.		

Source: Author compiled

4.0 Presentation and Discussion of Results

This section presents and discusses the results of the analysis. Descriptive analysis and data visuals (graphics) are presented first followed by regression results.

4.1 Descriptive Statistics

In 2020 COMESA Member States had an average intra-exports of US$ 29.1 million with a maximum of US$1.2 billion as shown in Table 3. The GDP of COMESA Member States averaged US$ 38.6 billion in 2020. The average distance between trading partners is 2,951km. About 11 percent of the Member States share a border, 56 percent use the same official language, and 30 percent share a common colonial history.

Table 3: Descriptive statistics

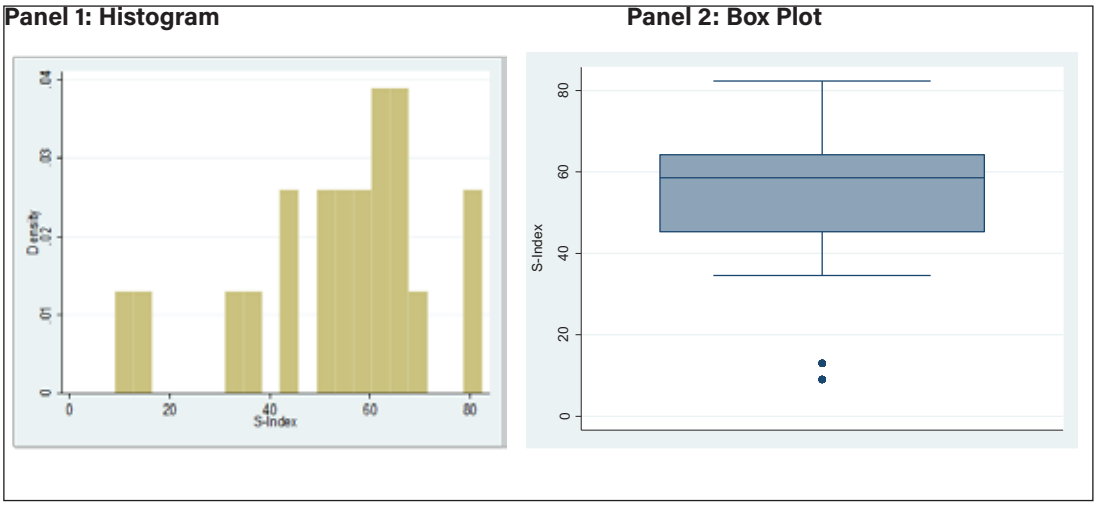
Variable	mean	Std. Dev.	Min	Max
X_{ij}	29.092 USD (million)	129.2551 (million)	0	1243.638 USD (million)
GDP_i	38,600 USD (million)	66,000 USD (million)	12,000 USD (million)	85,000 USD (million)
Dis_{tij}	2951.725km	1628.264km	180.006km	8053.869km
$Contig_{ij}$	.1190476	.3242308	0	1
$Comlang\text{-}off_{ij}$	.5571429	.4973164	0	1
$Comcol_{ij}$	.3047619	.4608555	0	1
S_Index	53.18701	18.00435	9	82.33821
Int_Use (per-cent of pop)	25.31567	18.52532	1.308907	58.76981
EDI (Implemen-tation Score)	3.119048 out of 6	1.995847	.5	6

Source: Author Compiled

The government policy response stringency index for COMESA Member States averaged 53.18, with a minimum of 9 and maximum 82.3 in 2020 as given in Table 3. Whilst the stringency index averaged 53.18, panel 1 of Figure 2, shows that index are skewed to the right and index of between 60 and below 80 are quite frequent. Panel 2 of Figure 2 shows that the median index is close to 60 and that about 50 percent of COMESA Member States had stringency indexes within the range 42 to 62. Index of below 20 are outliers. These statistics imply that, overall, there was high level of COVID-19 government response policy stringency in the COMESA region. Based on economic predictions, the high stringency level is expected to harm intra-regional exports 2020.

Table 3 also shows that about 25.3 percent of the population in COMESA use internet with an average regional score of 3.11 out of 6 in terms of implementing EDI systems. The region, thus, has lower levels of internet use and implementation of electronic data interchange systems. This implies that COMESA is at a relatively lower level of trade digitalisation (see Table 1). In that regard, the impact of COVID-19 on intra-regional trade is expected to be high.

Figure 2: Distribution of the COVID-19 government policy response stringency index for COMESA member states



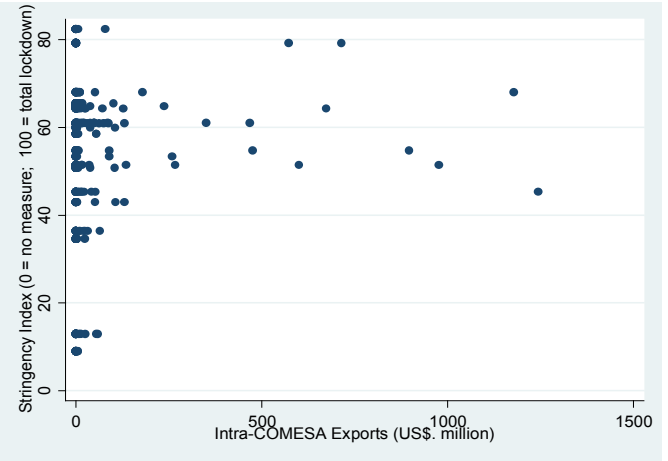
Source: Author Compiled

4.2 Correlation Analysis

The correlation analysis results in Table 4 show that the GDP of the exporter and importer countries, distance between trading partners, sharing a border and common official language, correlate with intra-COMESA exports as expected from economic theory. The COVID-19 stringency index (positive signs), importer use of internet (negative signs), EDI variables (negative signs) had unexpected signs.

The scatter plot in Figure 3 presents the relationship between severity of COVID-19 governments' response measures (S-Index) and intra-COMESA exports (exports). Higher stringency index values are associated with lower trade values. This implies a likelihood that COVID-19 response measures implemented by COMESA Member States could have negatively affected intra-regional trade.

Figure 3: Intra-COMESA exports and stringency of COVID-19 government response measures



Source: Author Compiled

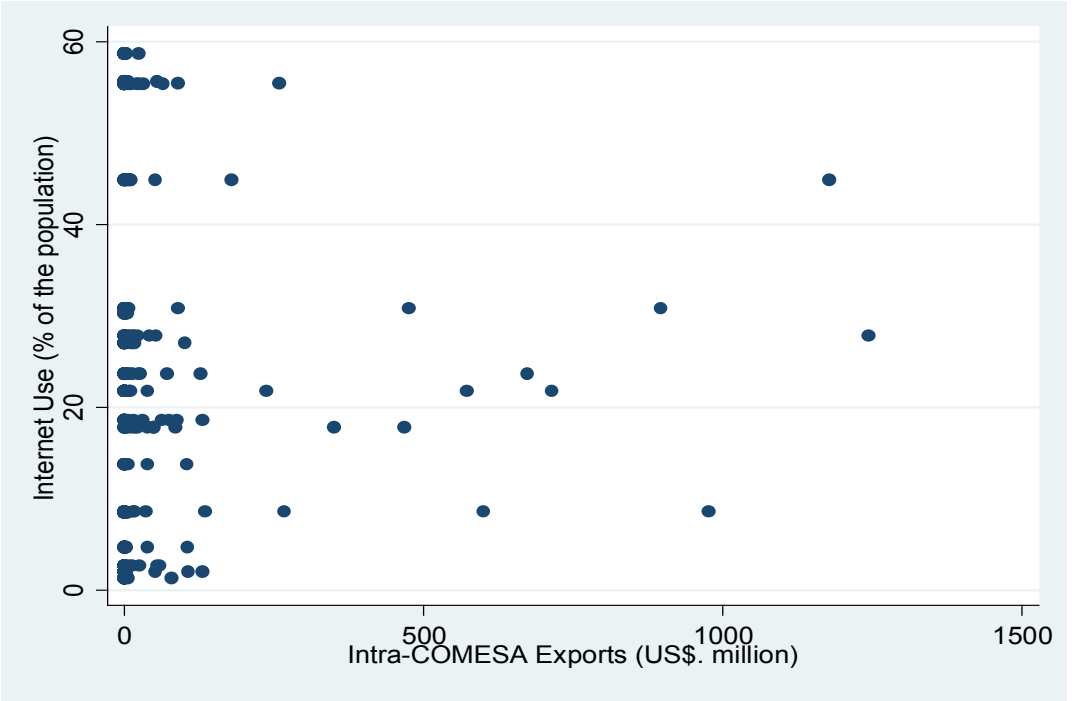
Table 4: Correlation analysis

Variable	X_{ij}	GDP_i	GDP_j	$Dist_{ij}$	$Contig_{ij}$	*Comlang-off*	$Comcol_{ij}$	*xS-Index*	*mS-Index*	*xIntr-Use*	*mIntr-Use*	*xEDI*	*EDI*
X_ij	1.0000												
GDP_i	0.1937	1.0000											
GDP_j	0.1260	-0.0500	1.0000										
$Dist_{ij}$	-0.1848	0.1238	0.1238	1.0000									
$Contig_{ij}$	0.4364	0.0678	0.0678	-0.3938	1.0000								
Comlang-off	0.0104	-0.1614	-0.1614	-0.2128	0.0613	1.0000							
$Comcol_{ij}$	-0.0296	-0.1497	-0.1497	-0.1659	0.0761	0.4028	1.0000						
S_Index_i	0.0658	0.2845	-0.0142	0.0982	0.0973	-0.0932	-0.0057	1.0000					
S_Index_j	0.0632	-0.0142	0.2845	0.0982	0.0973	-0.0932	-0.0057	-0.0500	1.0000				
Int_Use_i	0.0450	0.2423	-0.0121	0.2430	-0.0654	0.0869	0.0245	0.0326	-0.0016	1.0000			
Int_Use_j	-0.0097	-0.0121	0.2423	0.2430	-0.0654	0.0869	0.0245	-0.0016	0.0326	-0.0500	1.0000		
EDI_i	-0.0108	-0.3174	0.0159	0.0193	-0.1178	0.1182	0.0279	-0.2192	0.0110	0.1832	-0.0092	1.0000	
EDI_j	-0.0473	0.0160	-0.3201	0.0129	-0.1155	0.1256	0.0323	0.0015	-0.2222	-0.0079	0.1859	-0.0414	1.0000

Source: Author Compiled

Similarly, COMESA Member States that have low internet use (Int-Use) also have low intra-regional trade as portrayed in Figure 4.

Figure 4: Scatter plot of internet use and intra-COMESA exports



Source: Author Compiled

4.3 Regression Results

Table 5 presents the effects of COVID-19 and digitalising trade on intra-COMESA exports. The results show that the coefficients of traditional gravity model variables are significant and have the expected signs save for the coefficients of the common official language and common colonial history variables.

Table 5, Column 1, shows that the coefficient of the exporter stringency index of COVID-19 response measures, S_Index_{it} is statistically significant and has the expected sign. Similarly, Column 2, shows that the coefficient of importer stringency index of COVID-19 response measures, S_Index_{jt} is statistically significant and has the expected sign. In line with economic theory, these results confirm the existence of an adverse relationship between COVID-19 pandemic and intra-COMESA exports. A 10 percent increase in the exporter stringency index would lead to a loss of intra-COMESA exports by 0.72 percent. The findings are in line with economic theory and similar to previous studies by Serhan (2020); Espitia, Mattoo, Rocha, Ruta, & Winkler (2020) and Hubert & Sangeeta (2021). Our exporter model is reasonable as it explains about 76 percent variation in intra-COMESA exports.

Table 5: Regression analysis results

VARIABLES	(1) Exports	(2) Exports	(3) Exports	(4) Exports	(5) Exports	(6) Exports
$LogGDP_i$	2.191***	0.650***	2.389***	0.645***	1.136***	0.763***
	(0.175)	(0.195)	(0.208)	(0.188)	(0.144)	(0.168)
$LogGDP_j$	0.669***	0.697***	0.669***	0.691***	0.669***	0.739***
	(0.132)	(0.137)	(0.132)	(0.139)	(0.132)	(0.120)
$LogDist_{ij}$	-1.906***	-0.921*	-1.906***	-0.798	-1.905***	-1.906***
	(0.432)	(0.498)	(0.432)	(0.485)	(0.432)	(0.432)
$Contig_{ij}$	1.571***	1.925***	1.571***	2.239***	1.571***	1.571***
	(0.474)	(0.586)	(0.474)	(0.584)	(0.474)	(0.474)
$Comlang\text{-}off_{ij}$	-0.461	-0.225	-0.4608	-0.353	-0.460	-0.461
	(0.402)	(0.419)	(0.402)	(0.479)	(0.401)	(0.402)
$Comcol_{ij}$	-0.171	-0.524	-0.1711	-0.589	-0.171	-0.171
	(0.550)	(0.529)	(0.550)	(0.545)	(0.550)	(0.550)
S_Index_i	-0.0719***					
	(0.0195)					
S_Index_j		-0.0204*				
		(0.0120)				
EDI_i			0.423***			
			(0.089)			
EDI_j				0.155**		
				(0.077)		
Int_Use_i					0.149***	
					(0.023)	
Int_Use_j						0.028
						(0.021)
Constant	-48.80***	-21.42***	-59.14***	-23.67***	-32.48***	-19.05**
	(5.629)	(6.793)	(6.646)	(6.88)	(6.092)	(6.406)
Observations	420	420	420	420	420	420
Origin FE	Yes	Yes	Yes	Yes	Yes	Yes
Destination FE	Yes	No	Yes	No	Yes	Yes
R-squared	0.759	0.419	0.759	0.442	0.759	0.759

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Column 3 of Table 5 shows that the exporter coefficient of the electronic data interchange systems implementation score is significant and has the expected sign. Similarly, Column 4 shows that the importer coefficient of the electronic data interchange systems implementation score is significant and

has the expected sign though the model is weak. The results provide evidence that trade digitalisation in the form of implementing EDIs increases intra-COMESA trade. Column 5 shows that the coefficient of the exporter internet use variable has the expected sign and is statistically significant at 1 percent level.

The results presented in Table 5 provide evidence largely from an exporter perspective that the COVID-19 response measures implemented by various governments in the COMESA reduced intra-regional trade. Secondly, the results show that trade digitalisation in the form of use of internet and implementation of electronic data interchange systems (EDI) led to increased trade within the region.

Table 6 presents the results of interacting the COVID-19 variable with trade digitalisation variables. In column 1, the exporter stringency index has a statistically significant negative coefficient of 0.082 reconfirming that the policy measures instituted to contain COVID-19 negatively impacted intra-COMESA trade. The exporter use of internet increases intra-regional trade with a statistically significant coefficient of 0.056. When the exporter stringency index is interacted with the exporter use of internet, Column 1, shows that the variable has a positive statistically significant coefficient of 0.001. The implication of this finding is that trade digitalisation through the use of internet by exporters in the COMESA region dampen the adverse effect of COVID-19 on intra-COMESA exports. The trade promoting effect of digitalisation offsets the adverse effects of COVID-19 response measures.

Table 6: Regression analysis results: models with interaction variables

	(1)	(2)	(3)	(4)
VARIABLES	**Exports**	**Exports**	**Exports**	**Exports**
$LogGDP_i$	1.143***	0.763***	2.201***	0.659***
	(0.145)	(0.168)	(0.176)	(0.166)
$LogGDP_j$	0.669***	1.140***	0.669***	0.896***
	(0.132)	(0.268)	(0.132)	(0.184)
$LogDist_{ij}$	-1.906***	-1.906***	-1.906***	-0.990*
	(0.432)	(0.432)	(0.432)	(0.527)
$Contig_{ij}$	1.571***	1.571**	1.571***	2.261***
	(0.474)	(0.474)	(0.474)	(0.569)
$Comlang\text{-}off_{ij}$	-0.461	-0.461	-0.461	-0.411
	(0.402)	(0.402)	(0.402)	(0.440)
$Comcol_{ij}$	-0.171	-0.171	-0.171	-0.586
	(0.550)	(0.550)	(0.550)	(0.533)
S_Index_i	-0.0816***		-0.0741***	
	(0.018)		(0.0197)	
S_Index_j		0.009		0.017
		(0.021)		(0.018)
Int_Use_i	0.056*			
	(0.032)			
Int_Use_j		0.088**		

	(1)	(2)	(3)	(4)
VARIABLES	**Exports**	**Exports**	**Exports**	**Exports**
		(0.041)		
EDI_j				1.074**
				(0.452)
$S\_Index_i*Int\_Use_i$	0.001*			
	(0.001)			
$S\_Index_j*Int\_Use_j$		0.002*		
		(0.001)		
$S\_Index_i*EDI_i$			0.0115***	
			(0.003)	
$S\_Index_j*EDI_j$				-0.015**
				(0.007)
Constant	-25.9***	-28.27***	-49.29***	-28.78***
	(4.785)	(6.77)	(5.687)	(6.75)
Observations	420	420	420	420
Origin FE	Yes	Yes	Yes	Yes
Destination FE	Yes	Yes	Yes	No
R-squared	0.759	0.759	0.759	0.536

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In Column 2 of Table 6, the coefficient of the importer stringency index is statistically insignificant. However, the importer use of internet variable has a statistically significant positive coefficient. The interaction variable of the importer stringency index and importer use of internet has a positive and statistically significant coefficient. The results provide evidence that the use of internet by importing countries in the COMESA region reduce the negative effects of COVID-19 containment policies on intra-COMESA exports.

Furthermore, column 3 of Table 6 shows that the exporter stringency index significantly reduce intra-COMESA trade. It also shows that the interaction variable between the stringency index and EDI variable has a positive and statistically significant coefficient. This implies that trade digitalisation in the form of applying electronic data interchange systems reduce the negative effect of COVID-19 containment policies on intra-COMESA exports. The importer perspective model presented in column 4 has weak predictive power though it shows a negative and statistically significant coefficient of the interaction variable of the importer stringency index and the importer EDI variable.

5.0 Conclusion and Policy Implications

5.1 Conclusion

This paper sought to investigate whether digitalising trade can minimise the adverse effect of COVID-19 on trade in COMESA region. It explored the effects of COVID-19 and government stringency measures on intra-COMESA trade. It also investigated the role of trade digitalisation in mitigating the negative effects of the pandemic on intra-COMESA trade. The key findings of this study are:

i. The COVID-19 policy response measures implemented by COMESA Member States had adverse effects on intra-COMESA exports;

ii. The use of internet in trade transactions had a positive effect on intra-COMESA exports;

iii. The application of electronic data interchange systems had a positive effect on intra-COMESA exports. However, models predicting the effectiveness of application of EDIs by the importer had weak predictive power;

iv. Use of internet in trade transactions in the presence of stringent COVID-19 containment measures minimised the adverse effects on intra-COMESA exports;

v. Application of electronic data interchange systems by the exporter in the presence of the exporter's stringent COVID-19 containment measures reduced the adverse effect of the strict measures on intra-COMESA exports.

5.2 Policy Implications

The empirical findings of this study imply that:

i. COMESA Member States should effectively address the spread of COVID-19 pandemic, given that it is likely to persist and continue to hurt intra-COMESA trade;

ii. There is need to increase internet connectivity (availability, accessibility and reliability) in the COMESA region; and

iii. There is need to enhance digitalization of trading instruments to increase efficiency and reduce transaction costs in the region.

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Kenya Trade Performance in COMESA Amidst COVID-19

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32 I thank Ana Fernandes who oversees the Exporter Dynamics Database at the World Bank for granting me access to this updated data which is yet to appear online.

Abstract

The study evaluated the effect of the COVID-19 on monthly export and import trade margins; trade flows, intensive margins[33] and extensive margins[34] between Kenya and COMESA countries from January 2019-December 2020. The study found that monthly exports from Kenya to COMESA countries rose by 5.4 percent while imports fell by 21 percent during the COVID-19 period. The improvement in exports was associated with the increase in the number of COVID-19 cases. The presence of domestic lockdowns specifically the closure of workplaces and restrictions on the internal mobility of people reduced Kenya's imports from COMESA countries. COVID-19 cases, deaths and stringency index in Kenya and COMESA countries reduced the average sale of products exported from the former to the latter. The number of exported products was negatively impacted by COVID-19 cases and deaths in Kenya and COMESA countries and Kenya's COVID-19 stringency measures and lockdown. However, it was positively associated by COMESA's stringency measures. COVID-19 cases and deaths in COMESA countries and containment measures- stringency and lockdown by the government of Kenya positively influenced the number of products that were imported into the country from the COMESA region. The study recommends that Kenya reduces restrictions on internal movements to boost domestic production for domestic and export markets, while at the same time enhancing adherence to WHO protocols on the COVID-19 pandemic; consider putting in place measures to support/ boost production in export oriented firms as well as vulnerable households affected by the COVID-19 pandemic; and explore opportunities to enhance export sales and number of products exported into the COMESA region. Further it recommends COMESA Members States to effectively implement COMESA's trade facilitation measures, as specified in the COMESA guidelines on trade in essential goods during the COVID-19 period to boost intra-regional trade

Keywords: Trade Margins; COVID-19; Kenya; COMESA

JEL Classification: F14, F15, H12, I18

33 Average sales per product per destination in a month.
34 Number of products traded with a partner country in a specific month.

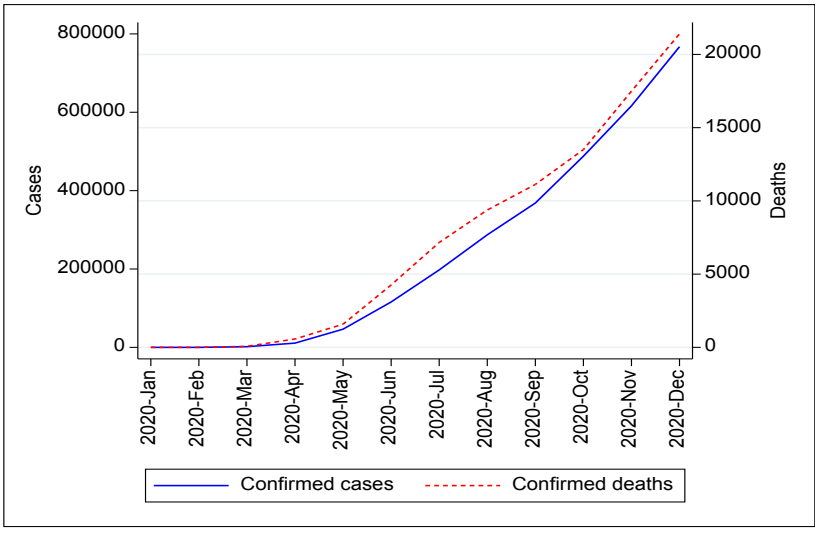
1.0 Introduction

The Coronavirus (COVID-19) pandemic started as a health crisis in China in December 2019 and became a social and economic disaster worldwide. The global economy shrank by 3.2 percent in 2020, while advanced economies contracted by 4.6 percent and emerging and developing countries by 2.1 percent (IMF, 2021). The volume and value of merchandise trade in the world declined by 5.3 percent and 7.6 percent, respectively, in 2020 (WTO, 2021). Exports declined by 8.1 percent in Africa, while imports dropped by 8.1 percent in 2020 (WTO, 2021). Empirical evidence on the effect of the pandemic on international trade is still nascent, mainly covering developed economies and primarily descriptive.

The first case of COVID-19 in COMESA region was confirmed in February 2020, two months after China recorded the first case. Figure 1 shows the trend of confirmed COVID-19 cases and deaths in COMESA between January and December 2020. The number of COVID-19 cases in COMESA was less than five at the beginning of March but rose to 1,727 at the end of March 2020. The number had increased by six-fold by the end of April (10,876) and over 115,904 cases had been confirmed by the end of June.There were 767,238 confirmed cases by end of December 2020. The first COVID-19 related death in COMESA region occurred in March 2020. There were 73 fatalities by end of March which increased to 570 in April and 1,584 by the end of May. There were 17,487 fatalities by the end of November and the number rose by over 3,900 by the end of December 2020.

Tunisia and Egypt had the highest number of confirmed COVID-19 cases by the end of 2020, each accounting for 18 percent of the 767,238 cases in the COMESA region. The two countries also led in terms of COVID-19 fatalities, with 36 percent of fatalities in Egypt and 22 percent in Tunisia. With 527 cases as of December 2020, Mauritius had the least number of COVID-19 infections. Burundi and Eritrea had the least number of deaths, two and three respectively, by the end of 2020. Kenya had 96,458 confirmed COVID-19 cases as of December 2020, accounting for 13 percent of total infections in the COMESA region. Kenya had the fourth highest number of deaths arising from COVID-19 in the COMESA region accounting for 8 percent by the end of 2020.

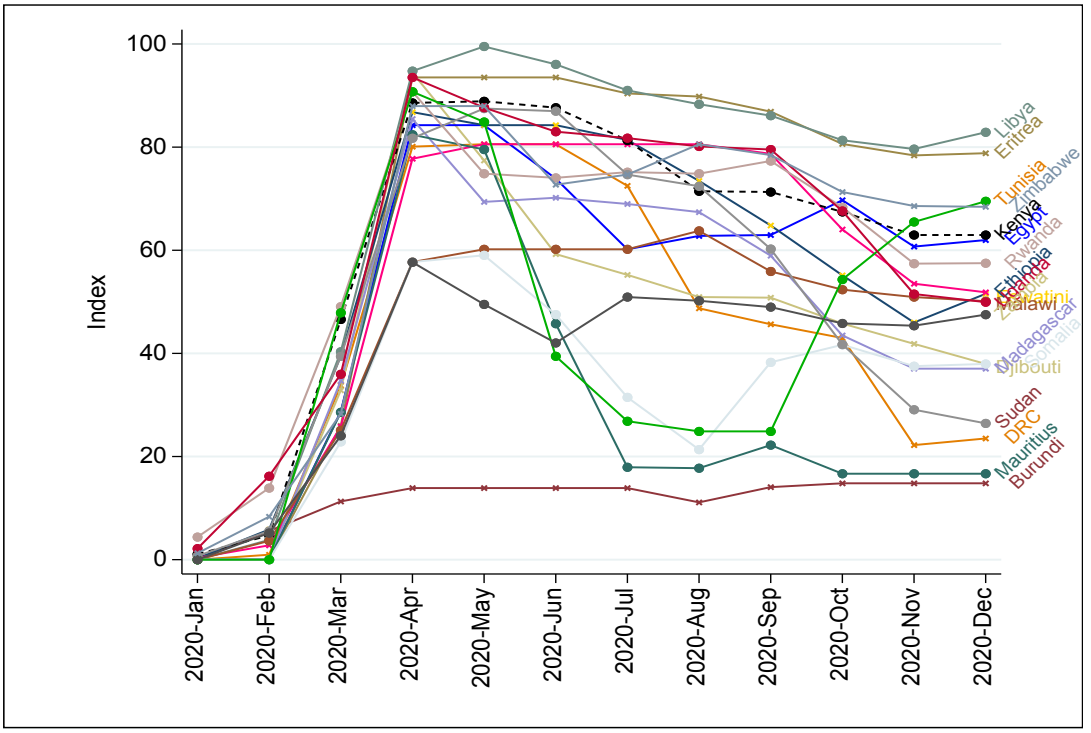
Figure 1: Confirmed COVID-19 cases and deaths in COMESA (January –December 2020)



Source: Author's compilation using data from Hale et al. (2020)

Figure 2 shows the trend of the stringency index among COMESA countries. The index shows the severity of containment measures that governments applied to prevent the spread of COVID-19. It ranges from 0 to 100, where 100 indicates strict implementation of containment measures. Most COMESA countries started imposing sterner COVID-19 measures around mid-March 2020, as shown by the sudden jump in respective country graphs in Figure 2. Easing of containment measures for most countries started in July, although the overall trend of COVID-19 control measures fluctuated. This implies that countries partially relaxed the measures depending on the waves of the pandemic. Nevertheless, Libya and Eritrea had the highest rates of COVID-19 restrictions in 2020. Burundi was the least stringent country followed by Mauritius as of December 2020.

Figure 2: COVID-19 stringency index by COMESA countries (January - December 2020)



Source: Author's compilation using data from Hale et al. (2020)

The first measure of containing the spread of the virus in Kenya was imposed on 20 January 2020 through mandatory screening of international travelers.This policy was followed by the cancellation of public events and restrictions on gatherings on 13 March 2020. Closure of schools and workplaces was imposed after two days and borders were shut on 17 March 2020. Other policies such as the closure of public transport and borders, stay at home requirement and restrictions on internal movement were in operation as of 27 March 2020. This explains the sudden jump in Kenya's stringent index between February and March and the subsequent peak in March 2020. Kenya's stringency index stayed at the peak between March and May until the government started relaxing some policies in late June 2020. Nonetheless, the implementation of COVID-19 containment measures in Kenya fluctuated based on the severity of the waves of the virus.

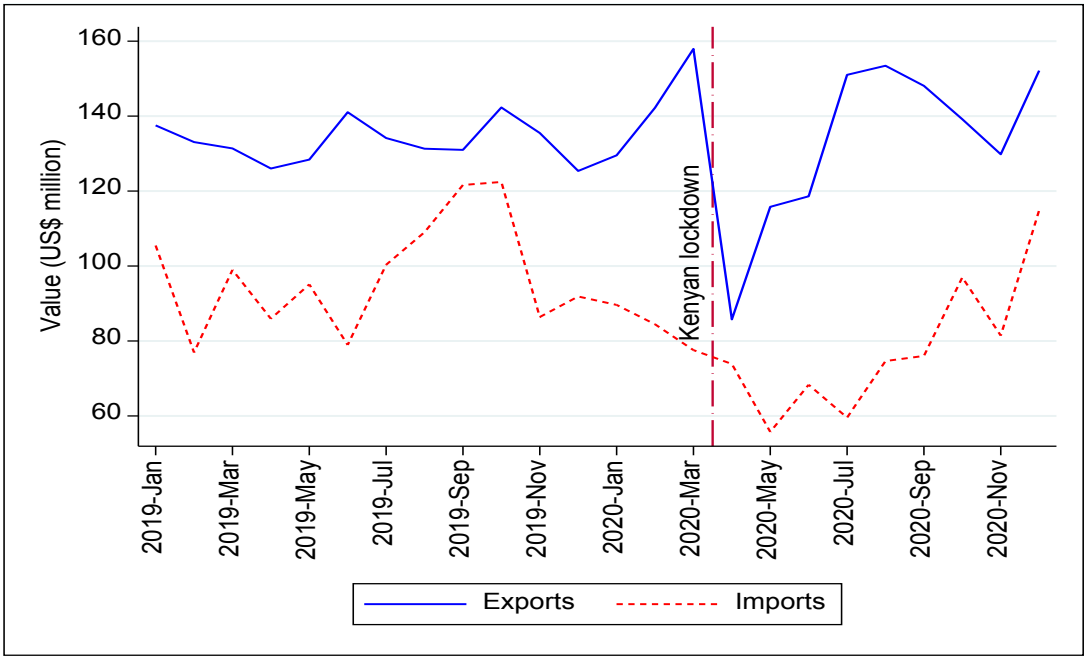
1.2 Kenya's International Trade with COMESA before and during COVID-19

The trends of Kenya's exports to and imports from COMESA countries between January 2019 and December 2020 is shown in Figure 3. Over the two years, exports were consistently higher than imports, suggesting that Kenya had a trade surplus with COMESA.

Monthly exports fluctuated between US$ 125 million and US$ 158 million before the lockdown in Kenya (mid-March) 2020. Exports were on a steady increase between January 2020 and March 2020 but later slumped by US$ 72 million (from March-April) 2020 immediately after Kenya imposed containment measures. Exports rose by 35 percent (US$ 86 million-US$ 116 million) from April to May 2020 and 2 percent (US$ 118 million) in June 2020. The relaxation of containment measures in late June 2020 led to a 27 percent rise in exports in July (US$ 151 million) followed by a 2 percent increase in August (US$ 153 million). However, the value of exports consistently dropped between September and November before increasing in December 2020.

Kenya's monthly imports fluctuated throughout the 24 months except for a steady decline between November 2019 and May 2020. The average monthly value of imports from COMESA countries to Kenya for the 24 months was about US$ 89 million. Imports peaked in September and October 2019 before drastically falling, heading to the lockdown period. This implies that COMESA's imports to Kenya started to decline before the COVID-19 period. The value of imports declined by 5 percent a month into the lockdown (March-April) and later declined by 25 percent in the second month (April-May). Imports briefly increased in June 2020 but declined by 13 percent in July (from US$ 68 million in June to US$ 60 million in July). The growth of import volumes was largely positive between August and December except for a 16 percent slump between October and November 2020.

Figure 3: Value of exports and imports from Kenya to COMESA (January 2019 – December 2020)



Source: Author's compilation using data from Exporter Dynamics Database (EDD).

Table 1 shows the share of import and export value by COMESA countries in their trade with Kenya before and after the country imposed lockdowns. The lockdown indicator is binary, with one indicating the period between March and December 2020 when the lockdown was active in Kenya and zero otherwise. The column on difference indicates the percentage point difference in the share of exports (pre and during the lockdown) and imports (before and during the lockdown).

Over 39 percent of Kenya's exports to COMESA countries go to Uganda, followed by Rwanda, Egypt, the Democratic Republic of the Congo (DRC), Somalia, Ethiopia, Burundi, Sudan and Zambia respectively. Cumulatively, these countries accounted for at least 95 percent of Kenya's export to COMESA before and during the lockdown. This implies that the remaining countries – Malawi, Mauritius, Zimbabwe, Djibouti, Madagascar, Comoros, Eritrea, Libya, Tunisia and Eswatini - had weak export relations with Kenya. The column on export difference indicates that export trade between Kenya and Uganda, Sudan, Ethiopia, Malawi, the DRC, Rwanda, Djibouti, Somalia and Eswatini increased during the lockdown period. Particularly Uganda and Sudan had a more than 1 percentage point rise. During the lockdown period, the fall in exports was largest with Egypt, dropping by 1.5 percentage point. Exports to the remaining COMESA countries declined during the lockdown period though the difference was often less than 0.3 percentage points.

Egypt is Kenya's top import partner, with a proportion of 36 percent before the lockdown and 44 percent after the lockdown. Uganda's share was 27 percent before the lockdown and 25 percent after the lockdown, suggesting that at least two-thirds of Kenya's imports are from Egypt and Uganda. Other countries in the top ten include Eswatini, Mauritius, Zambia, Zimbabwe, Malawi, Sudan, Madagascar and the DRC. The top ten countries account for 98 percent and 97 percent of Kenya's imports before and during the lockdown respectively. Among the top 10 importers, only Egypt, Zimbabwe, Malawi, and the DRC increased their share of imports to Kenya during the pandemic period. Eswatini had the highest decline, over 3 percentage points, followed by Uganda and Zambia (2.3 percentage points respectively), Sudan and Zambia whose percentage point difference was approximately 2, respectively.

The last two columns of Table 1 indicate that Kenya's total trade was positive and thus increased with only three COMESA countries - Malawi, Rwanda and the DRC during the lockdown period. Kenya mainly trades in food products, metals and chemicals with these countries. Kenya gained a trade surplus with Uganda, Eswatini, Mauritius, Zambia, Sudan, Ethiopia, Somalia and Djibouti. Kenya mainly exports chemicals, animal, food, machinery and electronic products to these countries thus indicating

its comparative advantage in these product categories during the lockdown. The country had a deficit with the remaining countries, led by Egypt, whose percentage point difference in imports was over five times that of exports.

Table 1: Kenya's export and import trade by COMESA partner

	Exports (%)		Imports (%)		Difference (%)	
Country	**Pre-lock-down**	**Lock-down**	**Pre-lock-down**	**Lock-down**	**Exports**	**Imports**
Burundi	4.2	3.2	0.0	0.3	-0.9	0.3
Comoros	0.1	0.1	0.0	0.0	-0.1	0.0
DRC	8.2	8.4	1.3	2.2	0.2	0.9
Djibouti	0.4	0.4	0.1	0.0	0.0	-0.1
Egypt	12.0	10.5	35.7	43.6	-1.5	7.9
Eritrea	0.1	0.0	0.0	0.0	0.0	0.0
Ethiopia	4.3	4.8	0.8	0.6	0.4	-0.2
Libya	0.1	0.0	0.0	0.0	0.0	0.0
Madagascar	0.4	0.1	1.4	1.2	-0.2	-0.2
Malawi	2.2	2.4	2.7	3.0	0.3	0.2
Mauritius	0.7	0.7	6.5	4.6	-0.1	-1.9
Rwanda	13.9	14.0	0.9	1.5	0.1	0.6
Somalia	7.0	7.0	0.3	0.1	0.0	-0.3
Sudan	3.9	4.9	2.5	0.5	1.0	-2.0
Eswatini	0.0	0.0	11.1	7.9	0.0	-3.2
Tunisia	0.1	0.0	0.2	0.6	-0.1	0.4
Uganda	39.1	40.2	27.2	24.9	1.1	-2.3
Zambia	2.6	2.6	5.6	3.3	0.0	-2.3
Zimbabwe	0.7	0.5	3.6	5.8	-0.2	2.2

Source: Author's compilation using data from EDD

Table 2 shows the shares of exports and imports by product category before and during COVID-19. The last two columns show the percentage point difference before and during the lockdown for products, by exports and imports respectively. The lockdown is binary, indicating the period Kenya was under the lockdown and before. Vegetables are the most exported product from Kenya to COMESA countries, accounting for a quarter of the total trade before and under COVID-19. It is followed by chemicals, food products, metals and minerals, respectively, which cumulatively aacounted for over 74 percent of Kenya's exports to COMESA before and during the lockdown in Kenya. The value of vegetable

exports reduced marginally, by 0.3 percent, before and during COVID-19. Of all products, food exports experienced the largest growth during the lockdown (1.5 percent). This suggests that external demand for food products increased during the pandemic in 2020 (KNBS, 2021).

Other products whose stake in Kenya's exports to COMESA improved during the COVID-19 period were; chemicals, minerals, plastic/rubber, machines and electronics, and textiles and clothing. Since these products fall within the category of intermediate goods, which are vital for Global Value Chain (GVC) trade (Johnson, 2018), this suggests that Kenya participated in GVC trade with COMESA countries through forward linkages[35]. Exports of wood, metals, stone and glass, animals, hides and skins, and vessels associated with transport equipment declined during COVID-19. This could be because most of these products are heavy and are mainly transported by the sea, yet sea transport was affected negatively by COVID-19 (Majune, 2020).

Kenya primarily imports food products from COMESA countries (around 30 percent), followed by chemicals and animals, respectively, as shown in Table 2. The three products cumulatively accounted for 59 percent of overall imports before COVID-19 but declined to 51 percent during the pandemic. This implies that the overall drop in imports during the pandemic, shown in Figure 3, could have been triggered by the dip in these top import products, particularly food products and animals whose shares declined by 4.5 percent and 3.6 percent respectively. Wood, the fourth import product before COVID-19, increased its share from 8.6 percent to 11.2 percent during the pandemic. The share of metal imports also rose from 5 percent to 8.7 percent during the pandemic. The surge in wood and metal imports could have been influenced by the expansion of Kenya's construction sector, which grew by 11.8 percent in 2020 (KNBS, 2021). Other products whose share of imports improved during the pandemic include minerals, plastic/rubber, machines and electronics, stone and glass, hides and skins and footwear.

Table 2: Kenya's export and import trade under COMESA by product

	Exports (%)		**Imports (%)**		**Difference (%)**	
Products	**Pre-lock-down**	**Lock-down**	**Pre-lock-down**	**Lock-down**	**Exports**	**Imports**
Animal	0.8	0.7	11.1	7.4	-0.2	-3.6
Vegetable	25.3	25.0	6.7	5.7	-0.3	-1.0
Food Products	15.5	17.1	33.4	28.9	1.5	-4.5
Minerals	7.0	8.1	4.3	5.7	1.1	1.3
Chemicals	16.2	16.4	15.0	14.7	0.2	-0.3
Plastic/Rubber	5.0	5.2	3.2	3.7	0.2	0.5
Hides & Skins	0.1	0.0	0.2	0.2	-0.1	0.0
Wood	4.4	3.5	8.6	11.2	-0.8	2.6
Textiles & Clothing	2.2	2.5	1.0	0.9	0.3	-0.1
Footwear	2.2	2.1	0.4	0.4	0.0	0.0

35 Forward GVC participation occurs when a country exports intermediate commodities that are used in other countries' exports. Backward linkages is when a country's exports are mainly composed of imported intermediate inputs

Stone & Glass	1.5	1.2	2.9	3.1	-0.3	0.2
Metals	9.6	9.0	5.0	8.7	-0.6	3.6
Mach & Elec	4.7	5.0	4.1	4.3	0.2	0.3
Transportation	2.5	1.8	0.6	0.0	-0.7	-0.6
Miscellaneous	2.9	2.3	3.4	4.9	-0.6	1.4

Source: Author's compilation using data from EDD

The last two columns of Table 2 show that only minerals, machines and electronics, and plastic/rubber had a positive difference for both exports and imports. Given that these are intermediate products, it can be inferred that Kenya partially participated in GVC trade through both backward and forward linkages during the pandemic. Animal, vegetable, and transportation products experienced a simultaneous drop in import and export trade during the pandemic. Food products, textile and clothing, and chemicals had a trade surplus as their export shares surpassed the import shares while the remaining products had a trade deficit.

1.3 Problem Statement

COVID-19 has not only disrupted the health systems of countries but also their economies. The pandemic has led to increased unemployment, a fall in economic growth and a surge in public debt (Baldwin and Tomiura, 2020). International trade has also declined due to the imposition of containment measures by countries. Nonetheless, this evidence is seldom in developing countries, and it is mainly descriptive, using macroeconomic data to assess export trade. Kenya is among the top trading countries in COMESA and was adversely affected by the COVID-19 pandemic. It had the fifth highest number of COVID-19-cases and the fourth highest number of deaths in the COMESA region by the end of 2020. However, there are limited empirical evaluations of Kenya's monthly export and import trade performance, in terms of intensive margin and extensive margin in COMESA, during the COVID-19 period.

1.4 Study Objectives

The main objective of the study is to establish the effect of COVID-19 on Kenya's trade performance (intensive margin and extensive margin) in COMESA. The specific objectives are to:

i) Analyze the effect of the spread of COVID-19 on Kenya's trade performance with COMESA; and

ii) Analyze the effect of the COVID-19 government containment measures on Kenya's trade performance with COMESA.

1.5 Justification of the Study

COVID-19 has disrupted the performance of international trade. In response, countries instituted measures to cushion their economies and facilitate trade. The current study contributes to this discussion by shedding light on the cost of the spread of the disease and subsequent confinement measures by COMESA members on Kenya's trade. Kenya is among the top traders in COMESA and has been adversely affected by the COVID-19 pandemic. It had the fifth highest number of COVID-19-cases and fourth highest number of deaths in the COMESA region in 2020. The concentration on trade

performance is crucial given the importance of international trade on the economy of Kenya and other COMESA countries. In addition, trade margins are vital towards informing policy on sustaining long-term export and import growth, especially after the pandemic.

2.0 Literature Review

2.1 Theoretical Literature Review

The imposition of restrictions by countries to prevent the spread of the virus can be likened to Mercantilism. Mercantilism is an economic philosophy that favors government regulation of international trade in order to increase national wealth and power (Majune and Mwania, 2020). It is linked to policies that restrict imports such as tariffs, quotas, and non-tariff obstacles so as to raise a nation's wealth and safeguard domestic businesses. In the context of COVID-19, governments restricted imports and international trade in general through policies such as total border closure so as to prevent the spread of the virus. As a result, the effect of the pandemic on international trade can be summarized in four channels: supply shock, demand shock, substitution and contagion effect, and financial shock.

The supply shock channel of COVID-19 arises from infections and deaths of people and lockdown measures such as workplace closure. The factors reduce labor participation and in turn the production capacity of firms and the overall economy (Baldwin and Tomiura, 2020; Hayakawa and Mukunoki, 2021a). This is specifically prevalent in sectors whose chances of working online, remotely and in shifts are low. The spread of COVID-19 and its corresponding containment measures can also disrupt access to inputs if the country supplying inputs is affected. As a result, the production cost of the exporting firm will rise, leading to an increase in prices of the final commodity whose demand in the importing country will reduce. Closure and slow clearance of goods at border points also decrease cross-border supply by traders.

The demand shock of the pandemic affects importers (Baldwin and Tomiura, 2020; Hayakawa and Mukunoki, 2021a). Aggregate demand of an economy drops as the earning capacity of people declines from a surge in unemployment, reduced working hours and closure of businesses. Import trade can also be affected by the virus as the composition of products that are demanded changes. For instance, the demand for essential products such as food and medical supplies has increased during the pandemic period (Hayakawa and Mukunoki, 2021a).

The substitution effect of the pandemic occurs where a country's exports grow because its neighbour and competitor is heavily affected by the virus and has a low capacity to produce and trade. Therefore, a country might take advantage and export to some partners who initially imported from the neighbour that is affected by COVID-19. These new partners might stop importing from the country that is affected by COVID-19. The contagion effect occurs where exports from the country that is not affected by the pandemic reduce because it relies on inputs from the affected neighbour through value chains. Lastly, the pandemic also distorts the trade finance activities of financial institutions thereby undermining their capacity to invest in international trade (Afreximbank, 2021). The health of financial institutions is more important to international trade than domestic trade during crises (Demir and Javorcik, 2020).

2.2 Empirical Literature Review

Existing literature that has investigated the effect of COVID-19 on international trade covers topics on GVCs (Banga et al., 2020; Javorcik, 2020; Vidya and Prabheesh, 2020; Espitia et al. 2021; Hayakawa and Mukunoki, 2021a), trade policies (Baldwin and Evenett, 2020; Evenett, 2020), export and import flows (Baldwin and Tomiura, 2020; Lin and Zhang, 2020; Maliszewska et al., 2020; Büchel et al., 2020; Hayakawa and Mukunoki, 2021b) and COVID-19 lockdown/government measures (Majune, 2020;

Hayakawa and Mukunoki, 2021c; Barbero et al., 2021). These studies employed various strategies in their analysis (descriptive statistics, gravity regression (ordinary least squares (OLS) and poisson pseudo maximum likelihood (PPML)) and event-study methodology). Most of them used monthly data except Majune (2020), who applied weekly-level data.

This study is closely linked to studies that employ the gravity model in assessing COVID-19 and international trade, namely, Hayakawa and Mukunoki (2021a,b), Büchel et al. (2020), Espitia et al. (2021) and Barbero et al. (2021).

Hayakawa and Mukunoki (2021a,b) used four indicators of COVID-19 severity; the number of cases, deaths, people mobility and the share of days in a month that stay-home orders were in effect against bilateral export (over 34 countries) and import (over 173 countries) trade values. Irrespective of the severity metric, COVID-19 had negative implications on trade in both importing and exporting countries. The negative impact on importing countries was insignificant since July 2020. Imports of transport equipment, leather and mineral products decreased, especially in April and May 2020. In contrast, imports of some medical products increased between March to May 2020. Labor-intensive industries in exporting countries were negatively affected by the social distancing protocols to limit COVID-19 spread.

Büchel et al. (2020) assessed COVID-19's effect on monthly Swiss export and import trade between January and July 2020. The spread of COVID-19 was measured by the number of cases and stringency of containment policies. The study found that both indicators of COVID-19 significantly reduced Swiss exports and imports. However, exports were primarily affected by the spread of the pandemic in Switzerland's trading partners, while the government restrictions vastly contributed to the fall in imports.

Espitia et al. (2021) assessed the effect of COVID-19 measured by worker mobility, retail mobility, competition shock, and upstream shock on bilateral export growth in 28 exporting countries and over 50 importers for the period February-June 2020. The study found that both worker and retailer mobilities and competition shock slowed the growth of exports but the upstream shock improved it. The upstream shock arises when a third-party country, which is a supplier of inputs to the exporter, is hit by the pandemic. Exporters from sectors that were susceptible to remote working were resilient to the negative shock of COVID-19 and GVC trade was massively affected, especially when inputs were from a third country that was most affected by COVID-19.

Barbero et al. (2021) studied the effect of COVID-19 related government policies on monthly bilateral trade flows from 68 exporting countries to 222 destinations between January 2019 and October 2020. The study found that presence of lockdowns and measures such as health policies, stringency, economic measures and government response reduced trade flows among cuntries. High-income countries were also more affected by the pandemic compared to low and middle-income ones.

A few studies have assessed the impact of the virus on Kenya's international trade. Mold and Mveyange (2020) and Were and Ngoka (2022), used macroeconomic data, and Majune (2020) and Chacha et al. (2021) used firm-level data.

2.3 Overview of Literature

The studies on Kenya did not assess its trade within COMESA nor trade margins and GVC trade. Trade margins, intensive and extensive are vital in informing trade policy past the pandemic as they show how variations in trade are influenced by existing and new trade relationships. Pei et al. (2021) have made such an attempt by studying the effect of lockdowns on the intensive and extensive margins of exports but only concentrated on China and did not cover imports as done in this study[36]. Imports provide inputs for the manufacturing sector and contribute to economic growth in developing countries (Edwards et al., 2018, 2020).

Furthermore, studying imports adds to the limited literature on the role of import trade in international trade that is often ignored (Wagner, 2016). The importance of participating in value chain trade is widely known (Antràs and Chor, 2018; Johnson, 2018) but evidence from developing countries is scarce (Van Biesebroeck and Mensah, 2019; Alhassan et al., 2021). Hence, this study also contributes to this topical issue.

36 Some firm-level evidence on COVID-19 and trade margins exists - Amador et al. (2021), Benguria (2021) and Bricongne et al. (2021) – but the literature of this study is restricted to the country-level analysis.

3.0 Methodology

3.1 Empirical model

To establish the effect of COVID-19 on Kenya's trade with COMESA countries, the study adopted the model by Hayakawa and Mukunoki (2021a,b) specified as follows:

$$T_{abmy} = exp\{\beta_1 Covid_{amy} + \beta_2 Covid_{bmy} + \delta_{abm} + \emptyset_{aby} + \varphi_{my}\} * \in_{abmy} \quad (1)$$

Where T_{abmy} is the value of exports and import flows between country a (Kenya) and b (COMESA country) in a specific month (m) and (y) year . Since this study also assessed the effect of COVID-19 on trade margins, , could either be the intensive or extensive margin. The extensive margin is the total number of products traded (exported or imported) with a specific trade partner in a particular month. The intensive margin is the average sales per product by month and trading partner. $Covid_{amy}$ is an indicator of the spread and government response to COVID-19 in country a while $Covid_{bmy}$ indicates the spread and containment measures imposed by country b . δ_{abm} is the country-pair month fixed effects to control for seasonality of trade between Kenya and a COMESA partner. $\varnothing_{aby}$ is the country-pair year fixed effects which controls for the standard gravity indicators such as distance, trade agreements and multilateral resistance terms (costs from the rest of the world that affect trade between partners). φ_{my} is the month-year fixed effects that controls for variations across time. β_1 and β_2 are coefficients for COVID-19 indicators in countries a and b while $\in_{abmy}$ is the disturbance term.

Equation 1 is estimated using the Poisson pseudo maximum likelihood (PPML) approach. As illustrated by Silva et al. (2006; 2011), the PPML estimator is better than the Ordinary Least Squares (OLS) estimator of the gravity model because it handles the problem of heteroscedasticity by relying on the White robust covariance matrix estimator. It also solves the problem of zero flows by taking values as they are as opposed to log-linearizing them like the case of OLS yet the natural logarithm of zero is undefined. PPML approach is also available in many econometric software such as Stata 17 which was used in this study. It also avoids Jensen's inequality bias and does not suffer from the problem of equidispersion which assumes identical mean and variance of the dependent variable.

3.2 Data Types and Sources

Export and import data was sourced from the updated Exporter Dynamics Database (EDD) of the World Bank (Fernandes et al., 2016). This data records customs transactions for export and import flows by product (at 8-digit Harmonized System (HS) level), destination/origin, date of transaction and value of a transaction in Kenya shillings. The first step of the data cleaning process entailed re-classifying products into HS-6 digit level which is more internationally comparable (Bellert and Fauceglia, 2019). This was done in line with Cebeci (2012). The second step entailed converting transactions to monthly levels (January 2019-December 2020) since the final analysis was at the monthly level. Trade values were then converted to US$ using monthly exchange rate values from the Central Bank of Kenya. Lastly, the total number of products traded (exported or imported) with a specific trade partner in a specific month (extensive margin) and the average sales per product by month and trading partner (intensive margin) were calculated.

Four indicators confirmed deaths, confirmed cases, Government Stringency Index (GSI) and lockdown dummy were used to proxy for COVID-19. COVID-19 deaths and cases were calculated as the sum of new cases and deaths per month. These variables indicate the spread of the disease. GSI and lockdown indicate the government response. As earlier described, GSI is an index ranging from 0 (low stringency) to 100 (high stringency). Lockdown is a dummy variable indicating the period when Kenya and COMESA countries imposed workplace closure, closure of public transport, stay at home requirements, restrictions on internal movement and international travel controls. Data for all these variables was obtained from the COVID-19 Government Responses Tracking Database compiled by Blavatnik School of Government of the University of Oxford (Hale et al., 2020).

4.0 Presentation and Discussion of Results

4.1 Summary Statistics

Descriptive statistics for the variables are presented in Table 3. The average monthly product-country of destination exports from Kenya to COMESA countries increased by 5.4 percent from US$ 56,000 before the lockdown to US$ 59,000 after the lockdown. This was attributed to increased exports to major trading partners like Uganda and increased exports of food products to the region (see Tables 1 and 2). Nonetheless, the maximum value of exports during the lockdown period was slightly lesser than before the lockdown while the minimum values are equivalent for the two periods.

The average monthly product-country of origin imports to Kenya from COMESA countries was US$ 179,000 prior to COVID-19 and US$ 142,000 during the COVID-19 period. Therefore, imports declined by US$ 38,000 during the pandemic, an equivalent of a 21 percent drop. This result may be attributed to the massive drop in imports of commodities such as food and animals (Table 2) and trading partners like Uganda and Eswatini (Table 1). Whereas the minimum import values between the two periods are equivalent, the maximum value for the pre-lockdown period is more than double that of the pre-lockdown period. This further shows the drop in import values per transaction during the pandemic.

COMESA indicators of COVID-19 signify the effect of external factors on Kenya's international trade while Kenya-specific COVID-19 factors show how the domestic situation of COVID-19 affected Kenya's trade with COMESA countries. Table 3 further shows that the monthly average number of new COVID-19 cases and deaths among COMESA countries that imported products from Kenya was 1,131 and 20 respectively. Conversely, the monthly average confirmed COVID-19 cases and deaths among COMESA countries that imported products into Kenya was 3,339 and 145 respectively. Notably, the average COVID-19 confirmed cases and deaths for exports and imports differ because the number of product-country observations for export and import records varies regardless of the countries being similar. Overall, the maximum number of new cases and new deaths in COMESA countries was 43,326 and 1,994 – in June 2020 in Egypt.

The average stringency index for exports and imports was 24 percent and 27 percent respectively. This is almost half what all countries globally imposed on Kenya's import and export trade - at least 50 percent (Majune, 2020). This implies that COMESA countries were less stringent in containing the spread of COVID-19. The maximum stringency for exports was around 99.5 percent, in Libya in May 2020, and the maximum for imports was 93.5 percent in Uganda in April 2020.

As for domestic COVID-19 policies, Table 3 shows that Kenya's average lockdown dummy for export and import trade was 44 percent and 47 percent respectively. The average stringency index for exports was 27 percent, while that of imports was 29 percent. Together, results for the lockdown dummy and stringency index imply that Kenya imposed slightly more barriers to imports than exports when trading with COMESA countries[37]. This could have influenced the growth in exports and the decline in imports shown in Figure 3.

Summary statistics for trade margins – intensive and extensive for exports and imports show that the mean intensive margin for exports was US$ 57,000, which was the average sales per product per

37 Kenya imposed containment measures - such as at-the-border health checks and 14-day quarantine of new arrivals – during the pandemic. Some repercusions of these measures was an increase in the number of days products are cleared at the border: it took around 3.5 days to transport cargo from Mombasa to Kampala before COVID-19 but 7-10 days during the pandemic.

month that was exported from Kenya to COMESA countries. The minimum intensive margin was about US$ 100 while the maximum is US$ 1.447 million. The mean extensive margin was 419, implying that approximately 419 products were exported from Kenya to COMESA countries in a month. The minimum export intensive margin was 1, indicating that only a single product was exported from Kenya to some COMESA markets during the study period. Since this was prevalent in the pandemic period between the months of April and October with Eritrea, Eswatini, and Tunisia, it indicates that some export products were dropped during the pandemic. The maximum number of products from Kenya exported to a specific COMESA destination is 834, which was with Uganda before the pandemic occurred.

The average import intensive margin was US$ 163,000 with a minimum of about US$ 20 and a maximum of US$ 3.518 million. On the other hand, approximately 138 products were imported from COMESA countries into Kenya per month, on average. The minimum number of products imported into Kenya by a COMESA country in a specific month was 1, while the maximum was 272. The minimum number of products was mainly in 2019 with Burundi, Comoros, Djibouti and Somalia, and 2020 with Eritrea and Somalia.

Table 3: Descriptive statistics

Indicator	Obs	Mean	Std. Dev.	Min	Max
Export trade					
Export value (Pre-lockdown)	32,982	0.056	0.3890	0	19.745
Export value (lockdown)	23,419	0.059	0.3619	0	14.403
Intensive margin	56,401	0.057	0.078	0	1.447
Extensive margin	56,405	419	255	1	834
Lockdown dummy	56,405	0.415	0.4928	0	1
Confirmed cases	56,405	1131	3794	0	43326
Confirmed deaths	56,405	20	108	0	1994
Stringency index	56,405	23.724	31.439	0	99.523
Lockdown dummy-Kenya	56,405	0.442	0.497	0	1
Confirmed cases-Kenya	56,405	4263	7579	0	28426
Confirmed deaths-Kenya	56,405	74	126	0	488
Stringency index-Kenya	56,405	27.168	34.163	0	88.890
Import trade					
Import value (Pre-lockdown)	7,551	0.179	0.740	0	22.139
Import value (lockdown)	5,470	0.142	0.531	0	9.968
Intensive margin	13,021	0.163	0.149	0	3.518
Extensive margin	13,021	138	97	1	272
Lockdown dummy	13,021	0.420	0.494	0	1
Confirmed cases	13,021	3339	8026	0	43326

Confirmed deaths	13,021	145	387	0	1994
Stringency index	13,021	26.722	32.983	0	93.520
Lockdown dummy-Kenya	13,021	0.473	0.499	0	1
Confirmed cases-Kenya	13,021	4485	7715	0	28426
Confirmed deaths-Kenya	13,021	78	128	0	488
Stringency index-Kenya	13,021	28.599	34.360	0	88.890

Source: Author's compilation using data from EDD

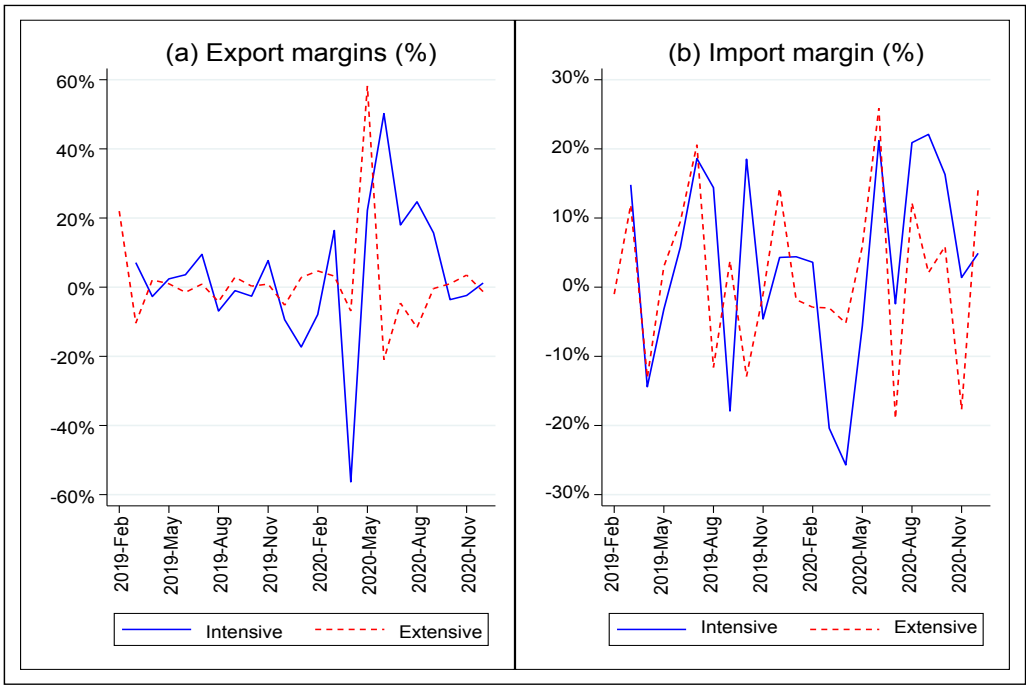
Figure 4 shows the month-by-month variation in the number of new products traded (extensive margin) and the monthly growth of products currently being exported/imported (intensive margin). Intensive margin was responsible for about 85 percent of the value of exported and imported products between Kenya and COMESA counterparts. This suggests that trade between Kenya and COMESA countries was majorly in incumbent other than new products[38].

The intensive and extensive margins of exports fluctuated prior to the start of COVID-19 (December 2019) as shown in Figure 4 a. The range of variation in growth for the intensive margin was -6.9 percent to 9.5 percent and -10.4 percent and 22 percent for the extensive margin. However, the impact of COVID-19 was immediate, especially on the intensive margin, which shrunk by 9.4 percent in December 2019, 17.3 percent in January 2020 and 7.9 percent in February 2020. It was worst in April 2020 where the decline was -56.3 percent. The extensive margin reacted sporadically to COVID-19: major drops occurred in December 2019, April 2020, and between June and September 2020. The remaining months had positive growth rates. Cumulatively, these results imply that most export products were dropped during the pandemic while the introduction of new products was spontaneous.

Figure 4b shows an almost parallel trend for the intensive and extensive margins of imports before the pandemic. However, the extensive margin was first to react to the virus, it persistently declined from -1.8 percent in January 2020 to -5.2 percent in April. This implies that most firms relied on sales of their existing products during this period as opposed to launching new products. The adverse effects of the virus on the intensive margin were active between March and May 2020, a time when Kenya and most COMESA countries imposed containment measures (see Figure 2). The period after May 2020 saw increased sales at intensive and extensive margins, with the former often growing faster.

38 The dominance of the intensive margin on trade growth is common among developing countries (Besedeš and Prusa, 2011).

Figure 4: Trade margins for export and import trade between Kenya and COMESA (February 2019 to December 2020)



Source: Author's compilation using data from EDD

4.2 Baseline Regression Results

Regression results for export trade between Kenya and COMESA countries are shown in Table 4. The first model results indicate that an increase in COVID-19 cases in COMESA countries reduced Kenya's exports to the region, although the effect is statistically insignificant. Nevertheless, a 10 percent increase in the number of new COVID-19 cases in Kenya reduced the volume of exports by 1.14 percent. This effect is statistically significant at the 1 percent level.

Column 2 of Table 4 shows that an increase in the number of new COVID-19 deaths in COMESA countries did not affect Kenya's exports to COMESA. Instead, a 10 percent rise in the number of COVID-19 fatalities led to a 1.79 percent drop in the volume of exports. The results compare with Amador et al. (2021) who found an effect of 25 percent in Portugal.

The third column indicates that an increase in stringency measures by both Kenya and COMESA countries lowered the volume of exports between the two trading partners. However, only the increase in Kenya's stringency index had a significant effect, a 10 percent increase in containment measures reduced export trade between Kenya and COMESA countries by 3.12 percent.

The presence of lockdown policies in COMESA countries had the expected negative effect on export flows, although the effect is statistically insignificant. In contrast, the presence of lockdowns in Kenya improved the country's exports to COMESA countries by 28 percent [39]. The effect was statistically significant at the 5 percent level.This result is unexpected as COVID-19 lockdown restrictions are theoretically projected to interrupt distribution channels which in turn reduces export flows. Empirically,

39 This percentage is calculated by transforming the estimated coefficient as follows: . This approach is recommended for indicator variables (Yotov, Piermartini, Monteiro, and Larch, 2017, p. 29).

the lockdown stringency reduced export flows in Portugal (Amador et al., 2021) and export growth rates in Colombia (Benguria, 2021) and France (Bricongne et al., 2021).

The results affirm the findings of Majune and Addisu (2021) who found that Kenya's lockdown policies increased its exports to the world by 19.4 percent. This result can be attributed to trade facilitation policies that were adopted by Kenya. For instance, the government of Kenya reduced the turnover tax rate from 3 percent to 1 percent for all Micro, Small and Medium Enterprises at the onset of the pandemic (Were, 2020).

Nonetheless, due to the conflicting result in the stringency index and lockdown, a robustness analysis for respective containment measures was conducted as shown in section 4.3. The results show that Kenya's exports to COMESA countries were mainly affected by the country's state of COVID-19 as opposed to that of COMESA partners.

Table 4b covers import trade between Kenya and COMESA countries. Columns 1 to 3 show that an increase in the number of new cases and deaths, and the stringency index for both Kenya and COMESA countries reduce import trade. However, the effect is statistically insignificant. Whereas the presence of lockdown measures in COMESA has an insignificant effect on import trade, the presence of Kenya's lockdown policies reduced imports by about 42 percent. This effect is statistically significant at the 5 percent level. The result compares with Bricongne et al. (2021) who found that the lockdown stringency reduced Colombian imports by about 20 percent.

Table 4: PPML regression results for export and import trade volume

	(1)	(2)	(3)	(4)
Export trade				
COMESA'S COVID-19	-0.033	0.216	-0.068	-0.259
	(0.029)	(0.120)	(0.063)	(0.135)
Kenya's COVID-19	0.114***	-0.179**	-0.312**	0.250**
	(0.033)	(0.076)	(0.122)	(0.128)
Constant	-1.412**	-2.780***	-1.975***	-4.558***
	(0.687)	(0.170)	(0.521)	(0.306)
COVID-19 indicator	Cases	Deaths	Stringency	Lockdown
Observations	56401	56401	56401	56401
Import trade				
COMESA'S COVID-19	-0.050	-0.033	-0.025	0.090
	(0.027)	(0.022)	(0.132)	(0.136)
Kenya's COVID-19	-0.026	-0.084	-0.244	-0.352**
	(0.041)	(0.061)	(0.214)	(0.159)

Constant	-4.581***	-4.582***	-10.541***	-1.693***
	(0.794)	(0.794)	(0.229)	(0.141)
COVID-19 indicator	Cases	Deaths	Stringency	Lockdown
Observations	13021	13021	13021	13021

*Note: Standard errors are in parentheses. ** p < 0.05 and *** p < 0.01.*

Results of the intensive trade margins for exports and imports are presented in Table 5. The first column shows that a 10 percent increase in the number of COVID-19 cases and deaths in COMESA countries and Kenya significantly reduces the intensive margins of exports by 0.2 percent and 3.5 percent respectively. As the number of deaths in the second column, a 10 percent increase in COVID-19 fatalities in COMESA and Kenya reduces the intensive margin of exports by 0.5 percent and 9.3 percent respectively. Results in columns 1 and 2 indicate that the average sales per product were adversely affected by the spread of the virus. More so, the deaths arising from its spread since the magnitude of coefficients in the second column are larger than those of the first column.

Results of the stringency index in column 3 indicate that the intensive margin of exports was significantly reduced by a rise in containment measures – 0.07 percent for COMESA related measures and 0.3 percent for Kenya's policies. The presence of a lockdown in COMESA countries reduces the intensive margin of exports by about 23 percent as shown in the fourth column. However, the presence of lockdowns in Kenya enhanced the intensive margins of exports by 40 percent. This result corroborates that of Table 4 where Kenya's lockdown improved the export value during the pandemic.

The spread of COVID-19 in Kenya and COMESA countries reduced the intensive margins of imports as shown in Table 5b. However, the effect was only statistically significant for COVID-19 cases in COMESA countries, and deaths in Kenya and COMESA Member States. The magnitude of the coefficient is largest for Kenya's COVID-19 related deaths, 2.6 percent, implying that the demand side had a larger impact on imports. The pandemic has been associated with a decline in people's earning capacity, which increased the rate of unemployment and collapse of businesses, thereby reducing demand for foreign goods (Baldwin and Tomiura, 2020; Hayakawa and Mukunoki, 2021a).

Table 5: PPML regression results for export and import intensive trade margins

	(1)	(2)	(3)	(4)
Export trade				
COMESA's COVID-19	-0.024***	-0.050***	-0.068***	-0.267***
	(0.004)	(0.003)	(0.009)	(0.049)
Kenya's COVID-19	-0.349***	-0.931***	-0.312***	0.337***
	(0.050)	(0.034)	(0.040)	(0.046)
Constant	-1.224***	-19.734***	-1.975***	-2.903***
	(0.461)	(0.102)	(0.204)	(0.021)
COVID-19 indicator	Cases	Deaths	Stringency	Lockdown

Observations	56401	56401	56401	56401
Import trade				
COMESA's COVID-19	-0.050***	-0.073***	0.114***	0.090***
	(0.006)	(0.011)	(0.016)	(0.026)
Kenya's COVID-19	-0.026	-2.588***	-0.180***	-0.352***
	(0.040)	(0.148)	(0.016)	(0.027)
Constant	-4.581***	-21.571***	-1.687***	-1.693***
	(0.650)	(0.666)	(0.021)	(0.020)
COVID-19 indicator	Cases	Deaths	Stringency	Lockdown
Observations	13021	13021	13021	13021

*Note: Standard errors are in parentheses. ** p < 0.05 and *** p < 0.01.*

A rise in the stringency index and the presence of lockdowns in COMESA countries enhanced their sales per import product into Kenya, as shown in columns 3 and 4. This is unexpected but could partly be attributed to the guidelines on trade in essential goods during the COVID-19 period by COMESA (COMESA, 2020). These guidelines provide measures that are to be adopted by member states such as coordinating and ensuring the cooperation of government agencies to fast-track border clearance of essential commodities. In contrast, an increase in stringency and the presence of a lockdown in Kenya reduce the intensive margin of imports into the country.

Results for the extensive margins for imports and exports are presented in Table 6. Columns 1 and 2 show that COVID-19 cases and deaths in COMESA countries and Kenya significantly reduced the number of products exported from Kenya to each country per month. The magnitude was highest for the number of deaths in Kenya, 0.2 percent, and least for the number of deaths in COMESA countries, 0.005 percent. Columns 3 and 4 show that response by governments in COMESA – stringency index and lockdown, significantly boosted Kenya's extensive margin of exports to the region. Conversely, the domestic policies significantly reduced the number of products exported from Kenya to COMESA countries by 0.6 percent for the stringency index and 65 percent for the presence of the lockdown in Kenya.

The effect of the COVID-19 spread and government policies on the extensive import margin is shown in Table 6b. Columns 1 and 2 indicate that COVID-19 cases and deaths in COMESA countries directly influenced the number of products they exported to Kenya per month. However, the number of COVID-19 cases and deaths in Kenya significantly reduced the extensive margin of imports from the COMESA region. This means that the disruption of domestic demand through unemployment and collapse of businesses associated with COVID-19 adversely affected the number of products imported from COMESA countries per month.

The third and fourth columns indicate that the response of COMESA governments to COVID-19 through lockdowns and stringency index reduced their capacity to produce and sell products to Kenya. A 10 percent increase in stringency conditions in COMESA countries reduced their exports to Kenya by

1.7 percent while the presence of lockdowns reduced Kenya's extensive import margins from COMESA countries by 28 percent. Columns 3 and 4 also reveal that a rise in stringency index and presence of lockdowns in Kenya improved the country's import extensive margins.

Table 6: PPML regression results for export and import extensive trade margins

	(1)	(2)	(3)	(4)
Export trade				
COMESA's COVID-19	-0.027***	-0.005***	0.656***	1.109***
	(0.001)	(0.001)	(0.007)	(0.021)
Kenya's COVID-19	-0.025***	-0.157***	-0.626***	-1.059***
	(0.003)	(0.021)	(0.006)	(0.020)
Constant	3.134***	-14.557***	6.006***	6.035***
	(0.158)	(0.583)	(0.008)	(0.009)
COVID-19 indicator	Cases	Deaths	Stringency	Lockdown
Observations	56401	56401	56401	56401
Import trade				
COMESA's COVID-19	0.042***	0.017***	-0.168***	-0.330***
	(0.002)	(0.002)	(0.004)	(0.022)
Kenya's COVID-19	-0.136***	-0.192***	0.736***	0.310***
	(0.018)	(0.028)	(0.040)	(0.022)
Constant	1.790***	1.308***	-0.556**	4.918***
	(0.203)	(0.214)	(0.294)	(0.021)
COVID-19 indicator	Cases	Deaths	Stringency	Lockdown
Observations	13021	13021	13021	13021

*Note: Standard errors are in parentheses. ** p < 0.05 and *** p < 0.01.*

4.3 Robustness Checks

This section contains results for three levels of robustness checks. First, using an alternative econometric model, an event-study methodology, to establish the effect of domestic and external lockdowns on export and import trade between Kenya and COMESA countries. Second, employing the PPML model to establish the effect of different indicators of lockdowns on both export and import trade between Kenya and COMESA countries. Lastly, employing the PPML model on product categories – specifically intermediate goods which are part of global value chain (GVC) trade (Antràs and Chor, 2018; Johnson, 2018), to establish the effect of the spread of COVID-19 and government response on export and import trade.

a) Event-study analysis of the effect of lockdown policies on Kenya's trade with COMESA

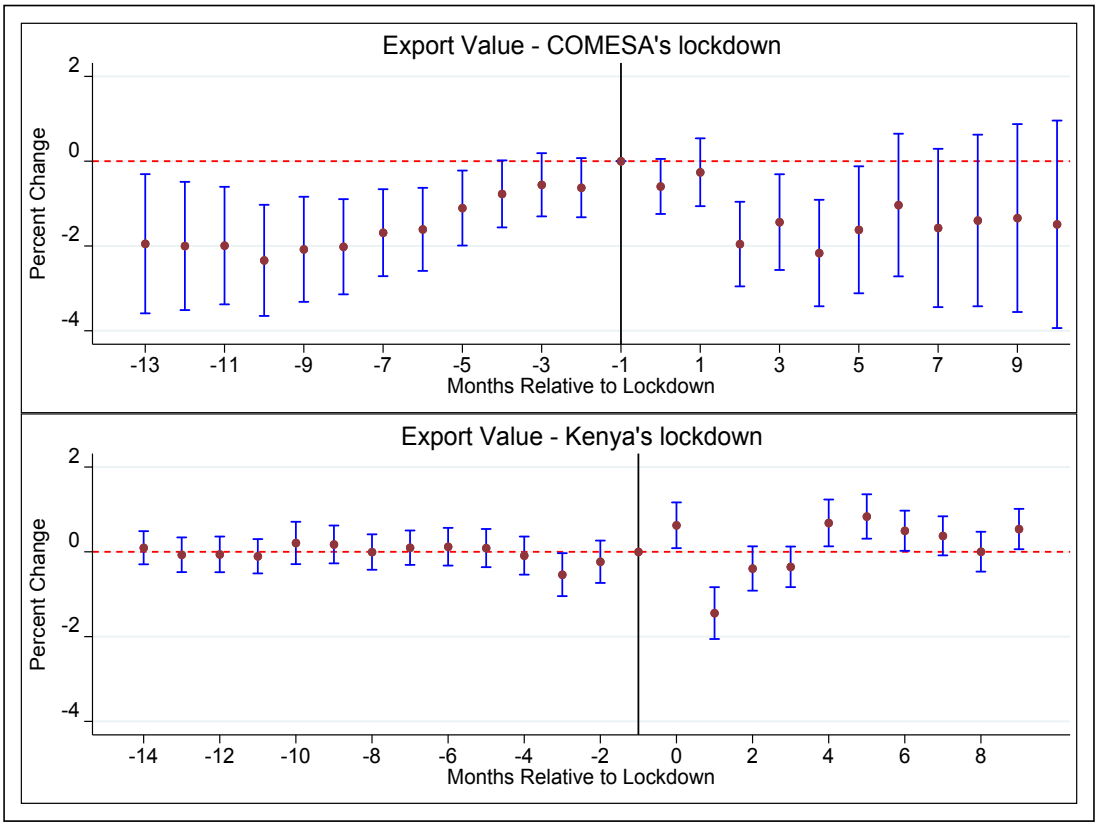
An event-study methodology generates coefficients to establish the effect of an occurrence on the outcome variable over a specific period of time. In the case of this study, the event is the lockdown initially defined as an indicator variable where 1 shows imposition of policies such as border closure and 0 otherwise, and the outcome variables are the values of bilateral exports and imports between Kenya and COMESA countries[40]. Since this study uses monthly data, it is vital to establish the number of months before lockdowns were either imposed by Kenya or COMESA countries. The period before the lockdown is defined as leads while the period after the lockdown is the lags in event-study analysis (Majune, 2020). Since Kenya first imposed the lockdown in March 2020, the fifteenth month of the study period, the maximum number of lags is nine months while the maximum number of lags is 14. The maximum number of lags and leads for COMESA-specific lockdowns is 10 and 13, respectively, since the first case of lockdowns in the COMESA region occurred in February 2020.

The average monthly growth of exports by value from Kenya to COMESA countries, during the latters' lockdown was -1.4 percent as shown in Figure 5. This shows that lockdowns in COMESA countries had an overall negative effect, affirming the finding in Table 4 which showed that COMESA lockdowns reduced exports from Kenya.

The reaction of exports to Kenya's lockdown is shown in the lower panel of Figure 5. Exports dropped by 1.4 percent a month into the lockdown in response to Kenya's lockdown policies and were negative up to the third month. They later recovered from the fourth month and surpassed the pre-lockdown growth rate. The average monthly growth rate of exports for the period Kenya imposed lockdown policies was 0.7 percent. This suggests that Kenya's exports to COMESA grew, when domestic lockdown policies were active, a result that has been found using the PPML model in Table 4.

40 As before import and export data is at product-month-country level. The dependent variable is the natural logarithm of export and import values. Country-pair month fixed effects, country-pair year fixed effects and month-year fixed effects are included to address the problem of endogeneity.

Figure 5: Effects of COMESA and Kenya-specific lockdown policies on export trade



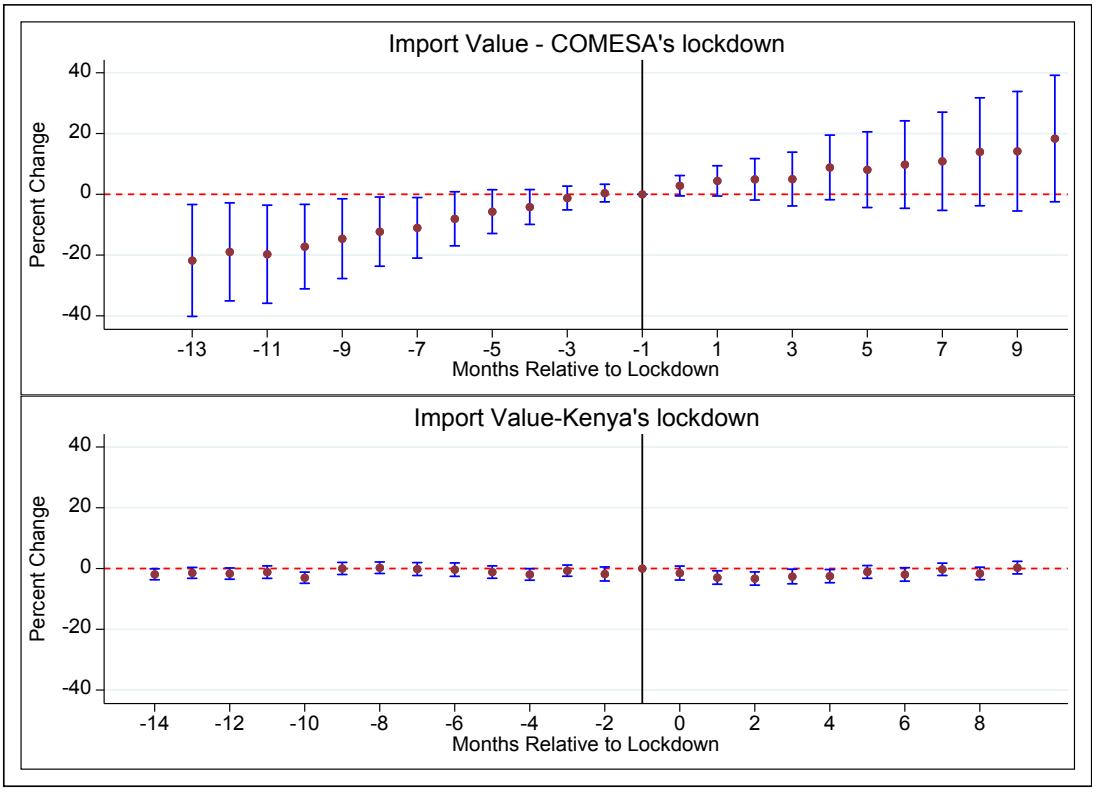
Note: The red dots indicate the regression coefficients for the event-time dummies, and the spikes indicate their 95% confidence interval bands. The coefficients are transformed to reflect percentage change in import and export trade associated with the lockdown event dummies. The sample covers a two-year period from January 2019 to December 2020, where observations are monthly product-by-country import and export values (in US$), and products are defined at the 8-digit level of HS codes.

Source: Author's compilation using data from EDD

Kenya's imports from COMESA grew due to lockdown policies imposed by COMESA Member States as shown in the top panel of Figure 6. Nonetheless, the growth was only statistically significant in the first month of the lockdown at 4 percent growth. The average monthly growth of imports from the COMESA region was about 10 percent, confirming the PPML results in Table 4 which find that COMESA's lockdown measures improved imports. As for Kenya's lockdown policies in the lower panel of Figure 6, the average monthly growth rate was -1.8 percent, affirming the results in Table 4 that Kenya's lockdown measures reduced the country's imports from the COMESA region.

Imports from COMESA countries to Kenya contracted by 3 percent the first month Kenya imposed lockdown measures. This was followed by a 3.3 percent drop in the second month, a 2.6 percent drop in the third month and a 2.5 percent decline in the fourth month. The coefficients for these months are statistically significant at 5 percent, suggesting that the effect of Kenya's lockdown policies on imports was severe in the first four months. There was a slight recovery afterwards, although the coefficients largely remained statistically insignificant.

Figure 6: Effects of COMESA and Kenya-specific lockdown policies on export trade



Note: The red dots indicate the regression coefficients for the event-time dummies, and the spikes indicate their 95% confidence interval bands. The coefficients are transformed to reflect percentage change in import and export trade associated with the lockdown event dummies. The sample covers a two-year period from January 2019 to December 2020, where observations are monthly product-by-country import and export values (in US$), and products are defined at the 8-digit level of HS codes.

Source: Author's compilation using data from EDD

b) Effect of lockdown indicators on exports and imports

PPML regression results for four lockdown indicators, workplace closure, stay-at-home requirement, controls on internal movements, and international travel restrictions[41] are shown in Table 7. International travels restrictions by COMESA countries negatively and significantly reduced Kenya's exports to COMESA countries as shown in Table 7a. The presence of travel restrictions in COMESA countries reduced their imports from Kenya by 22 percent. Other COMESA-specific policies, closure of workplaces, stay home requirement and internal movement had varied effects but were insignificant. As for Kenya-specific policies, results reveal that restrictions on internal movements negatively and significantly dampened Kenya's exports to COMESA countries by about 93 percent. Closure of workplaces and stay-home requirements ha the expected sign but they were statistically insignificant. As before, country-pair month fixed effects, country-pair year fixed effects and month-year fixed effects are included to address endogeneity.

Kenya's imports from COMESA countries were mainly affected by domestic policies as all external

41 All variables are dummies, 1 if they were active in a specific month and 0 otherwise.

indicators were statistically insignificant as shown in Part b of Table 7. The closure of workplaces and restrictions on internal movements were the key hindrances of imports from the COMESA region. Kenya's imports from COMESA countries reduced by 50 percent and 37 percent due to the closure of workplaces and restrictions on internal movements respectively.

Table 7: PPML regression results by type of lockdown policy

	(1)	(2)	(3)	(4)
Export trade				
COMESA's lockdown	0.041	0.015	-0.060	-0.243**
	(0.103)	(0.101)	(0.102)	(0.118)
Kenya's lockdown	-0.147	-0.122	-2.679**	0.233
	(0.105)	(0.119)	(1.360)	(0.137)
Constant	-4.154***	-4.176***	1.049	-4.539***
	(0.285)	(0.290)	(2.081)	(0.310)
Lockdown indicator	Workplace	Home	Internal	International
Observations	56401	56401	56401	56401
Import trade				
COMESA's lockdown	0.489	0.187	0.252	-0.008
	(0.326)	(0.250)	(0.222)	(0.139)
Kenya's lockdown	-0.701**	-0.410	-0.461**	-0.266
	(0.311)	(0.221)	(0.200)	(0.162)
Constant	-1.725***	-1.725***	-1.725***	-1.693***
	(0.135)	(0.135)	(0.135)	(0.141)
Lockdown indicator	Workplace	Home	Internal	International
Observations	13021	13021	13021	13021

*Note: Standard errors are in parentheses. ** p < 0.05 and *** p < 0.01. (1)=Workplace-workplace closure; (2)=Home-stay at home requirements; (3)= Internal-restrictions on internal movement; (4)=International-international travel controls*

c) Effect of COVID-19 on exports and imports by product category

PPML regression results for the effect of COVID-19 indicators on exports and imports of intermediate goods are shown in Table 8. Intermediate goods accounted for 34 percent of the value of exports from Kenya to COMESA countries. The portion for imports was 37 percent, suggesting that Kenya had a slightly higher backward GVC participation with the COMESA region than the forward linkage. Egypt and Uganda accounted for 54 percent of Kenya's intermediate export trade while 57 percent of intermediate import trade is with Uganda. The top panel of Table 8 shows that the number of COVID-19 cases, in COMESA and Kenya, had a significant effect on exports of intermediate goods.

A 10 percent increase in the number of cases resulted into a 1.5 percent rise in the value of exports and a 1.6 percent fall in imports. Other COVID-19 indicators largely have the expected sign (negative) but are not statistically significant. This implies that they are likely to have had more impact on non-GVC commodities. Domestic factors, namely, the number of cases and the stringency index, significantly reduced imports of intermediate products. This implies that Kenya's own reaction to the pandemic had adverse effects on imports as opposed to external factors which can be assumed to have impacted non-intermediate goods. Intermediate commodities were identified based on the fifth revision of the Broad Economic Categories (BEC) and they broadly include products such as chemicals, minerals, plastic/rubber, machines and electronics (United Nations, 2018).

Table 8: PPML regression results for intermediate goods

	(1)	(2)	(3)	(4)
		(a) **Export trade**		
COMESA'S COVID-19	0.147***	-0.062	-0.113	-0.683
	(0.031)	(0.044)	(0.144)	(0.403)
Kenya's COVID-19	-0.156***	-0.018	0.078	0.551
	(0.047)	(0.044)	(0.213)	(0.371)
Constant	-3.128***	-4.779***	-4.128***	-5.445***
	(0.189)	(0.328)	(0.320)	(0.489)
COVID-19 indicator	Cases	Deaths	Stringency	Lockdown
Observations	19135	19135	19135	19135
		(b) **Import trade**		
COMESA'S COVID-19	-0.057	-0.053	0.126	-0.109
	(0.122)	(0.091)	(0.275)	(0.224)
Kenya's COVID-19	-0.394**	-0.344	-2.186***	-0.253
	(0.200)	(0.189)	(0.401)	(0.243)
Constant	-4.313***	-1.459	-11.949***	-1.779***
	(0.902)	(1.573)	(2.303)	(0.200)
COVID-19 indicator	Cases	Deaths	Stringency	Lockdown
Observations	4674	4674	4674	4674

*Note: Standard errors are in parentheses. ** p < 0.05 and *** p < 0.01.*

5.0 Conclusion and Policy Implications

5.1 Conclusion

The study evaluated the effect of the COVID-19 on export and import margins of trade between Kenya and COMESA countries using monthly-product-country data for the period January 2019 to December 2020. Margins were measured in threefold: trade flows, intensive margins (average sales per product per destination in a month) and extensive margins (number of products traded with a partner country in a specific month). COVID-19 was proxied by four indicators; the number of new cases and deaths per month to indicate the effect of the spread of the virus on trade and the Government Stringency Index (GSI) and lockdown dummy to indicate the effect of government policy. These indicators were for Kenya (domestic) and other COMESA countries (external).

The study found that monthly exports from Kenya to COMESA countries rose by 5.4 percent while imports fell by 21 percent during the COVID-19 period. The improvement in exports was associated with the increase in the number of COVID-19 cases. Most COMESA-specific COVID-19 indicators had no effect on exports, suggesting that Kenya's exports to COMESA were mainly affected by the existing domestic policy. The presence of domestic lockdowns specifically the closure of workplaces and restrictions on the internal mobility of people reduced Kenya's imports from COMESA countries. External factors (containment measures, COVID-19 cases and deaths) in COMESA Member States did not have a significant effect on Kenya's imports.

The value of sales (intensive margin) which is responsible for about 85% of Kenya's export and import trade volume with COMESA was affected by both domestic and external factors. COVID-19 cases and deaths in Kenya and COMESA countries reduced the average sale of products exported from Kenya to COMESA Member States. An increase in the stringency index in both Kenya and COMESA countries also reduced the sale of products.

The presence of lockdowns in COMESA countries, and spread of the disease in Kenya and COMESA reduced the export sales. However, Kenya's lockdown induced an increase in export sales. An increase in COMESA's stringency measures and the presence of a lockdown boosted import sales but Kenya's lockdown and stringency dampened its import sales from COMESA countries.

The number of exported products (extensive margin) was negatively impacted by COVID-19 cases and deaths in Kenya and COMESA countries and Kenya's COVID-19 stringency measures and lockdown. However, it was positively associated by COMESA's stringency measures and the presence of lockdowns. This suggests that domestic restrictions hampered the production of exportable products while external restrictions created more demand for products from Kenya.

COVID-19 cases and deaths in COMESA countries and containment measures- stringency and lockdown by the government of Kenya positively influenced the number of products that were imported into the country from the COMESA region.However, government measures - stringency and lockdowns and number of COVID-19 cases and deaths in Kenya induced reduction in the number of import products into Kenya.

5.2 Policy Implications

Based on the study findings, the following policy implications can be deduced for Kenya and COMESA Member States.

Kenya

- Reduce restrictions on internal movements to boost domestic production for domestic and export markets, while at the same time enhancing adherence to WHO protocols on the COVID-19 pandemic.
- The Government to consider putting in place measures to support/ boost production in export oriented firms as well as vulnerable households affected by the COVID-19 pandemic.
- Kenya to explore opportunities to enhance export sales and number of products exported into the COMESA region.

COMESA Members States

- Implement trade facilitation measures, as specified in the COMESA guidelines on trade in essential goods during the COVID-19 period to boost intra-regional trade.
- Boost the demand and production capacities in the region through fiscal consolidation, tax incentives and provision of subsidies on production of essential goods such as medical products and personal protective equipment (PPEs).
- Enhance testing and mass vaccination to control the spread of the pandemic.

5.3 Areas of Further Research

Further research can be carried out on; the effect of COVID-19 in other trading blocks and countries, Effect of COVID-19 on export and import trade using firm-level data; (since firms, not countries, trade internationally (Melitz and Redding, 2014) a firm-level analysis is likely to improve the stylised facts of the effect of COVID-19 on trade); and effect of COVID-19 on the services sector.

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Effects of COVID-19 Pandemic on Intra-COMESA Trade

James Ochieng Babu

Abstract

This study sought to determine the effects of the Coronavirus (COVID-19) pandemic and associated containment measures on intra-COMESA trade. It employed a Gravity model framework estimated using the Poisson Pseudo Maximum Likelihood (PPML) technique and applying quarterly data for 21 COMESA Member States over the period 2019-2020. The study found that COVID-19 containment measures adopted in various COMESA countries as well as the spread of infections negatively affected trade in the region. The results show that an increase in containment measures by 10 index points led to a 6.4 percent drop in intra-COMESA exports. The study also found that a 10 percent increase in COVID-19 infections of the importing country led to decline in intra-COMESA exports by 0.6 percent. It is therefore important for COMESA Member States to expand vaccination programmes to contain the spread of COVID-19 to avoid further deterioration of intra-regional trade. Additionally, harmonizing COVID-19 regulations and border management is critical in promoting cross-border trade among the COMESA Member States. It is also important for COMESA Member States to embrace coordinated responses to COVID-19 pandemic to promote trade recovery.

Key Words: COVID-19 Pandemic; Trade Flows; COMESA

1.0 Introduction

1.1 Overview of COVID-19 and Trade

The Coronavirus disease 2019 (COVID-19), first reported in China in December 2019 and declared a pandemic in March 2020, led to a global crisis, affecting human health and socio-economic welfare across the world (International Trade Centre, 2020). By mid-2021, most of the COVID-19 cases and deaths had been reported in the developed countries of North America and Europe. As of 31st May 2021, 170.7 million cases and 3.7 million deaths had been reported globally. In Africa, 4.84 million cases and 130,636 deaths had been reported over the same period.[42]

The Common Market for Eastern and Southern Africa (COMESA) region, with a membership of 21 countries had reported 767,565 cases and 21,401 deaths by December 2020. As of May 2021, total cases in COMESA had increased to 1,628,314 and deaths at 47,339.[43] The burden of COVID-19 was disproportionately higher among the COMESA Member States in the Northern Africa than those in East and Central Africa. For example, as of December 2020, the COVID-19 cases in Egypt, Libya and Tunisia accounted for nearly 50 percent of the total cases in the COMESA region. The least affected Member States were Seychelles, Mauritius and Comoros, accounting for just 0.2 percent of the reported cases over the same period.

To contain the spread of COVID-19 pandemic, different countries around the world adopted extreme physical distancing measures to prevent its spread (Hale et al., 2020). Most African countries adopted varying degrees of containment measures, including suspension of international flights, a 14-day quarantine for entrants into the country and closure of land and/or maritime borders. The measures affected production, consumption and trade. In addition, countries that were heavily reliant on international trade were severely affected due to the resultant supply constraints.

Most of these measures were targeted at the movement of people. However, there were some exemptions in relation to the movement of emergency and essential supplies. The exemptions were generally under strict conditions, including mandatory testing, sanitisation of trucks, limiting crew members on trucks, and designating transit resting and quarantine areas (Banga et al., 2020). This led to delays and an overall slowdown in cross-border trade. Often this was characterised by disputes between neighbouring countries, long lines of trucks awaiting clearance, and the divergence of trade to less safe unofficial routes. Informal cross-border trade, which typically requires traders to physically cross borders was particularly hard hit (Luke et al., 2020).

Trade came under pressure due to the COVID-19 pandemic, posing threats to economic growth and development. The measures adopted by various countries to contain the spread of the virus contributed to the global decrease in trade (International Finance Corporation, 2020). According to World Trade Organization (WTO, 2020), the volume of Africa's trade in 2020 was projected to fall by 8 percent for exports and about 16 percent for imports in comparison with previous historic trend estimates. Further, UNCTAD (2020) had estimated that Africa's total merchandise exports were to contract by 17 percent in 2020 with potential public revenue loss of about 5 percent.

Due to the negative impact that COVID-19 had on the services sector, particularly trade in services,

42 Data obtained from https://ourworldindata.org/covid-cases
43 See Table A1 in Appendix A for details

COMESA developed guidelines[44] to facilitate the movement of essential goods and services in the region during the pandemic period. The guidelines aimed at, *inter alia*, facilitating the flow of essential goods such as food, fuel and medicines through a common framework. The priority list of goods comprised food products, cleaning and hygiene products, medical, fuel, courier services and perishable goods, agricultural inputs and raw materials and equipment and spares necessary for repair and maintenance of machinery used for manufacturing of essential products.

1.2 The Problem

Prior to the advent of the COVID-19 pandemic, the total value of intra-COMESA exports had increased by 7.5 percent (in nominal US dollar terms) from US$ 10.11 billion in 2018 to US$ 10.87 billion in 2019. This was on account of increased exports from Libya, Egypt, Tunisia, Malawi, Rwanda, Zimbabwe, Eswatini and Zambia whose combined share of intra-COMESA exports was estimated at 60 percent (COMESA, 2020a).

According to COMESA[45], the COVID-19 pandemic led to increased trade barriers, consequently affecting intra-COMESA trade. However, some Member States, Burundi, Democratic Republic of Congo, Ethiopia, Malawi, Somalia, Tunisia, Uganda and Zimbabwe removed and/or reduced tariffs on pharmaceutical and medical supplies to enhance the fight against COVID-19 pandemic. Other Member States such as Kenya, Egypt, Eswatini, Madagascar, Zimbabwe and Libya also adopted different measures such as export restrictions of certain products which were deemed important. The different measures adopted by various Member States directly or indirectly affected trade within the region.[46] As of April 2020, most Member States had reported decreased exports and imports. This suggests that the COVID-19 pandemic has had a negative impact on intra-COMESA trade, including customs revenues collected by different Member States (COMESA, 2020b).

The effects of the various COVID-19 containment and mitigation measures reviewed above on intra-regional trade in COMESA are yet to be empirically well-established and understood. Determining these effects is important in identifying key policy implications and formulating appropriate policy and strategic responses to counteract the adverse effects of the containment measures.

1.3 Objectives of the Study

The overall objective of the study is to determine the effects of the COVID-19 pandemic and related containment measures on intra-COMESA trade flows over the period 2019-2020. The specific objectives are:

(i) To determine the effect of COVID-19 infections on intra-COMESA exports; and

(ii) To determine the effects of COVID-19 containment measures on intra-COMESA exports.

44 See COMESA guidelines published in May 2020
45 https://www.comesa.int/notable-rise-in-trade-barriers-as-countries-responded-to-COVID-19/
46 https://www.tralac.org/documents/resources/COVID-19/regional/4222-how-comesa-can-mitigate-negative-effects-of-COVID-19-pandemic-on-trade-comesa-special-report-november-2020/file.html

2.0 Literature Review

2.1 Conceptual Review

Infectious diseases that spread rapidly tend to affect many people simultaneously while disrupting economic activities (Muley et al., 2020). The movement of people travelling between cities (and countries) is an important factor fostering the spread of a disease (Belik et al., 2011; Denphedtnog et al., 2013; Poletto et al., 2013).

Trade is considered as key element for current globalization; however, it is also considered as one of the channels through which contagious and infectious diseases spread. This takes place through shipped commodities, shipping functions and related human involvements (Rezza, 2008; Mack et al., 2011). Different studies have linked trade to a number of diseases, for example, Wilson (1995), linked Malaria, Tuberculosis, Cholera and HIV/AIDS to global trade. Conceptually, a link therefore exists between disease propagation and trade flows. Given the history of diseases and trade, trade operations globally came to a standstill in some parts of the world and slowed down drastically in others due to the COVID-19 pandemic (Suborna, 2020).

The Coronavirus pandemic has caused a significant escalation in trade costs due to travel restrictions, which disrupt global supply chains and resulting into deepening recessionary economies, both at regional and international levels (Vasilveja et al., 2020; Baldwin and Toimura, 2020). In addition, the pandemic has led to closure of industries and businesses worldwide and movement restrictions on humans and goods, impeding global trade of goods and services (Baldwin and di Mauro, 2020; Maliszewska et al., 2020). According to Hayakawa and Mukunoki (2020), a higher COVID-19 burden in an exporting country reduces the export supply by decreasing the production capacity. While on the importing country, it lowers trade by reducing the aggregate demand due to reduced earnings. The decline in demand can also be attributed to reduced visits to markets or retail stores due to fear of contracting the disease. They further argue that reduced exports due to high COVID-19 burden in a particular country may also create an opportunity for the neighbouring countries to export more. The COVID-19 pandemic also caused supply-side shocks since measures to control its spread affected business operations and ability of workers to fully go to work. Furthermore, the fact that social distancing measures limit face-to-face interactions affects more, the sectors that require workers to be in close contact with one another (Koren and Peto, 2020; Hayakawa and Mukunoki, 2020). The negative effects of the supply shocks of a country may spill-over to neighbouring countries through supply-chain linkages.

The COVID-19 pandemic also led to the creation of new trade barriers, which were erected to minimize the spread of the virus (Buchel at al., 2020). For example, export restrictions were imposed by some countries on various goods such as food and pharmaceuticals. According to Organization on Economic Cooperation and Development (2020), the effect of COVI-19 pandemic on Africa trade will vary by individual country. The most affected are the commodity exporters because of decreased demand.

2.2 Empirical Literature

Empirical analysis of the actual impact of COVID-19 pandemic on trade flows are scarce. Minondo (2020) analysed the effects of COVID-19 responses in Spain on trade and found that the measures adopted by the Spanish government to stop the spread of COVID-19 led to the sharpest decline in

goods and services trade. Specifically, the largest decline in the value of trade was reported in April 2020, when exports dropped by 39.3 percent.

Buchel at al. (2020) obtained similar results for Switzerland. They found that Swiss trade dropped by 11 percent between January and July 2020 compared to the same period in 2019. This was mainly attributed to strict containment measures put in place by different trading partners. However, they found that the impact of COVID-19 on trade begun to ease as containment measures were eased.

Brodzicki (2020) obtained similar findings using a global sample of 104 countries studied between January 2019 and August 2020. In addition, the study found that the impact of government response measures was negative and only statistically significant on the side of importers.

Verschuur et al. (2021) employed panel fixed-effects technique to analyze global maritime trade. They found that COVID-19 pandemic, through disruptions of supply chains, led to reduction in maritime trade by approximately 7.0 percent to 9.6 percent in the first 8 months of 2020.

Some studies have however, established that COVID-19 pandemic did not entirely lead to a decline in trade. For example, Surni et al. (2020) employed descriptive analysis techniques and found that COVID-19 pandemic led to over-supply of certain livestock products such as chicken in Indonesia.

Further, Lashitew and Socrates (2021) employed an event study design to analyze the impact of lockdown measures on Kenya's trade. Their findings indicate that the lockdown measures put in place by Kenya's trading partners led to a moderate increase in exports but a relatively larger drop in imports. Mold and Mveyange (2020) found similar results for Kenya.

The COVID-19 pandemic had different effects on different countries depending on whether a country is an importer or exporter, developing or developed. Hayakawa and Mukunoki (2020) found that COVID-19 had a negative effect on the exporting but not importing countries. Further, the negative effect on exports is stronger in developing countries compared to developed countries. They further found that COVID-19 pandemic had a positive effect on the agricultural sector but negative effects on sectors such as footwear, textile, and plastics.

Studies based on simulations have also found negative impact of COVID-19 pandemic on trade. For example, Davidescu et al. (2021) employed simulation techniques using gravity model and panel data for Romania between 2008 and 2019. They found a sharp decline in exports in 2020, but a recovery was predicted in 2021. Similarly, Arndt et al. (2020) used simulation approach and found that COVID-19 pandemic was expected to reduce exports in South Africa under different scenarios.

Other infectious diseases that have occurred in the past include Severe Acute Respiratory Syndrome (SARS). The SARS epidemic occurred in 2003 and hit various parts of China. Fernandes and Tang (2020) analyzed the impact of SARS on Chinese trade using transaction-level quarterly data for Chinese firms. Using difference-in difference method, they found that firms in regions affected by SARS had lower import and export growth compared to regions that were not affected. Other studies that support the negative impact of SARS on trade include Chen et al. (2009) and Beutels et al. (2009).

3.0 Methodology

3.1 Gravity Model

The analysis was based on the Gravity model, drawn from Newton's Law of Gravity. The model was first introduced by Tinbergen (1962) to explain the volume of trade between two trading partner countries. According to Gravity model, the volume of trade between two trading partners varies directly with the product of gross domestic product (GDP) of the two countries and indirectly with distance. The basic version of the Gravity model is presented as:

$$TR_{i,j} = \beta_0[\frac{GDP_i^{\beta_1} GDP_j^{\beta_2}}{D_{i,j}^{\beta_3}}] \quad (1)$$

Where *TR* denotes trade flows (exports) from country *i* (exporter) to country *j* (importer); β_0 denotes a constant; GDP_i refers to GDP of the exporting country; GDP_j refers to the GDP of the importing country; $D_{(i,j)}$ refers to the distance between the trading partners, used as a proxy for trade costs and , β_i, $i=1,2,3$ are unknown parameters.

According to Anderson and van Wincoop (2003), Equation (1) can further be modified to capture multilateral trade resistance (MTR) terms. This is usually done using importer and exporter fixed-effects. This is given as:

$$TR_{i,j} = \beta_0[\frac{GDP_i^{\beta_1} GDP_j^{\beta_2}}{D_{i,j}^{\beta_3}}]\varepsilon^{\alpha_i\delta_i+\alpha_j\delta_j} \quad (2)$$

where δ_i and δ_j are exporter and importer dummies respectively and ε is error term.

Following Boerner and Servergini (2012) and Brodzicki (2020), this study augments the Tinbergen's Gravity model to include other variables that are likely to affect trade flows such as infectious diseases. Estimation of the augmented Gravity model for trade is done using Poisson Pseudo Maximum Likelihood (PPML) technique by Silva and Tenreyro (2011). One of the strengths of PPML is its ability to control for zeros (zero bilateral trade flows between countries). PPML is therefore especially useful when dealing with zero bilateral trade flows, which could arise either because no trade takes place between countries or due to the non-reporting of trade flows. Zero trade flows are likely to be witnessed during the COVID-19 pandemic due to similar reasons. In addition, the model performs well in the presence of heteroscedasticity. A log-linearized form of the augmented Gravity model (equation (2)) is given as:

$$\begin{aligned} TR_{i,j,t} = exp[&\beta_o + \beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 lnD_{i,j} + \beta_4 \ln Area_i + \beta_5 \ln Area_j + \beta_6 CB_{i,j} \\ &+ \beta_7 OLAN_{i,j,t} + \beta_8 ELAN_{i,j,t} + \beta_9 LLock_{i,t} + \beta_{10} LLock_{j,t} + \beta_{11} SI_{i,t} + \beta_{12} SI_{j,t} \\ &+ \alpha_i\delta_i + \alpha_j\delta_j] + \varepsilon_{i,j} \end{aligned} \quad (3)$$

where $TR_{(i,j,t)}$ refers to total exports from i^{th} country in COMESA region to the j^{th} country in COMESA region at time *t*; *GDP* is gross domestic product; *D* is distance between the capital cities of trading partners; *Area* refers to geographical land size; *CB* refers to common border/contiguity; *OLAN* refers to common official language; *ELAN* refers to common ethnic language; *LLock* represent landlocked countries; *SI* refers to the government stringency index for containing COVID-19; and $\varepsilon_{(i,j)}$ is the error term.

For robustness checks, the study performed additional estimations based on a dummy for COVID-19 pandemic and reported COVID-19 cases. The models are given as equations (4) and (5), respectively.

$$\begin{aligned} TR_{i,j,t} = exp[\beta_o + \beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 lnD_{i,j} + \beta_4 \ln Area_i + \beta_5 \ln Area_j + \beta_6 CB_{i,j} \\ + \beta_7 OLAN_{i,j,t} + \beta_8 ELAN_{i,j,t} + \beta_9 LLock_{i,t} + \beta_{10} LLock_{j,t} + +\beta_{11} CD_{i,t} + \alpha_i \delta_i \\ + \alpha_j \delta_j] + \varepsilon_{i,j} \end{aligned} \quad (4)$$

$$\begin{aligned} TR_{i,j,t} = exp[\beta_o + \beta_1 \ln GDP_{i,t} + \beta_2 \ln GDP_{j,t} + \beta_3 lnD_{i,j} + \beta_4 \ln Area_i + \beta_5 \ln Area_j + \beta_6 CB_{i,j} \\ + \beta_7 OLAN_{i,j,t} + \beta_8 ELAN_{i,j,t} + \beta_9 LLock_{i,t} + \beta_{10} LLock_{j,t} + \beta_{11} lnCDI_{i,t} \\ + \beta_{12} lnCDI_{j,t} + \alpha_i \delta_i + \alpha_j \delta_j] + \varepsilon_{i,j} \end{aligned} \quad (5)$$

where *CD* refers to dummy for COVID-19 infections and *CDI* represents reported new COVID-19 cases among COMESA Member States. The rest of the variables are as earlier defined in relation to equation (3).

GDP is expected to contribute positively to trade, hence the coefficients β_1 and β_2 are expected to be positive. Longer distance is expected to translate into higher trade costs, hence β_3 is expected to be negative. Larger land area is expected to produce positively to trade hence β_4 and β_5 are expected to be positive. Countries that share a common border are expected to trade more due to simpler trade procedures, β_6 therefore is expected to be positive. Common language between two trading partners implies ease of communication and lower communication costs, therefore β_7 and β_8 are expected to be positive. Landlocked countries are generally expected to incur higher transport costs during trade, hence β_9 and β_{10} are expected to be negative in this study. COVID-19 pandemic and associated containment measures are expected to impede trade services, hence, β_{11} and β_{12} are expected to be negative in all the equations.

3.2 Data Types and Sources

The study uses quarterly data from the first quarter of 2019 to the fourth quarter of 2020 for the COMESA Member States [47]. This period covers the pre-COVID-19 pandemic in the COMESA region (2019) and the period during the COVID-19 pandemic (2020). Bilateral exports data was measured in current US$ millions and obtained from IMF's Direction of Trade Statistics; GDP was measured in current US$ millions obtained from respective country National Bureau of Statistics, IMF and World Development Indicators of the World Bank. Data on distance was obtained from CEPII[48] database and measured as number of kilometres between the capital cities of the trading partners while land area was measured in square kilometres and obtained from CEPII database. Common border dummy was obtained from CEPII database and is given as 1= if two trading partners (country *i* and *j*) share a common border, 0-otherwise. Similarly, the official language dummy was obtained from CEPII database, where 1= country *i* and *j* share an official language, 0-otherwise. Ethnic language dummy is obtained from CEPII database, where 1= common ethnic language spoken by at least 9 percent of the population in country *i* and *j*, 0-otherwise. Landlocked dummy takes a value of 1 if a country is landlocked, 0-otherwise. Data on new COVID-19 infections is obtained from WHO and Our World in Data of the University of Oxford. The data was smoothed using a 7-day moving average and aggregated to quarterly data. Data on

47 See Table B1 in Appendix B for full list of Member Countries of COMESA
48 http://www.cepii.fr/cepii/en/bdd_modele/bdd.asp

government stringency index ranges from 0 to 100 (100-strictest) COVID-19 containment measures. It is obtained from the Oxford Coronavirus Government Response Tracker (OxCGRT) by Hale et. al. (2021) and aggregated to quarterly data. The COVID-19 dummy used in the robustness check was based on authors elaboration, it takes a value of 1= from the first quarter to fourth quarter of 2020 when at least COMESA Member States had reported COVID-19 infections and 0-otherwise.

4.0 Presentation and Discussion of Results

4.1 Descriptive Statistics

The descriptive statistics for the variables used in the gravity model are presented in Table 1.

Table 1: Summary statistics

Variable	*Obs*	*Min.*	*Max.*	*Mean*	*Std. Dev.*
Exports (US $ Million)	1,280	0	662.66	8.6	38.11
GDP (US $ Million)	1,280	32,585	$1.03x10^{11}$	$1.53x10^{10}$	$2.40x10^{10}$
Distance	1,280	162.18	9,970.13	2,906.65	1,616.57
Land Area	1,280	1,862	2,345,410	583,195.8	796,368.7
Contiguity	1,280	0	1	0.13	0.33
Official Language	1,280	0	1	0.51	0.50
Ethnic Language	1,280	0	1	0.41	0.49
Landlocked	1,280	0	1	0.38	0.48
Stringency Index	1,280	0	93.52	25.39	32.05
COVID-19 Dummy	1,280	0	1	0.38	0.48
COVID-19 Infections	1,280	1	67,886.14	4,552.55	13,946.89

Source: Author's computation

Intra-COMESA bilateral exports averaged US$ 8.6 million between 2019 and 2020, with the highest value of exports recorded at US$ 662.66 million as shown in Table 1. The standard deviation for intra-COMESA exports was US$ 38.11 million. The high standard deviation depicts high volatility in trade experienced during the pandemic period. In addition, a minimum of 0 shows that in some instances, there were zero-valued bilateral trade flows during study period. The economic size as measured by the GDP averaged US$ 15.3 billion. The standard deviation of GDP was US$ 24.0 billion indicating large economic disparities existing within the COMESA region. The average distance between the capital cities of COMESA Member States is 2,906.65 kilometres with a standard deviation of 1,616.57 kilometres. The COVID-19 containment measures across the Member States of COMESA based on the stringency index averaged 25.39, with a standard deviation of 32.05. The minimum stringency index was 0 while the maximum was 93.52. The larger standard deviation together with a wide range shows the disparities with respect to COVID-19 containment measures, implying that some Member States were relatively stricter compared to others. By end of December 2020, the COMESA region had reported an average of 4,553 COVID-19 infections per quarter. The highest number that had been reported by the COMESA Member States was a total of 67,886 infections per quarter for the period under study.

4.2 Discussion of Regression Results

Four PPLM regression equations of the gravity model specification in equation (3) were estimated. The results are presented in Table 2 four successive columns (Column(1) – (4)).

In the first estimation, the COVID-19 containment measures, given by the stringency index, is used as a proxy for COVID-19 pandemic. The findings from the gravity model on the effects of COVID-19 containment measures on intra-COMESA trade are presented in Column 1 of Table 2.

Table 2: COVID-19 containment measures and intra-COMESA trade

Dependent Variable: Exports			***Method: PPML***	
Variable	*(1)*	*(2)*	*(3)*	*(4)*
Log of GDP_i	0.4581***	0.5272***	0.4264***	-7.2200
	(0.0902)	(0.1298)	(0.1383)	(6.8855)
Log of GDP_j	-0.0257	-0.0282	0.0172	0.0264
	(0.0230)	(0.0216)	(0.0186)	(0.0240)
Log of Distance	-1.4799***	-1.4945***	-1.4277***	-2.5266***
	(0.3638)	(0.3505)	(0.3268)	(0.3572)
Log of Land $Area_i$	0.3938***	0.3607***	0.6563***	-2.2426
	(0.1054)	(0.1050)	(0.2465)	(1.6935)
Log of Land $Area_j$	0.6366***	0.5925***	0.5355***	4.1523***
	(0.0693)	(0.0703)	(0.0636)	(0.7692)
Contiguity	0.8302**	0.8631**	1.2220***	1.9051***
	(0.4019)	(0.3892)	(0.3508)	(0.3870)
Official Language	-0.8538**	-0.8315**	-1.0211***	-2.2308***
	(0.3695)	(0.3552)	(0.3800)	(0.3448)
Ethnic Language	1.0109***	0.9056**	0.6573*	-2.2308***
	(0.3687)	(0.3677)	(0.3651)	(0.3448)
$Landlocked_i$	0.9925**	1.2660***	0.7979	-1.5648**
	(0.4126)	(0.4144)	(0.6266)	(0.6770)
$Landlocked_j$	-0.0394	0.0421	-0.2225	-1.1325***
	(0.2175)	(0.2270)	(0.2380)	(0.3119)
$Stringency_i$	0.4982*	0.7841***	0.4887	-0.0052
	(0.2793)	(0.2775)	(0.3220)	(0.0049)
$Stringency_j$	-0.6426**	-0.2915	-0.2225	-0.3257*
	(0.2553)	(0.2877)	(0.2380)	(0.1967)
Constant	-10.3112***	-13.8097***	-11.9636	183.9737
	(3.5801)	(3.7730)	(4.0116)	(198.5613)
Time FE	No	Yes	No	Yes
Importer FE	No	No	Yes	Yes
Exporter FE	No	No	Yes	Yes
Log psuedolikelihood	-4756.61	-4643.56	-4373.00	-2012.24

Dependent Variable: Exports			***Method: PPML***	
Variable	*(1)*	*(2)*	*(3)*	*(4)*
Pseudo R^2	0.6412	0.5202	0.5856	0.8482
Number of Observations	640	640	640	640

*Note: *P<0.1, **P<0.05, ***P<0.01; i and j are exporting and importing country respectively; robust standard errors are in parentheses.*

Source: Author

The results indicate that the COVID-19 containment measures as given by the stringency index of the importing country negatively affected intra-COMESA trade. Specifically, the findings show that an increase in COVID-19 containment measures by 10 index points in the importing country lowered intra-COMESA exports by 6.4 percent. These were consistent when importer, exporter and time fixed-effects were considered (Column (4)). This implies that the more stringent the COVID-19 containment measures were in the importing country, the lower the exported were and consequently, the lower intra-COMESA trade was. Several governments adopted measures that involved movement restrictions and border controls which had negative effect on trade. Hence, COVID-19 containment measures adopted by trading partners within COMESA created barriers to inter-country trade. These findings are in line with Brodzicki (2020). This study finds that COVID-19 containment measures of the exporting country positively impacted intra-COMESA exports. The results indicate that if the exporting country increases COVID-19 containment measures by 10 index points, then intra-COMESA trade increases by 5.0 percent, holding other factors constant. The results are consistent under time fixed-effects (Column (2)) but not under importer and exporter fixed-effects. The positive effect could suggest that movement restrictions targeted mostly the members of the public who were not involved in provision of essential services. This could have contributed positively to trade by lowering logistic costs due to reduced congestion in most of the transit routes. Movement of essential goods and services were exempted from restriction in many countries in the COMESA region such as Kenya, Uganda, Rwanda, among others.

Most of the coefficients on the control variables were significant and consistent with theory expectations. GDP of the exporting countries positively affects intra-COMESA trade such that a 1 percent increase in GDP of the exporters increases intra-COMESA exports by 0.46 percent. The findings are consistent under time fixed-effects (Column (2)) and importer and exporter fixed-effects (Column (3)). The findings show that distance negatively affects trade, an increase in the distance between the capital cities of the trading partners by 1 percent lowers intra-COMESA trade by 1.48 percent. The results also show that larger land area of both the exporting and importing countries is associated with more trade. Countries that have a common border in the COMESA region are more likely to trade with one another. Trade in the COMESA region was 57.42 percent higher due to countries with a common border[49]. Contrary to expectation, the official language has a negative relationship with exports. However, common ethnic language has a positive impact on intra-COMESA exports expect when all the fixed effects dummies are included in the regression. The study also finds that more trade occurred among the exporting landlocked countries. That is, the intra-COMESA was 169.80 percent higher due to trade among exporting landlocked countries in the region. However, trade was relatively lower among the importing landlocked countries as shown by the results in Column (4).

49 The coefficient of contiguity dummy is interpreted as: (e_(-0.8538)-1)*100=-57.42%. The same approach is applied to other dummy variables.

4.3 Robustness Checks

The study conducts two robustness checks. The first involves using a dummy for COVID-19 pandemic and the second using COVID-19 infections. The results for regression using the COVID-19 dummy are presented in Table 3. They further affirm the negative effect of COVID-19 pandemic on intra-COMESA trade. There is a negative relationship between the dummy for COVID-19 pandemic and intra-COMESA trade. Therefore, from the results, the coefficient of COVID-19 dummy is -0.3298, implying that trade was 28.09 percent lower in the COMESA region due the presence of COVID. The results are consistent when both importer and exporter fixed-effects are considered. This implies that the presence of COVID-19 among the COMESA Member States reduced trade within the region. The COVID-19 pandemic caused supply and demand shocks which has led to decrease in trade. The findings are in line with studies by Minondo (2020), Buchel at al. (2020) and Verschuur et al. (2021) who found that COVID-19 resulted in a negative effect on trade. The rest of the variables have similar signs like in the previous model.

Table 3: COVID-19 pandemic and intra-COMESA trade

Dependent Variable: Exports			**Method: PPML**	
Variable	*(1)*	*(2)*	*(3)*	*(4)*
Log of GDP_i	0.3471***	0.3442***	0.3105***	0.3074***
	(0.0414)	(0.0403)	(0.0443)	(0.0436)
Log of GDP_j	-0.0087	-0.0090	0.0287**	0.0284**
	(0.0138)	(0.0135)	(0.0122)	(0.0212)
Log of Distance	-1.1913***	-1.1913***	-1.1989***	-1.2002***
	(0.2494)	(0.2488)	(0.2549)	(0.2547)
Log of Land $Area_i$	0.4713***	0.4726***	0.7509***	0.7526***
	(0.0592)	(0.0592)	(0.1355)	(0.1355)
Log of Land $Area_j$	0.4956***	0.4953***	0.4191***	0.4188***
	(0.0691)	(0.0691)	(0.0755)	(0.0755)
Contiguity	0.8148***	0.84122***	1.1002***	1.0966**
	(0.2835)	(0.2843)	(0.2597)	(0.2606)
Official Language	-0.4022	-0.4009	-0.5182*	-0.5173*
	(0.2631)	(0.2631)	(0.2722)	(0.2715)
Ethnic Language	0.8287***	0.8288***	0.5064*	0.5064*
	(0.2582)	(0.2576)	(0.2698)	(0.2695)
$Landlocked_i$	0.4187*	0.4112***	0.1602	0.1512
	(0.2391)	(0.2396)	(0.2853)	(0.2852)
$Landlocked_j$	-0.2095	-0.2076	-0.3980**	-0.3960**
	(0.51598)	(0.1589)	(0.1688)	(0.1684)
COVID-19 Dummy	-0.3298**	-0.2205	-0.3281**	-0.2289
	(0.1791)	(0.4269)	(0.1670)	(0.4028)

Constant	-9.4296***	-9.3450***	-11.2986***	-11.1948***
	(1.4645)	(1.5527)	(1.2625)	(1.3224)
Time FE	No	Yes	No	Yes
Importer FE	No	No	Yes	Yes
Exporter FE	No	No	Yes	Yes
Log psuedolikelihood	-11831.66	-11778.59	-10879.82	-10827.59
Pseudo R^2	0.4523	0.5810	0.6130	0.6148
Number of Observations	1,280	1,280	1,280	1,280

*Note: *P<0.1, **P<0.05, ***P<0.01; i and j are exporting and importing country respectively; robust standard errors are in parentheses.*

Source: Author

The study also investigated the effect of COVID-19 pandemic using actual COVID-19 infections reported in the four quarters of 2020 among the COMESA Member States. Actual COVID-19 infections were used to capture the disease burden within the COMESA region. The findings are reported in Table 4.

Table 4: COVID-19 infections and intra-COMESA trade

Dependent Variable: Exports **Method: PPML**

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Log of GDP_i	0.3597***	0.36677***	0.3109***	0.3253***
	(0.0470)	(0.0526)	(0.0460)	(0.0525)
Log of GDP_j	-0.0091	-0.0124	0.0290**	0.0263**
	(0.0138)	(0.0131)	(0.0121)	(0.0126)
Log of Distance	-1.2315***	-1.2374***	-1.2025***	-1.2118***
	(0.2465)	(0.2474)	(0.2565)	(0.2558)
Log of Land $Area_i$	0.4587***	0.4079***	0.7504***	0.6455***
	(0.0621)	(0.0685)	(0.1429)	(0.1486)
Log of Land $Area_j$	0.4850***	0.4481***	0.4234***	0.4002***
	(0.0694)	(0.0735)	(0.0764)	(0.0775)
Contiguity	0.7931***	0.8195***	1.0947***	1.1119***
	(0.2835)	(0.2871)	(0.2593)	(0.2660)
Official Language	-0.4383*	-0.4249	-0.5211*	-0.5216*
	(0.2648)	(0.2611)	(0.2733)	(0.2672)
Ethnic Language	0.7259***	0.7022***	0.5087*	0.5010*
	(0.2578)	(0.2587)	(0.2698)	(0.2927)
Landlocked$_i$	0.4534*	0.4367*	0.1585	0.2341
	(0.2411)	(0.2462)	(0.2904)	(0.2927)

Landlocked$_j$	-0.1809	-0.1614	-0.3992**	-0.3750**
	(0.1600)	(0.1585)	(0.1692)	(0.1687)
Log of COVID-19 Infections$_i$	0.2745***	0.2745***	0.0004	0.1808**
	(0.0807)	(0.0807)	(0.0397)	(0.0813)
Log of COVID-19 Infections$_j$	0.0639**	0.1387*	-0.0282	0.1273*
	(0.0257)	(0.0729)	(0.0418)	(0.0713)
Constant	-9.0712***	-12.0589***	-11.3514***	-13.2263***
	(1.4779)	(1.7678)	(1.2593)	(1.6711)
Time FE	No	Yes	No	Yes
Importer FE	No	No	Yes	Yes
Exporter FE	No	No	Yes	Yes
Log psuedolikelihood	-11697.00	-11392.99	-10937.44	-10634.14
Pseudo R^2	0.4386	0.4668	0.6109	0.6217
Number of Observations	1,280	1280	1,280	1,280

*Note: *P<0.1, **P<0.05, ***P<0.01; i and j are exporting and importing country respectively; robust standard errors are in parentheses.*

Source: Author

These findings are consistent with and support the findings in the other models, suggesting that the overall results are robust. The results based on actual COVID-19 infections (Table 4) indicate a negative relationship between COVID-19 infections of the importing country and exports in the COMESA region. The results show that an increase in COVID-19 infections of the importing countries by 1 percent lowers intra-COMESA exports by 0.06 percent. This implies that higher COVID-19 infections in the region were associated with lower trade. According to Hayakawa and Mukunoki (2020), one of the channels through which COVID-19 pandemic lowers trade is through reduced aggregate demand of the importing country. These results support the findings by Lashitew and Socrates (2021). However, the results show that under time fixed effects, COVID-19 infections positively influenced intra-COMESA exports (Column 2 and 4). The rest of the variables had similar signs and were consistent with those obtained in the earlier regressions.

5.0 Conclusion and Policy Implications

5.1 Conclusion

This study investigated the effects of COVID-19 pandemic on trade among the 21 COMESA Member States. It used quarterly data between 2019 and 2020 applied to an augmented gravity model. In this regard, the study examined the effects of COVID-19 containment measures adopted by various governments in COMESA region on intra-regional trade. The study found that strict containment measures adopted by the governments to stem the spread of the pandemic and high COVID-19 infections negatively affected trade in the COMESA region. The results show that more stringent containment measures in the importing countries were associated lower exports among COMESA Member States.

5.2 Policy Implications

Based on the foregoing, the following are the main policy implications:

(i) Containing the spread of COVID-19 should remain a priority for COMESA Member States, given its importance in fully unlocking economic activities in the COMESA region, particularly trade.

(ii) To address the spread of COVID-19, Member States will require sustained and increased financing of the healthcare systems and in particularly, to foster the expansion of COVID-19 vaccination programmes, covering largest share of the population possible.

(iii) Governments in COMESA should also seek to harmonise COVID-19 regulations and border management to promote cross-border trade in the region.

(iv) Member States should embrace coordinated response to COVID-19 pandemic, including working through the COMESA Secretariat and Institutions, towards reigniting trade and minimizing associated trade losses.

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APPENDIX

APPENDIX A: COVID-19 cases in the COMESA region

Table A1: COVID-19 cases as of 31st December 2020 and 31st May 2021

Country	31st December 2020		31st May 2021	
	Cases	Deaths	Cases	Deaths
Burundi	818	2	4,790	6
Comoros	823	10	3,881	146
Djibouti	5,831	61	11,533	154
DR Congo	17,658	591	31,651	782
Egypt	138,062	7,631	262,650	15,096
Eritrea	1,320	3	4,094	14
Eswatini	9,358	205	18,595	673
Ethiopia	124,264	1,923	271,541	4,165
Kenya	96,458	1,670	170,735	3,172
Libya	100,277	1,478	185,776	3,126
Madagascar	17,785	261	41,342	839
Malawi	6,583	189	34,338	1,155
Mauritius	527	10	19,549	463
Rwanda	8,383	92	26,963	353
Seychelles	256	0	11,621	42
Somalia	4,714	130	14,662	769
Sudan	25,500	1,467	10,688	115
Tunisia	139,140	4,676	345,474	12,654
Uganda	35,216	251	23,672	708
Zambia	20,725	388	95,263	1,281
Zimbabwe	13,867	363	39,496	1,626
COMESA	**767,565**	**21,401**	**1,628,314**	**47,339**

Data Source: Our World in Data, University of Oxford

APPENDIX B: COMESA MEMBER STATES

Table B1: List of member countries of COMESA regional economic bloc

Burundi*	Eritrea	Madagascar** Malawi**	Somalia
Comoros**	Eswatini**	Mauritius**	Sudan
Djibouti	Ethiopia	Rwanda*	Tunisia
DR Congo**	Kenya*	Seychelles**	Uganda*
Egypt	Libya		Zambia**
			Zimbabwe**

*Note: * refers to countries that are also Partner States of EAC; **refers countries that are also members of SADC.*

Source: Author's elaboration using information from COMESA Secretariat

Effects of COVID-19 Pandemic on Intra-COMESA Trade: The Case for Bilateral Trade Between Kenya and Uganda

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Rodgers A. Wanyonyi

Abstract

This paper investigated the effects of the various COVID-19 containment measures and digitization of trade using Kenya-Uganda as a case. The study used monthly data from June 2018 to April 2021 and applied the Auto-regressive Distributed Lag-Error Correction Model (ARDL-ECM) approach to estimate the effect. To capture the effect of digital trade, the study used the value of Mobile Commerce (M-Commerce) transactions and the number of data/internet subscriptions as a proxy. The findings indicate that COVID-19 containment measures as captured by the stringency index as well as the COVID-19 cases negatively affected trade both in the short and long run. Nevertheless, the results showed that digitization boosted bilateral trade between the two countries. There is need to enhance digitalization of trade instruments to promote intra-COMESA trade. Further, it is vital for Kenya and Uganda to allow freer movement of people across the borders with adherence to Ministry of Health protocols on the spread of COVID-19.

1.0 Introduction

1.1 Background

The Novel Corona Virus (COVID-19) began as a simple localized outbreak in Wuhan, China in December 2019. However, it spread quickly across the globe, threatening the existence of humanity, global economic integration, value chain supplies and human mobility in general. As of 10th August 2021, a total of 204.21 million COVID-19 infections had been confirmed globally with over 4.32 million deaths reported (World Health Organisation, 2021). Not only has the disease directly impacted human life and health but it has also impacted on the global economy.

Indeed, the pandemic has plunged the global economy into recession comparable only to the 2008 global financial crisis and the Great Depression of the 1930's. While nearly all spheres of life have been affected and the resulting socioeconomic impacts far reaching, individuals, societies, and policy makers have had to devise means of survival. This has given rise to the common phrase "the new normal" which implies that humans have to learn to live with the disease by adjusting their ways of life rather than imagining the world the way it was before the pandemic.

The COVID-19 pandemic in Africa and particularly COMESA as a region has not been any different from the global state. The World Health Organisation (2021) statistics indicate that cumulatively, as of 10 August 2021, 7.11 million people had been infected with the virus since the first case was confirmed in the continent. As of 8 March 2021, all COMESA Member States had reported COVID-19 cases. The first confirmed case of COVID-19 in the region was reported on 14 February 2020 in Egypt. Thereafter, the region registered more cases across the Member States, as of 10 August 2021, it had recorded a total of 2,445,555 confirmed COVID-19 cases, with 2,080,737 recoveries and unfortunately 69,995 deaths.

Table 1 shows the COVID-19 statistics per COMESA Member State. The top-four countries that have recorded the highest number of cases are Tunisia (613,628), Egypt (284,789), Ethiopia (284,531) and Libya (269,847) as of 10th August 2021. Tunisia (21,089), Egypt (16,582), Ethiopia (4,430) and Kenya (4,179) recorded the highest number of fatalities. Comoros (4,031), Mauritius (5,120), Eritrea (6,589) and Burundi (8,800) recorded the lowest number of confirmed cases. Similarly, the following countries registered the least number of fatalities with Mauritius having 21 deaths, Eritrea 35 and Burundi 38.

Kenya registered a higher number of confirmed cases as of 10th August 2021 compared to Uganda as shown in Table 1. In total, Kenya had 212,573 confirmed cases with 4,179 fatalities whereas Uganda had recorded 95,875 cases and 2,808 fatalities. This shows that the pandemic has been more severe in Kenya as compared to Uganda.

Table 1: COVID-19 statistics for COMESA member states as of 10 August 2021

Country	Total number of confirmed cases	Number of deaths	Recoveries
Tunisia	613,628	21,089	546,614
Egypt	284,789	16,582	233,298
Ethiopia	284,531	4,430	264,673
Libya	269,847	3,750	200,238
Kenya	212,573	4,179	197,468
Zambia	200,201	3,491	193,051
Zimbabwe	116,853	3,919	90,210
Uganda	95,875	2,808	91,028
Rwanda	76,635	898	44,994
Malawi	56,135	1,850	41,314
DR Congo	51,985	1,048	30,189
Madagascar	42,781	948	42,456
Sudan	37,138	2,776	30,867
Eswatini	31,738	874	23,900
Seychelles	18,714	98	18,161
Somalia	15,929	858	7,783
Djibouti	11,663	156	11,499
Burundi	8,800	38	773
Eritrea	6,589	35	6,492
Mauritius	5,120	21	1,854
Comoros	4,031	147	3,875
Total	2,445,555	69,995	2,080,737

Source: World Health Organization.

The increasing number of confirmed cases as well as fatalities among Member States posed significant challenges affecting the various economic activities in the region. As a result, governments across the region imposed various measures, categorized broadly into two. The first category focused on preventing the spread of the virus. These included restriction on movement of people at the borders, curfews and lock downs, restriction of movement of non-essential goods, closure of businesses, mandatory testing of truck drivers, traders and all people crossing the borders as well as 14-day mandatory quarantine.

The second category of measures focused on reducing socio-economic effects as well as cushioning the citizens against the adverse effects of the pandemic. These encompassed both monetary and fiscal policies aimed at reducing tax burdens while increasing government support in terms of cash transfers, provision of medical equipment among others. Some Member States reduced tariffs and taxes to facilitate trade in pharmaceuticals and medical supplies in the fight against COVID-19, reduced taxes on imported food stuffs and other essential products while others, imposed export restrictions and export licensing requirements on medical supplies, masks, ventilators, hand sanitizers and food supplies as part of the measures to mitigate the adverse effects of the pandemic. Table A1 in the Appendix provides a summary of country specific mitigation measures against COVID-19.

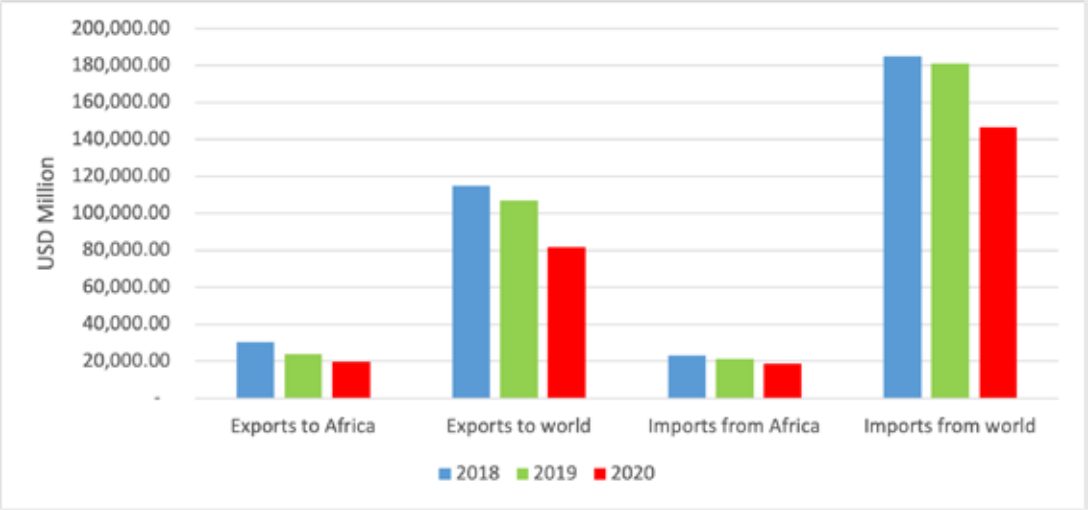
Kenya and Uganda instituted closely related mitigation measures to contain the spread of the virus. The initial measures were restrictions on movement and ban on social gatherings that were effected on 15 and 18 March 2020 in Kenya and Uganda respectively. This also included a 14-day compulsory quarantine for all persons entering the countries. The countries also declared nationwide curfews and lockdowns save for essential workers such as those in healthcare, pharmaceutical services, cargo transportation and financial services among others.

Kenya declared a nationwide dusk to dawn curfew lasting from 7 pm to 5 am on 27 March 2020 while Uganda declared the curfew on 31 March 2020 both of which were constantly being reviewed depending on the infection rates. Subsequently schools were closed in mid-March both in Kenya and Uganda and opened in October 2020 for finalists in Uganda and January 2021 for all learners in both countries. On the public health front, hospitals, offices and all businesses and service providers were required to provide soap and water or hand sanitizers in addition to temperature checking devices at entry points. In Kenya, government offices, businesses and companies were encouraged to allow employees to work from home, except employees working in critical or essential services. Notably, both countries closely observed the World Health Organisation (WHO) guidelines including social distancing, hand washing and wearing of masks required to curb the pandemic.

According to Musengele & Kibiru (2020), restrictions on the international and regional movement of people and tighter border controls during the pandemic disrupted cross-border trade, cutting linkages with global and regional value chains and reduced travel and tourism. Within individual Member States, curfews, quarantines and closure of educational and religious institutions, as well as suspension of sports and other entertainment activities led to massive job losses and disrupted social-cultural way of living for the people.

Overall, the region's exports and imports with Africa and the World show a declining trend from 2018 to 2020 (Figure 1). However, the decline between 2018 and 2019 was slight as compared to 2019 and 2020. Statistics indicate that exports from COMESA to Africa and the World declined by 17.6 and 23.7 percent respectively in 2020 compared to 2019. In addition, imports from Africa and the World to COMESA contracted by 12.1 and 19.2 per cent respectively during the same period. The significant decline may be attributed to the outbreak of COVID-19 that led to various stringent measures among countries, including the closure of borders.

Figure 1: COMESA's exports and imports (with Africa and World)

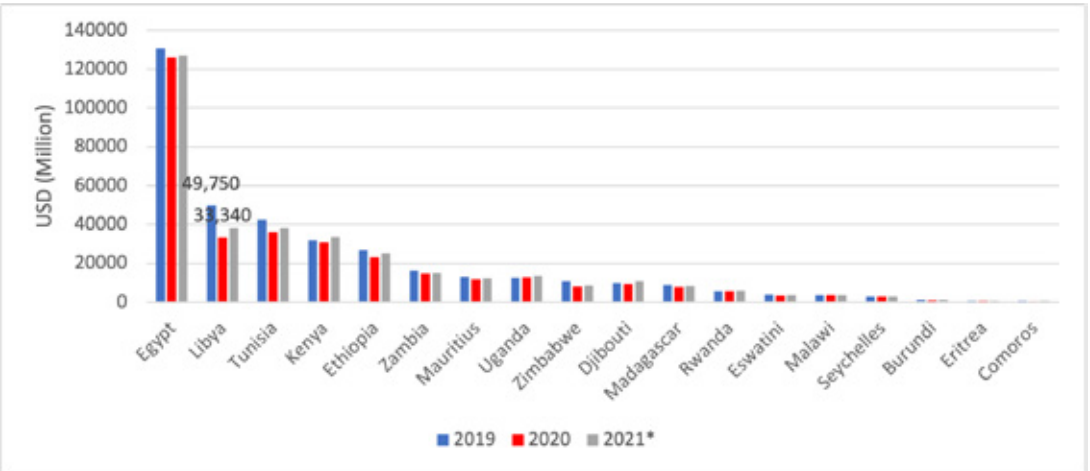


Source: International Trade Centre (2021)

Within COMESA region, trade plunged with the onset of COVID-19 containment measures by respective governments especially restrictions on movement of people across borders. As indicated above, countries that bore the brunt of the virus in the region were Tunisia, Egypt, Ethiopia, Libya, Kenya and Zambia. These countries also reported the most stringent measures and decrease in total trade. Nevertheless these countries reported the highest volumes of trade within COMESA (as shown in Figure 2).

Statistics indicate that trade in COMESA declined in 2020 (pandemic period) as compared to 2019 (Figure 2). Libya experienced the highest decrease of 32.99 percent from US$ 49,750.17 million in 2019 to US$ 33,339.85 million in 2020. This was followed by Zimbabwe, and Burundi which registered a decrease of 23.79 and 23.00 percent respectively, during the same period. Notably, Rwanda and Uganda recorded slight growth of 2.61 and 0.86 percent respectively during the same period.

Figure 2: Total trade for COMESA member states (2019-2021)



*Source: Africa Development Bank Group, (2021) * Projection*

1.2 Problem Statement

Governments across the globe instituted various measures to curb the spread of the pandemic and at the same time create economic resilience. Notably, was the lockdown and closure of borders among various Member States. During the same period, most governments, including Kenya and Uganda, enforced strict COVID-19 containment measures. Consequently, the two countries experienced a significant decline in their bilateral trade, leading to shortages in supply, closure of businesses and spike in domestic prices. So far limited analytical work has been carried out to establish the extent of COVID-19 effects on trade between these two countries using monthly data.

1.3 Objectives of the Study

The general objective of the study is to estimate the effect of COVID-19 pandemic on COMESA trade using the case of Kenya-Uganda trade.

The specific objectives are to;

i. Estimate the effect of COVID-19 restriction measures on Kenya-Uganda trade; and

ii. Estimate the effect of M-commerce and internet subscription on Kenya-Uganda trade.

1.4 Importance of the Study

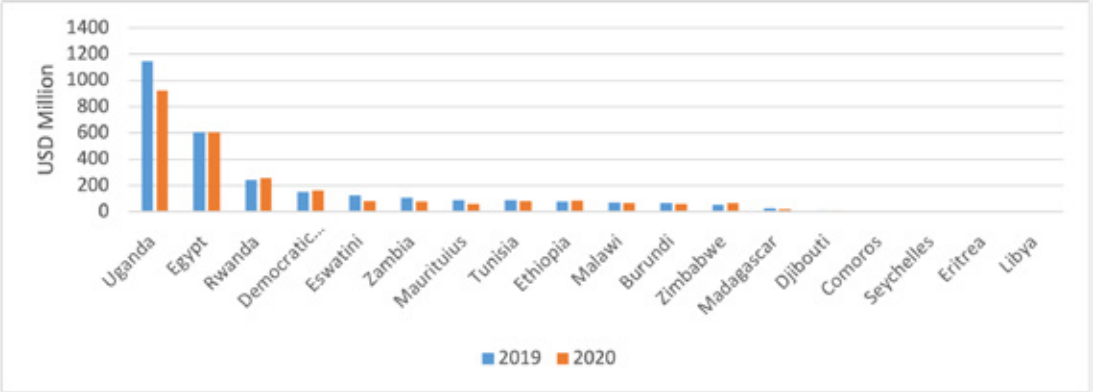
Statistics show that Kenya and Uganda experienced an increase in the number and value of M-Commerce transactions as well as data/internet subscriptions during the pandemic period. However, there is a dearth of empirical evidence to link the lockdown, increase in stringency measures, internet subscriptions as well as M-commerce to the erratic trade performance during the pandemic. Therefore, this paper attempts to bridge the gap by estimating the effect of the various measures instituted to curb the pandemic on COMESA trade using Kenya-Uganda trade as a Case study. The study seeks to examine the effect of the lockdown measures and e-commerce on trade between the two countries. This will inform policy makers on the necessary measures required to speed up the recovery of the trade sector and economic growth in general. The study is timely as countries are facing a health pandemic that needs specific policies to reengineer and promote economic recovery through various sectors including trade.

2.0 Literature Review

2.1 Kenya-Uganda Trade in COMESA

Restrictions on movement of people within counties and beyond borders greatly affected aggregate demand and caused supply shocks that may have influenced trade. An analysis of Kenya's trade with COMESA Member States indicates that in 2019 and 2020, Kenya traded most with Uganda followed by Egypt and Rwanda as shown in Figure 3. However, in 2020 Kenya's trade with Uganda decreased by 19.5 percent from US$ 1,144.73 million in 2019 to US$ 920.93 million.

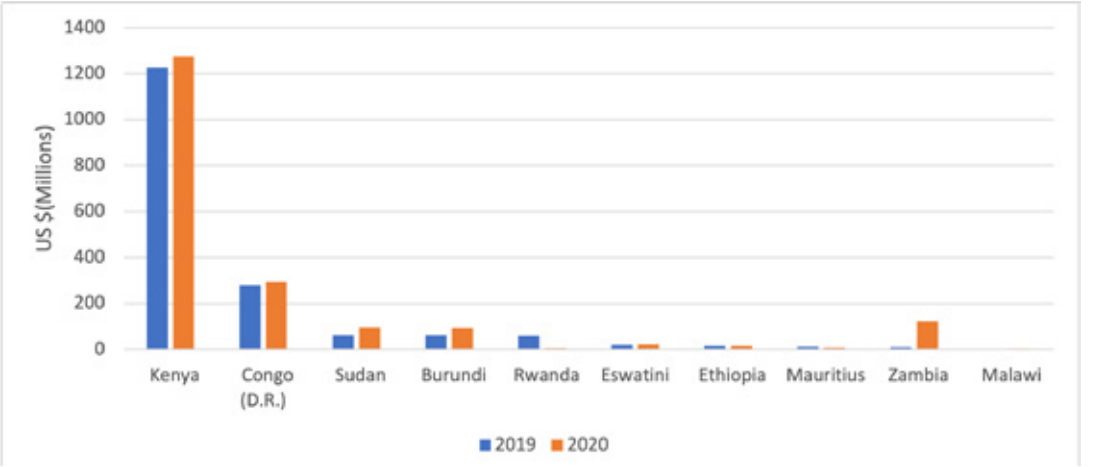
Figure 3: Kenya's total trade with COMESA member states



Source: Kenya Bureau of Statistics (Various issues)

Similarly, analysis of Uganda's trade with COMESA Member States shows that it traded the most with Kenya followed by Democratic Republic of Congo and Egypt in 2019 and 2020 as shown in Figure 4. Notably, Kenya trade constituted 55 percent and 46 percent of Uganda's total trade within COMESA in 2019 and 2020 respectively.This underscores the importance of trade between Uganda and Kenya in COMESA region.

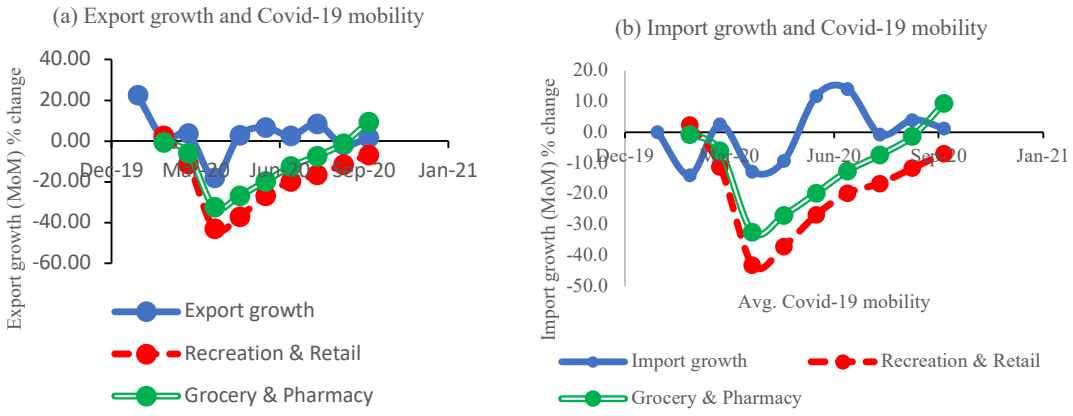
Figure 4: Uganda's total trade with COMESA member states



Source: Bank of Uganda

Furthermore, statistics indicate that Kenya's trade plunged immediately the measures were instituted across various countries. Google mobility data (Figure 5) shows that movement of persons to restaurants, shopping malls, eating cafes, visit to workplaces, among others plunged immediately the first case was reported in Kenya. Trade plunged during the same period as indicated in the diagram.

Figure 5: Export and import growth and COVID-19 mobility



Source: Google mobility data (2021)

From Figure 5 (a) and (b) above it is apparent that the onset of COVID-19 may have had far reaching repercussions on Kenya's trade.

2.2 Overview of COVID-19 and Kenya-Uganda Bilateral Trade

The preceding discussion indicates that the outbreak of the COVID-19 pandemic resulted in significant decline in trade between Kenya and Uganda. During the second quarter of 2020, trade between Kenya and Uganda declined by 22.9 percent from US$ 312.33 million registered during the first quarter to US$ 240.7 million. Similarly, the country experienced 33.6 percent decline during the period compared to the second quarter of 2019. The decline may be attributed to the restrictive measures instituted by the Kenyan Government in March 2020 when the country reported its first cases of COVID-19. The pandemic led to Kenya and Uganda closing their two busiest border posts, Busia and Malaba on 23 March 2020 save for heavy commercial vehicles.

The restrictive measures instituted at the borders led to long hours of waiting for clearance resulting to delays in commodity deliveries. This was reflected in the rise of the daily COVID-19 Stringency Index[50] in all Member States. As the Government of Kenya tightened its measures to slow down the spread of the virus, its Stringency Index rose from 2.78 in January 2020 to 88.89 in May 2020 before decreasing to 50.93 in February 2021. A similar trend was observed in Uganda as the Index rose from 5.78 in February 2020 to 93.52 in April 2020 and thereafter declined to 49.32 in April 2021. Based on the statistics, as the stringent measures increased, total trade decreased. In April 2020, the Stringency Index was at its peak whereas trade was at its lowest as shown in Figure 6. The figure further shows that as the stringent measures eased, trade increased.

50 Stringency Index refers to a composite measure based on nine response indicators including school closures, workplace closures and travel bans, rescaled to a value from zero to hundred, with hundred being strictest (Hale, et al., 2021). Extracted from https://data.humdata.org/dataset/oxford-covid-19-government-response-tracker

Figure 6: Monthly Kenya-Uganda trade and stringency index (Jan 2020-Apr 2021)

Source: Kenya National Bureau of Statistic (KNBS) (Various Quarterly Reports) and data.humdata.org

An analysis of the Kenya and Uganda trade indicates that between 2018 and 2020, Kenya exported goods amounting to US$ 859,080 to Uganda as compared to its imports. Specifically, Kenya's imports from Uganda decreased by an annual average of 32.1 percent from US$ 487,940 in 2018 to US$ 225,140 in 2020. On the contrary, the exports from Kenya to Uganda increased by 5.1 percent per year, on average, from US$ 610,540 to US$ 673,660 during the same period.

Table 2 presents the top ten Kenya's imports from Uganda and exports to Uganda. Based on the data, dairy produce is the main import from Uganda. However, there has been a shift in other goods since 2018. On one hand, iron and steel, and wood and articles of wood grew by averages of 51.2 and 18.7 percent per year, respectively, between 2018 and 2020. On the other hand, cereals, and residues and wastes from food experienced the largest annual average contractions of 92.3 and 43.4 percent, respectively, during the same period.

Table 2: Kenya-Uganda sectoral trade

Kenya's imports from Uganda	(US$ Thousand)			(% change)		
	2018	2019	2020	2019	2020	2019-2020 (avg.)
All products	487,938	336,142	225,142	-31%	-33%	-32%
Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere	98,269	130,655	64,353	33%	-51%	-9%
Edible vegetables and certain roots and tubers	77,616	275	3,251	-100%	1082%	491%
Cereals	80,989	13	2	-100%	-85%	-92%
Residues and waste from the food industries; prepared animal fodder	59,121	10,130	9,732	-83%	-4%	-43%

Tobacco and manufactured tobacco substitutes	44,452	41,578	9,019	-6%	-78%	-42%
Sugars and sugar confectionery	34,562	37,654	16,600	9%	-56%	-23%
Wood and articles of wood; wood charcoal	29,196	37,609	40,854	29%	9%	19%
Coffee, tea, maté and spices	11,955	7,123	7,940	-40%	11%	-14%
Iron and steel	5,681	8,458	12,987	49%	54%	51%
Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles ...	5,230	4,792	3,550	-8%	-26%	-17%
Kenya's exports to Uganda	**(US$ Thousand)**			**(% change)**		
	2018	**2019**	**2020**	**2019**	**2020**	**2019-2020 (avg.)**
All products	610,539	624,099	673,660	2%	8%	5%
Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal	64,098	77,246	109,007	21%	41%	31%
Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral	44,246	39,031	35,799	-12%	-8%	-10%
Iron and steel	43,752	55,472	49,798	27%	-10%	8%
Salt; sulphur; earths and stone; plastering materials, lime and cement	41,530	39,323	53,805	-5%	37%	16%
Plastics and articles thereof	40,380	33,329	38,309	-17%	15%	-1%
Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	33,112	31,392	19,719	-5%	-37%	-21%
Paper and paperboard; articles of paper pulp, of paper or of paperboard	21,373	23,392	15,447	9%	-34%	-12%
Pharmaceutical products	21,253	23,058	25,212	8%	9%	9%
Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial	21,178	20,113	16,762	-5%	-17%	-11%
Fertilisers	18,744	13,071	11,732	-30%	-10%	-20%

Source: ITC calculations based on UN COMTRADE statistics since January, 2020.

Analysis of the exports show that animal or vegetable fats and oils remain Kenya's main exports to Uganda. The exports of the products grew by an average of 30.8 percent per year from US$ 64,090 in 2018 to US$ 109,010 in 2020. During the same period, Salt, sulphur, earths and stone, plastering materials, lime and cement similarly increased by 15.8 percent per year on average. However, the country registered a decline in exports of vehicles other than railway or tramway rolling stock, and parts and accessories as well as fertilisers by averages of 21.2 and 20.3 percent per year, respectively.

2.2 Role of Digitalisation in Trade

In person meetings and face to face interactions are key determinants of trade as demonstrated by (Coscia, Neffke, & Hausmann, 2020). However, in the wake of COVID-19 pandemic, physical interactions were limited and hence arose the need for electronic commerce. As a result, digital trade played a vital role in the continuity of trade as physical movement of people was restricted. This included cross border e-commerce, digital payments (for example mobile payment platforms), teleconferencing with business partners, digitally enabled transactions in goods and services as well as online marketing among others.

E-Commerce refers to the sale and purchase of goods and services through electronic networks and internet. It may be classified into four forms; business-to-business, business-to-consumer, consumer-to-consumer and, to a lesser extent, business-to-Government (United Nations Conference on Trade and Development, 2015). The COVID-19 pandemic accelerated the adoption of digital technologies facilitating continuity of trade flow amidst movement restrictions.

COMESA is cognisant of the role that e-commerce and digital trade plays. To this end, the region developed a COMESA COVID-19 essential goods online portal. The platform is envisaged to enable Member States share information on availability of essential products and their potential to produce and supply various types of goods. Further it is expected to benefit traders by providing access to market information as well as linking producers, sellers and buyers. Additionally, in 2017, COMESA developed Digital Free Trade (FTA) based on three aspects; e-regulation, e-logistics and e-trade (including an e-commerce platform).

The outbreak of COVID-19 necessitated governments to implement required infrastructure to support e-commerce (UNCTAD 2020). These included actions to ensure digital and physical connectivity and increase the use of digital skills and abilities of retailers. In measuring the preparedness of a Country to support online shopping and trading, UNCTAD developed a Business to Consumer (B2C) E-Commerce Index (e-readiness). The Index is generated using four indicators established to be highly related to online shopping and for which there is wide country coverage. These include account ownership at a financial institution or mobile money service provider, persons using internet, Postal Reliability Index and secure internet servers per million people (UNCTAD, 2020).

In 2020, Switzerland ranked first (Index value of 95.9) as the country with the highest readiness to engage in and benefit from e-commerce worldwide. Among COMESA Member States and Africa at large, Mauritius emerged first with an Index value of 58.4 and ranked 69th Worldwide in its preparedness to support online trade. The exemplary performance was attributed to the rise in internet penetration that greatly boosted e-commerce industry in Mauritius. Libya and Kenya ranked second and third in COMESA with an Index value of 49.7 and 49 respectively as shown in Table 3. The performance of

COMESA Member States in terms of the four indicators, 2020 Index value as well as 2020 rankings are shown in Table 3. Based on the statistics, postal reliability is the region's biggest e-commerce infrastructural weakness as most countries attained a score of less than 20 with four countries registering a score of zero.

Table 3: COMESA member states B2C e-commerce index and network readiness index

	Share of individuals using the Internet (2019 or latest)	Share of individuals with an account (15+, 2017	Secure Internet servers (normalized, 2019)	UPU postal reliability score (2019 or latest	2020 (Index value)	2020 Rank	2019 NRI Index Value	2019 NRI Rank
Burundi	3	7	20	3	8.3	150	-	-
Comoros	8	22	18	0	12	149	-	-
Djibouti	56	12	32	10	27.7	125	-	-
DR Congo	9	26	11	5	12.8	148	-	-
Egypt	57	33	31	26	36.6	109	38.58	92
Eswatini	47	29	38	0	28.4	123	25.19	114
Ethiopia	19	35	6	51	27.5	126	23.37	116
Kenya	23	82	46	46	49	88	38.19	93
Libya	75	66	57	1	49.7	85	-	-
Madagascar	10	18	19	30	19.2	137	22.73	118
Malawi	14	34	25	0	18	141	22.9	117
Mauritius	64	90	51	28	58.4	69	53.4	53
Rwanda	11	50	36	16	28.3	124	39.97	89
Sudan	31	15	14	26	21.7	131	-	-
Tunisia	67	37	46	69	54	77	-1.4	74
Uganda	24	59	27	30	34.9	112	29.7	110
Zambia	24	46	31	19	30	120	26.2	112
Zimbabwe	31	55	36	0	30.5	118	22.09	117
Eritrea*								
Seychelles*								
Somalia*								

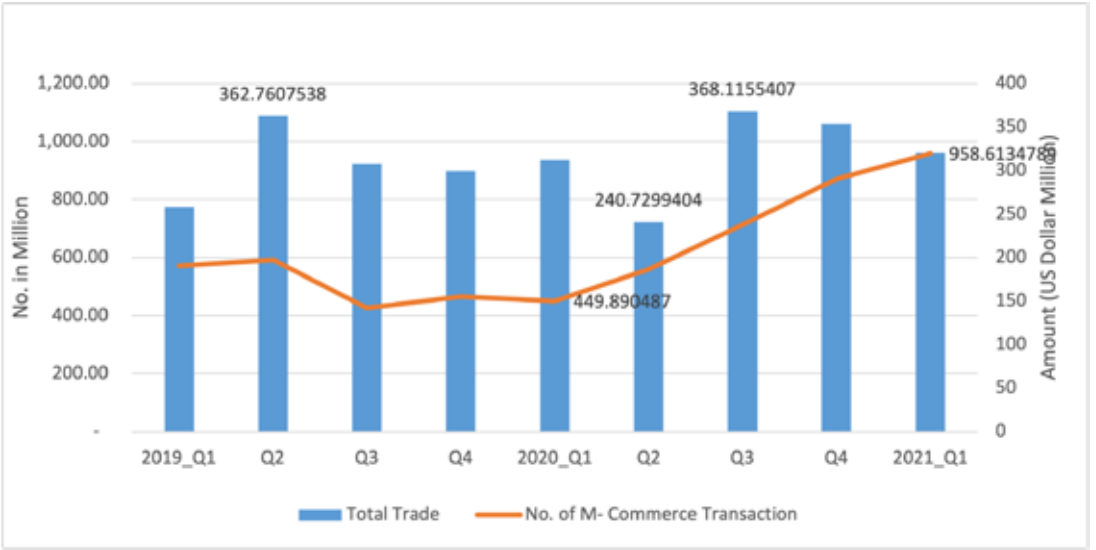
*Source: United Nations Conference on Trade and Development, (2020) * Not reported*

In addition to (B2C) E-Commerce Index, Network Readiness Index (NRI) and Global Innovation Index (GII) are also key in assessing a country's readiness to leverage on technology. Specifically, NRI framework assesses the factors, policies, and institutions that enable a country to fully leverage on information and communication technologies (ICTs) for inclusive, sustainable growth, competitiveness, and well-being (Dutta & Lanvin, 2019). The NRI is premised on four key pillars technology, people, governance and impact. In 2019, Sweden ranked first worldwide out of the total 121 economies evaluated with a score of 82.65 due to its consistency across the four pillars. In Africa, Mauritius similarly emerged first followed by South Africa and Rwanda. The performance of the other COMESA Member States is as outlined in Table 3.

On the other hand, the Global Innovation Index aids in providing an environment that evaluates innovation factors continuously (Cornell University, INSEAD and WIPO, 2020). The GII has been used by various governments worldwide to improve their innovation performance and shape their evidence-based policies. Switzerland was ranked the most innovative economy in the Global Innovation Index 2020 followed by Sweden. In Africa and COMESA region, Mauritius was ranked as the most innovative economy. South Africa and Tunisia ranked second and third respectively in Africa. The report noted that COVID-19 crisis catalyzed innovations in many sectors such as trade, education and remote work. As such, there is need to leverage on the power of innovation to collectively build a cohesive, dynamic and sustainable recovery in all sectors of the economy.

In the case of Kenya-Uganda trade, e-commerce gained prominence following the closure of various border posts. The Government of Kenya waived transaction fees for mobile money transfers (upto Ksh. 1000) from March 2020 to 31 December 2020 to encourage mobile money transactions over cash transactions in response to COVID-19 pandemic. This saw an increase in the number of mobile transactions both for person to person and businesses. The country experienced a surge in data/internet subscriptions and the number and value of Mobile-Commerce (M-Commerce[51]) transactions during the pandemic period. Statistics indicate that the number of M-Commerce transactions rose by 27.7 percent from 449.89 million registered during the first quarter of 2020 to 559.04 million in the second quarter of 2020. Further, the transactions grew by 113.1 percent to 958.61 million in the first quarter of 2021 compared to the same period of 2020 as shown in Figure 7. Similarly, the number of data/internet subscriptions grew by 52.1 percent from 39.4 million registered during the first quarter of 2020 to 59.9 million during the first quarter of 2021. Over the same period, the country experienced an increase in total trade with Uganda as shown in Figure 7.

Figure 7: Quarterly Kenya-Uganda trade and m-commerce transactions

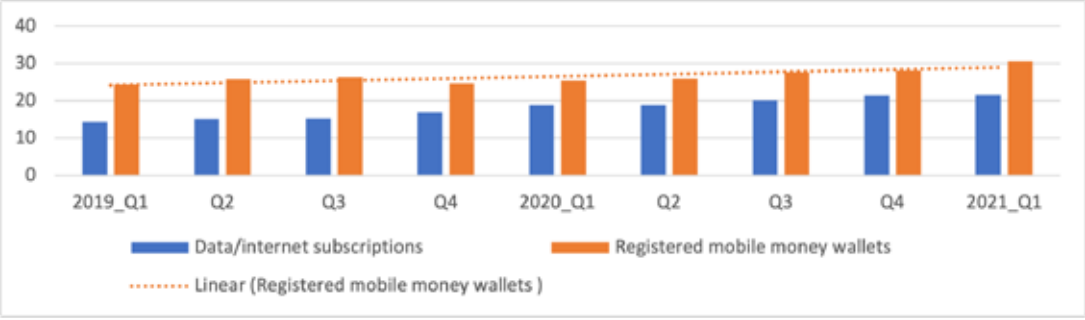


Source: KNBS and Communications Authority of Kenya (Various Quarterly Reports)

51 Mobile Commerce Transactions- Customer to business (C2B), Business to Customer (B2C), Business to Business (B2B), Government to Business (G2B) (Communication Authority of Kenya, Various Reports)

In Uganda, the government eliminated bank-to-wallet charges and cash-out fees for lower transaction tiers for 30 days to encourage mobile money transactions (Deloitte, 2020). This led to the increase in the number of registered mobile money wallets and M-Commerce transactions. Statistics show that the country registered more than 5 million new mobile money accounts between March 2020 and March 2021. The growth as outlined by Uganda Communications Commission (2021) was largely fuelled by significant fee waivers, increased merchant acceptance and limited movements at the height of the pandemic. In addition, fixed and mobile data/internet subscriptions grew by 13.8 percent from 18.9 million registered in March 2020 to 21.6 million in March 2021 as shown in Figure 8.

Figure 8: Uganda's quarterly data/internet subscriptions and mobile money wallets



Source: Uganda Communications Commissions (Various Quarterly Reports)

2.3 Conceptual Framework

The effect of the ongoing COVID-19 pandemic on trade can be observed through three different channels (Bekkers, et.al, 2020). First is the supply channel emanating from supply shocks. A reduction in production and supply of goods and services has a negative effect not only on trade but also on all other economic activities. This idea has been demonstrated by Gourinchas (2020), who states that a modern economy is a complex web of interconnected parties; employees, firms, suppliers, consumers, and financial intermediaries. According to Gourinchas, everyone is someone else's employee, customer, lender and so on. Consequently, from this high degree of inter-connectiveness and specialization of productive activities, a breakdown in the supply chains and the circular flows will have a cascading effect.

According to Jonung and Roeger (2006), a supply effect of a pandemic results from the breakdown of trade linkages that interrupt the flow of intermediate inputs in production as well as a general reduction in labour supply. Further, Saka (2021) noted that the supply shock occasioned by general reduction in labour supply partially occurs due to fear of infections, social distancing rules, and movement restrictions making healthy workers refrain from work place. Additionally, illness also reduces supply of a man's working hours while death, when it arises due to the pandemic further reduces labour supply. The supply effect has also been discussed by Baldwin (2020) who considers it through an expectation shock by which there is a "wait-and-see" attitude adopted by economic agents. Baldwin argues that this is common during economic climates characterized by uncertainties, as there is less confidence in markets and economic transactions. Ultimately, the intensity of the supply shock is determined by the underlying epidemiological properties of the pandemic, consumer and firm behaviour in the face of adversity, and public policy responses.

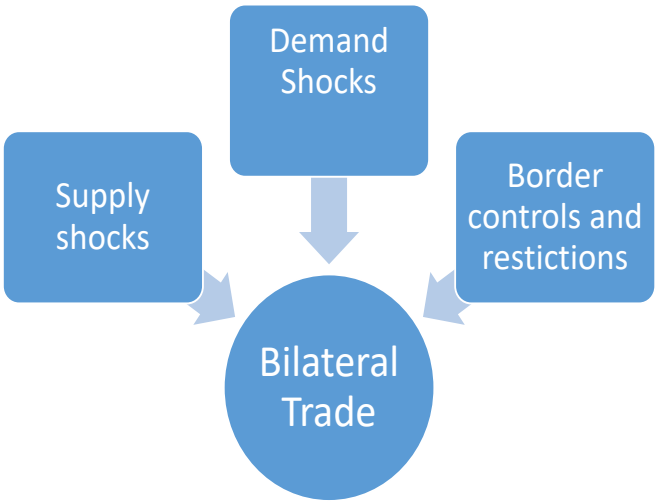
Secondly, is the demand effect of the pandemic. COVID-19 has led to a sharp decline in consumption of goods and services. Baker et al. (2020) found that households sharply increased their spending during the initial period in specific sectors such as retail and food spending. These increases, however, were followed by a sharp decrease in overall spending. Prolonged lengths of the pandemic and the social distancing measures have reduced consumer confidence by keeping consumers at home, wary of discretionary spending and pessimistic about the long-term economic prospects. The fear of contracting the virus while coming into contact with other people at the time of purchase of consumption goods can give rise to the demand effect.

Further, the decline in household income occasioned by salary cuts, job losses, retrenchments, unpaid leave and fall in business income leads to a decline in household incomes and consumption and hence a demand effect (Saka, 2021). For example, the leisure industry in most economies have reported a decline in demand as people cut back consumption spending. Binder (2020), from a survey of United States consumers established that 28 percent of the respondents in that survey delayed/postponed future travel plans, and 40 percent forego food purchases. Additionally, workers with lower levels of education, younger adults, and immigrants who are concentrated in occupations that are less likely to be performed from home mostly lost their jobs and income thereby reducing their spending power.

Lastly, increasing border controls and restriction on business and personal travel due to the spread of pandemic ultimately give rise to trade costs. Trade costs involve transportation costs, policy barriers, legal and regulatory costs (Anderson & Wincoop, 2004). COVID-19 travel restrictions have been imposed on nearly daily basis thus ultimately increasing transportation costs. For instance, with social distance regulations, public transport providers have had to raise the cost of travel to recover revenues lost due to operating below capacity.

Based on the description of the channels, the study derives the conceptual framework as illustrated in Figure 9. The framework and reviewed literature informs the model specification that is estimated to achieve the objectives of the study.

Figure 9: Conceptual framework of COVID-19 channels on trade



Source: Authors conceptualization

2.4 Empirical Literature

A number of studies have been conducted to establish the effect of COVID-19 and indeed other pandemics on economies of the world. For instance, Mattoo & Mensbrugghe, (2020) applied the CGE model in accounting for the direct impact of reduction in employment, increasing costs of international transactions, significant decline in trade and demand for services across the globe. The study found that the effect on global economy was dependent on the severity of the pandemic and duration during which the containment measures last considering the adverse effects.

In another study, Lashitew and Socrates (2021) analyzed how Kenya's import and export trade was affected by lockdown policies during COVID-19 outbreak using weekly series of product by country data. The study employed an event study design and established that the introduction of lockdown measures by trading partners led to a modest increase in exports and a comparatively larger decline of imports. In general, the study found that the strength of lockdown policies had an asymmetric effect on import and export trade.

A study undertaken by Nechifor, et al., (2020) sought to assess the short-term impact of COVID-19 pandemic on the Kenyan economy using a macroeconomic general equilibrium framework. The findings established that the April-June 2020 lockdown would result in a decrease in GDP growth to 0.9 percent in 2020, total supply to -5.5 percent (from -6.9 percent) and consumer demand to -4.9 percent. The constraints on the supply side were envisioned to increase Kenyan imports accompanied by a further depreciation of the Kenya Shilling (an increase in exchange rate) and an increase in inflation.

With a second lockdown in Kenya during 2020, the study found out that GDP would decrease by 9.2 percent wheare as employment would drop by 19.2 percent relative to the baseline values. Consequently, the lockdown would lead to increase in government deficit by Ksh. 6.1 billion and a decrease in investment levels by 13.7 percent. For economic recovery, the study recommended support to Micro Small and Medium Enterprises (MSMEs) by the financial institutions as well as the government through temporary support on the main running costs such as electricity and water for firms to ensure continuation of operations.

In assessing the COVID-19 impacts on African trade and value chains, Banga, et al,. (2020) applied a descriptive design. Their analysis indicated that the various measures instituted by countries to curb the pandemic led to an abrupt slowdown and delays in cross-border trade worsened by disputes between neighbouring countries, long lines of trucks awaiting clearance and divergence of trade to less safe unofficial routes. Specifically, the findings established that many African countries experienced inadequate access to emergency COVID-19 supplies, increased food insecurity, escalation of prices along key corridors and cities, loss of income for small-scale cross-border traders as well as reduced trade volumes between countries. All these effects adversely impacted the global value chains as Africa is a major exporter of cocoa, tea, coffee, iron ores, copper among others and an important supplier of a wide range of services in travel and transportation sectors.

In an exposition of potential trade effects and mitigation of the COVID-19 in COMESA, Musengele & Kibiru (2020) established that transport and travel-related services were most affected by COVID-19. According to the report, COMESA was likely to experience reduced trade due to the following: most of the export destination markets were among the countries highly affected by COVID-19 pandemic;

projected slow growth in 2020 in some of the major trading partners which was envisioned to cause a reduction in demand for COMESA exports; the projected contraction imports of goods and services by 11.5 percent and 8.2 percent respectively in advanced, emerging and developing economies in 2020; and disruption of supply chains due to closure of factories and businesses and other containment measures which were expected to reduce demand for raw materials and intermediate products which form the bulk of COMESA exports.

Raj, Sundararajan and You, (2020) analyzed the role of digital platforms on increasing the survival rate of firms during a crisis across five major US cities (New York, San Francisco, Atlanta, Miami and Dallas). The study applied order-level data from Uber Technologies to show how the COVID-19 pandemic and the shutdown of businesses in the United States affected independent, small business restaurant supply and demand on the Uber Eats platform. The findings established that small restaurants experienced significant increase in total activity, orders per day, and orders per hour following the closure of the dine-in channel. In addition, the findings showed an increase in the intensity of competitive effects following the shock. This implied that growth in the number of providers on a platform induced both market expansion and heightened inter-provider competition. The findings underscored the critical role that digitalization plays in creating business resilience in the post-COVID economy, and provided new managerial insight into how supply-side and demand-side factors shape business performance on a platform.

Using descriptive statistical analysis, Mold and Mveyange (2020), evaluated the impact of the COVID-19 on regional trade in the East African Community (EAC). Paradoxically, given the prevailing pessimism surrounding the prospects for global trade, Kenya experienced a significant improvement in exports in the first quarter of 2020 together with a moderation of imports, leading to a marked decline in trade deficit. The study found that not all supply chains were disrupted by the crisis, with some Kenyan exports such as tea and fruits surpassing levels of past years. Rather, imports were the principal victim of the crisis, declining by a quarter over the three months since the crisis began (between March and May 2020). Capital goods imports also declined markedly. The study also found that Kenya's EAC neighbours, especially the landlocked countries suffered a reduction in total trade.

3.0 Methodology

3.1 Model Specification

Based on the outlined conceptual framework and reviewed literature, the study considers the following as the function that describes total trade given a pandemic.

$$TR = f(GDP, MCOM, INT, SI, COV, U) \quad \text{.....(i)}$$

Where *TR* represents total trade, *GDP* is Gross Domestic Product, *MCOM* is the value of M-Commerce transactions, *INT* is data/internet subscriptions, *SI* is stringency index *COV* represents the COVID-19 cases. *U* is the error term

Since the study considers the case of Kenya-Uganda trade, equation (i) is restated as shown in equation (ii).

$$TR = f(GDP_U, GDP_K, MCOM, INT, SI_U, SI_K, COV_U, COV_K, U) \quad \text{.....(ii)}$$

Where, GDP_U and GDP_K is Gross Domestic Product for Uganda and Kenya respectively, MCOM is the value of M-Commerce transactions, INT is data/internet subscriptions, SI_U and SI_K represent the stringency index for Uganda and Kenya respectively while COV_U and COV_K represent the COVID-19 cases in Uganda and Kenya respectively. The macroeconomic variables in the model are GDP for Kenya and Uganda. All variables are expressed in natural logarithms and thus are interpreted as elasticities. GDP is included since it is a major determinant of trade as propounded by the Gravity model of international trade flows. GDP also captures the effect of the pandemic from the demand channel since it is a proxy for aggregate income. A reduction in aggregate income occasioned by salary cuts, retrenchments, unpaid leave and other such factors will lead to a fall in demand holding other factors constant. Distance was omitted because the study only considers trade between two countries hence the distance remains constant. Further, the study included a dummy variable (LD) to capture the lockdown period in Kenya.

Equation (ii) is then expressed in logarithmic form to yield;

$$lnTR_t = \beta_0 + \beta_1 lnGDP_{Ut} + \beta_2 lnGDP_{Kt} + \beta_3 lnMCOM_t + \beta_4 lnINT_t + \beta_5 lnSI_{Ut} + \beta_6 lnSI_{Kt} + \beta_7 lnCOV_{Ut} + \beta_8 lnCOV_{Kt} + \beta_9 LD + \mu_i \quad \text{.....(iii)}$$

The Coefficients β_5, β_6 , β_7, β_8 and β_9 are expected to be negative since restriction of movement of people as well as the increase in COVID-19 cases are expected to reduce trade especially where such trade requires movement and meeting of people. Conversely, the coefficients β_3 and β_4 are expected to be positive since a rise in e-commerce and internet subscriptions are expected to facilitate trade. In the COVID-19 era where restrictions on movement of people have been instituted and individuals voluntarily chose not to travel but minimize physical interaction, digital trade and e-commerce are critical in trade facilitation.

3.2 Time Series Estimation Techniques

3.2.1 Unit Root Test

The starting point in the estimation procedure was carrying out the unit root test to establish the

stationarity or otherwise of the variables under study. The study applied the Augmented Dickey Fuller unit root test to establish the presence of a unit root and the order of integration of the variables.

3.2.2 Cointegration

Since the variables under study were a mixture of both I(0) and I(1), the study used the bounds testing approach to test for cointegration within an Autoregressive distributed lag (ARDL) framework developed by Pesaran and Shin (1999) and Pesaran et.al. (2001). This method is applicable where the regressors are I(0) and/or I(1) but not I(2). The approach is also efficient in small sample sizes and it allows the cointegration relationship to be estimated using OLS once the lag order of the model is identified.

A simple ARDL model is give as:

$$Y_t = \delta_0 + \sum_{j=1}^{p} \delta_{0_{1j}} Y_{t-j} + \sum_{j=0}^{q} \delta_{1_j} X_{t-j} + \mathcal{E}_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (iv)$$

Incorporating the short run and long run dynamics, equation (iv) is transformed into bound testing approach as;

$$\Delta Y_t = \beta_0 + \sum_{j=1}^{p} \beta_{1j} \Delta Y_{t-j} + \sum_{j=0}^{q} \alpha_{1j} \Delta X_{t-j} + \theta_0 Y_{t-1} + \theta_1 X_{t-1} + \mathcal{E}_t \quad \ldots\ldots\ldots\ldots\ldots . (v)$$

3.2.3 ARDL Bounds Test

The model in equation (iii) was specified as follows for cointegration test

$$\Delta lnTR_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i}\, \Delta lnTR_{t-k} + \sum_{i=0}^{n} \delta_{2i}\, \Delta lnGDP_{Ut-k} + \sum_{i=0}^{n} \delta_{3i}\, \Delta lnGPD_{Kt-k} + \sum_{i=0}^{n} \delta_{4i}\, \Delta lnMCOM_{t-k} + \sum_{i=0}^{n} \delta_{5i}\, \Delta lnINT_{t-k} + \sum_{i=0}^{n} \delta_{6i}\, \Delta lnSI_{Ut-k} + \sum_{i=0}^{n} \delta_{7i}\, \Delta lnSI_{Kt-k} + \sum_{i=0}^{n} \delta_{8i}\, \Delta lnCOV_{Ut-k} + \sum_{i=0}^{n} \delta_{9i}\, \Delta lnCOV_{Kt-k} + \sum_{i=0}^{n} \delta_{10i}\, \Delta lnLD_{t-k} + \beta_1 lnTR_{t-1} + \beta_2 lnGDP_{Ut} \beta_3 lnGDP_{Kt-1} + \beta_4 lnMCOM_{t-1} + \beta_5 lnINT_{t-1} + \beta_6 lnSI_{Ut-1} + \beta_7 lnSI_{Kt-1} + \beta_8 lnCOV_{Ut-1} + \beta_9 COV_{Kt-1} + \beta_{10} lnLD_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (vi)$$

Where k is the chosen lag length while Δ is the difference operator. The parameters $\delta_1, \delta_2, \delta_3, \delta_4, \delta_5, \delta_6, \delta_7, \delta_8, \delta_9$ and δ_{10} are the short run dynamic coefficients of the ARDL model while $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8$ β_9 and β_{10} are long run parameters (elasticities).

To investigate the presence of a long run relationship, the following hypotheses are tested.

$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = 0$ (coefficients of the long run equation are all equal to zero implying no cointegration)

$H_1 : \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9 \neq \beta_{10} \neq 0$ (Coefficients of the long run equation are not significantly equal to zero implying cointegration exits)

Pesaran et.al. (2001) provides critical values, upper and lower critical values which are compared with the F-statistic in order to accept or reject the null hypothesis. The lower critical values assume all the variables are I (0) while the upper critical values' assumes all the variables are I(1).

If the F-statistic exceeds the upper critical bound, the null hypothesis is rejected meaning that co-integration exists among the variables, and if the F-statistic is below the lower critical bound; the null hypothesis is accepted indicating absence of long run relationship among the variables.

From the results of the bounds test, if the variables are found to be cointegrated, the study would specify both short run (ARDL) and long run (ECM) models as follows;

$$\Delta lnTR_t = \varphi_0 + \sum_{i=1}^{n} \varphi_{1i}\, \Delta lnTR_{t-k} + \sum_{i=0}^{n} \varphi_{2i}\, \Delta lnGDP_{Ut-k} + \sum_{i=0}^{n} \varphi_{3i}\, \Delta lnGPD_{Kt-k} + \sum_{i=0}^{n} \varphi_{4i}\, \Delta lnMCOM_{t-k} + \sum_{i=0}^{n} \varphi_{5i}\, \Delta lnINT_{t-k} + \sum_{i=0}^{n} \varphi_{6i}\, \Delta lnSI_{Ut-k} + \sum_{i=0}^{n} \varphi_{7i}\, \Delta lnSI_{Kt-k} + \sum_{i=0}^{n} \varphi_{8i}\, \Delta lnCOV_{Ut-k} + \sum_{i=0}^{n} \varphi_{9i}\, \Delta lnCOV_{Kt-k} + \sum_{i=0}^{n} \varphi_{10i}\, \Delta lnLD_{t-k} + \pi ECT_{it-1} \quad \text{.....(vii)}$$

3.3 Definition and Measurement of Variables

Gross domestic product (GDP) is measured at current prices, US dollars. The coefficient is expected to have a positive sign.

Trade (TRD) is the country's total exports and imports. It is measured at current prices, US$.

Value of M-Commerce Transactions (MCOM) as defined by Communications Authority of Kenya refers to value of Mobile Commerce transactions in Kenya Shillings, which include Customer-to-Business (C2B), Business-to-Customer (B2C) and Business- to-Business (B2B). It is expressed in US$. The variable is expected to positively influence trade. The study used the value of M-Commerce transactions and data/internet subscriptions to proxy e-commerce in Kenya and Uganda.

Data/internet subscriptions (INT) refers to the number of people who subscribed to internet connectivity and is expressed in millions. Similar to M-Commerce transactions, the variable is expected to be positively related to trade.

Stringency Index (SI) refers to a composite measure based on nine response indicators including school closures, workplace closures and travel bans, rescaled to a value from zero to hundred, with hundred being strictest. Based on literature, stringency index is expected to negatively affect trade.

COVID-19 Cases (COV) refers to the number of confirmed COVID-19 positive tests reported by the Ministry of Health. The variable is expected to have a negative sign.

Lockdown (LD) is a dummy variable used to capture the months when Country movements were restricted. (1=Lockdown 0 = No lockdown). Lockdown is expected to negatively affect trade.

3.4 Data Type and Sources

The study applied secondary time series data from various sources. Despite the availability of the aggregate data for the region, there is dearth of monthly data for most countries to capture the COVID-19 pandemic period. As such, the study focused on Kenya and Uganda to mirror COMESA region due to availability of disaggregated data. The data on Gross Domestic Product and trade were obtained from Bank of Uganda and Kenya National Bureau of Statistics, various reports. The number and value of M-Commerce transactions as well as the number of data/internet subscriptions data

were extracted from Communications Authority of Kenya and Uganda Communications Commission (various Quarterly Sector Statistics Reports) for Kenya and Uganda respectively, data on Stringency Index was obtained from *data.humdata.org* website and the number of confirmed COVID-19 cases in Kenya and Uganda was compiled from the various Ministry of Health reports for Kenya and Uganda. The data on all variables was monthly observations from June 2018 to April 2021. For GDP, the study used the quarterly data and applied interpolation in Eviews software to generate the monthly GDP. This is because the data is only available at quarterly levels.

3.5 Diagnostic Tests

3.5.1 Unit Root Test Results

The study applied the Augmented Dickey Fuller unit root test to establish the presence of a unit root and the order of integration of the variables. The results are presented in Table 4.

Table 4: Unit root test results augmented dickey fuller

Variables		Levels		First Difference	Conclusion
	Intercept, no trend	Intercept, trend	Intercept, no trend	intercept, trend	
GDP_Uganda	-1.8337	-2.4958	-5.6520	-5.5715*	I(1)
Value of M-Commerce Transactions	0.5875	-0.8367	-3.5993**	-3.8477**	I(1)
Data/internet subscriptions	-0.5922	-0.8323	-5.6249*	-5.7479*	I(1)
C-19 Cases_Uganda	-1.9022	-1.1368	-0.6213**	-3.5318	I(1)
C-19 Cases _Kenya	-3.8479**	-2.86691	-	-	I(0)
Stringency Index_Kenya	-4.0324**	-3.08291	-	-	I(0)
Stringency Index_Uganda	-5.7030*	-5.3173*	-	-	I(0)

*The asterisks * and ** denotes 1% and 5%significance levels respectively. I(0) and I(1) denote integration of orders zero and one respectively.*

Source: Authors own computation using E-views software from study data

The results established that total trade, stringency index both for Kenya and Uganda as well as the COVID-19 cases for Kenya were stationary at levels and integrated of order zero, I(0). On the other hand, GDP, value of M-Commerce transactions, data/internet subscriptions and COVID-19 cases for Uganda were non-stationary at levels. However, after differencing once, they all become stationary indicating that they are integrated of order one, I (1).

3.5.2 ARDL Bounds Test Results

Table 5 indicates that the F statistic (4.45) was greater than the critical value for the upper bund I (1)

at 5 percent significance level (3.61). The null hypothesis of no long run association was rejected, and the alternative hypothesis of long run association accepted. This indicates that there was presence of cointegration among the variables in the model. Consequently, the study went ahead to estimate the long run model.

Table 5: ARDL bounds test results

Test Statistic	**Value**	**K**
F-statistic	4.455153	6
Critical Value Bounds		
Significance	I (0) Bound	I (1) Bound
10%	2.12	3.23
5%	2.45	3.61
2.50%	2.75	3.99
1%	3.15	4.43

Source: Author's computation using E-views from study data

4.0 Presentation and Discussion of Results

4.1 Long Run Estimation Results

The results of the effect of the COVID-19 measures and e-commerce on trade between Kenya and Uganda are presented in Table 6.

Table 6: Long-run results of COVID-19 measures and e-commerce on trade

Dependent Variable: Total trade			
Independent Variable	**Coefficient**	**Standard Error**	**P-value**
GDP_Uganda	1.6951**	0.5454	0.0266
Value of M-Commerce Transactions	1.7956*	0.4391	0.0095
Data/internet subscriptions	2.1987**	0.6988	0.0255
Stringency Index_Kenya	-0.3091	0.2654	0.2967
Stringency Index_Uganda	-0.4185***	0.187	0.0754
C-19 Cases _Kenya	-0.1594*	0.0341	0.0054
C-19 Cases_Uganda	0.0436	0.0304	0.2114
Lockdown_Kenya	-0.1704***	0.0798	0.0859
Overall R	0.9443		
F-Statistics	10.5972	Probability	0.0009

*The asterisks *, ** and *** denote 1%, 5% and 10% significance levels respectively*

Source: Authors computation using E-views from study data

The results show that in the long run, all the variables have expected signs except COVID-19 cases in Uganda. Similarly, the variables are statistically significant except for Kenyan stringency index and COVID-19 cases in Uganda. The findings show that, in the long run, GDP for Uganda is positive and statistically significant at 5 percent. This implies that when Uganda's economy grows by 1 percent, its trade with Kenya increases by 1.7 percent. The finding is consistent with the underlying theory of gravity model which asserts that when a country's income grows, it creates a higher potential supply from the exporting country and increased demand in the importing country (Karamuriro, 2015).

As expected, the coefficients of the value of M-Commerce transactions and data/internet subscriptions are positively related to trade. The findings indicate that in the long run, a 1 percent increase in the value of M-Commerce transactions increases trade by 1.8 percent. Similarly, a 1 percent increase in the number of data/internet subscriptions boosts trade by 2.2 percent. This indicates that ecommerce or digitalization is vital in boosting trade between trading partners. Specifically, during the COVID-19 pandemic period, Kenya leveraged on digitalization to boost its trade resilience. COVID-19 pandemic gave online shopping in Kenya and Uganda a huge boost which revived trade after the second quarter of 2020. The findings compare with those of Raj, Sundararajan and You (2020) who found that businesses that had digital resilience survived during the lockdown period. In addition, the study

findings underscored the critical role that digitalization plays in creating business resilience in the post-COVID economy.

The long run results further established that coefficient of the stringency index was negatively related to trade and statistically significant at 10 percent. Specifically, when Uganda's stringency index rises by 1 percent, then trade decreased by 0.4 percent. As expected, when Countries tighten their measures to curb the COVID-19 pandemic, various sectors of the economy including production and supply of goods are negatively affected. The findings compare with the statistical review that showed that when the stringency index increased, trade declined and vice versa as well as the study by Banga, et al, (2020). Similarly, the long run coefficient of the COVID-19 cases in Kenya was negative and statistically significant at 1 percent. This implies that when the confirmed COVID-19 cases increase in Kenya by 1 percent, trade decreases by 0.16 percent. In addition, the coefficient of dummy variable lockdown was negative and statistically significant. The findings indicate that during lockdown period, trade decreased by 0.2 percent implying that the restriction of movement limits trading activities.

4.2 Error Correction Estimation Results

Table 7: ECM estimation result

Dependent Variable: Total trade			
Independent Variable	**Coefficient**	**Standard Error**	**P-value**
Total trade (lagged value)	0.8839***	0.0776	0.0557
GDP_Uganda	1.0452***	0.1551	0.0938
Value of M-Commerce Transactions	2.5420***	0.2301	0.0575
Data/internet subscriptions	4.6332***	0.4990	0.0683
Stringency Index_Kenya	-0.3026	0.0560	0.1166
Stringency Index_Uganda	-0.4626***	0.0560	0.0766
C-19 Cases _Kenya	-0.3797***	0.0346	0.0579
C-19 Cases_Uganda	0.0884	0.0191	0.1354
Lockdown_Kenya	-0.0566	0.0414	0.4020
ECT2(-1)	-0.5735***	0.5555	0.0537
Overall R	0.999372		
F-Statistics	159.021	Probability	0.061641

*The asterisks *, ** and *** denote 1%, 5% and 10% significance levels respectively*

Source: Author's computation using E-views from study data

The results presented in Table 7 indicate that in the short run, GDP Uganda positively and significantly affects total trade between Kenya and Uganda at 10 percent significance level. Similarly, the value of M-Commerce transactions positively and significantly affects Kenya-Uganda trade with a coefficient of 2.5 indicating that a 1 percent rise in the value of M-Commerce transactions will lead to a 2.5 percent

rise in total trade. Additionally, data and internet subscriptions positively and significantly affect total Kenya-Uganda trade. As expected, the coefficients of Stringency Index COVID-19 for both Kenya and Uganda were negative, and the coefficient for COVID-19 cases was negative for Kenya. However, the coefficient for Lock down in Kenya was negative though not significant in the short run.

The size of the coefficient of the error term (ECT_{t-1}) was negative and significant at 10 percent level of significance. This indicates that the speed of adjustment of the equilibrium towards long run stable state after a short run disturbance is -0.5735 and that the system corrects its previous month's disequilibrium by 57.35 percent in a month.

4.3 Post Estimation Diagnostic Tests Results

The study conducted post estimation diagnostic tests that include serial correlation test, heteroskedasticity test as well as stability test to ensure robustness of the findings. The tests are essential since they ensure that the estimator is unbiased, consistent and efficient. Specifically, the study employed the Breusch-Godfrey Serial Correlation LM test to test for serial correlation. The results presented in Table A2 in the Appendix indicate the none rejection of the null hypothesis[52], given the P-value corresponding to the observed R-squared is greater than 5 percent. This implies that the residuals are not serially correlated hence the estimator will be best, linear and unbiased. To test for Heteroskedasticity, the study used the Breusch-Pagan-Godfrey test and the results are presented in Table A3 in the Appendix. The findings indicate that the null hypothesis of constant variance could not be rejected and hence the model has no heteroskedasticity problem.

The study further prepared a correlation matrix of all the independent variables to determine the extent of multicollinearity among independent variables. The correlation matrix is a square matrix showing correlations between variables and is presented in Table A5 in the Appendix. The table indicates that there is no perfect collinearity amongst any of the independent variables given that most of the correlation coefficients are lower than 0.5. Since none of the variables were perfectly collinear, the study adopted the findings as multicollinearity was not a problem. In addition, the study applied the Cumulative sum (CUSUM) test to test for stability of the variables. The results, as presented in Figure A4 in the Appendix, show that the model is stable given that the calculated CUSUM statistics lies within the critical 5 percent bounds. This indicates that the ECM model is stable. The diagnostic test results indicate that the assumptions were satisfied and thus the results are consistent and can be interpreted.

52 The null hypothesis for serial correlation is that residuals are not serially correlated against the alternative that residuals are serially correlated.

5.0 Conclusion and Policy Implications

5.1 Conclusion

The study analysed the effects of restriction measures instituted during the pandemic and the role of e-commerce on intra-COMESA trade using Kenya-Uganda trade as a case study.

The findings indicate that COVID-19 significantly affected bilateral trade between Kenya and Uganda. Specifically restrictive measures in Kenya and Uganda, negatively affected total trade between the two countries. E-Commerce transactions positively affected total trade between the two countries. The results support the role of digitalization in enhancing cross border trade.

5.2 Policy Implications

The study recommends that:

- Kenya, Uganda and the region at large embrace the use of technology (online transactions) in sourcing for goods within and beyond their borders. This can be done by improving Information and Communication Technology (ICT) infrastructure, promoting accessible and affordable internet connectivity, digital skills, and literacy;
- Adopt policies that support and enhance electronic signatures, transactions and records to expedite clearance process at the borders; and
- Kenya and Uganda to allow freer movement of people across the borders with adherence to Ministry of Health protocols on prevention of COVID-19. This is expected to facilitate flow of goods within and across the borders.

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Appendices

Table A1: Country specific mitigation measures against COVID-19

Country	Mitigation measures
Burundi	• The country closed its borders shortly after the first case was confirmed. On 9th November 2020 Burundi opened its airspace for international flights • All travelers entering Burundi must present a certificate of a negative • COVID-19 test carried out before 72 hours of boarding the plane • Screening all passengers for coronavirus • Limited access to hotel premises
Comoros	• Closing of sea and air borders except for cargo ships and/or special evacuations • reduction of customs duties, deferral of tax obligations • The authorities announced a restructuring of commercial loans and freezing of interest rates for some commercial loans. • The number of passengers in public transport remains limited to 10 people in buses and four in taxis. • Closure of schools and institutions of higher learning institutions • Suspension of flights
DR Congo	• Suspension of International flights and flight services to DR Congo • Closure of business activities, schools and airports and ports of entry • Development of a response national plan with an estimated budget of $135 million
Djibouti	• Suspension of services at Djibouti International Airport • Closure of the borders and entry ports • Reduced port tariffs by 82.5% and granted Free Terminal Handling Charges
Egypt	• Suspension of international flights and tourism activities • The government introduced the New Tax Amnesty Scheme and extended the Dispute Settlement Process • Suspension of services provided by ministries and governorates to citizens, such as civil registry services, work permits, passports and renewal of traffic licenses • Public transport operators restricted to 50% of capacity of conveyance • Exemption from the taxation of capital gains on securities listed on the Egyptian stock exchange (EGX) for non-residents will be made permanent

Eritrea	• A lockdown was declared on 2nd April 2020 • Commercial airline flights in and out of Eritrea and entry visas were suspended. Land borders were also closed • All trading activities and transactions were banned. Similarly, weekly markets that occur in various parts of the country also remained closed
Eswatini	• Closure of schools • The kingdom went into a lockdown • Suspension of non-essential travel for all citizens • Only essential sectors as identified were allowed to operate and to also follow WHO Guidelines • Restricted entry to foreign nationals coming from high-risk countries
Ethiopia	• Postponement of elections from 29th August 2020 • Closure of all-night clubs and places of entertainment • Suspension of schools, gatherings and sporting activities • COVID-19 Response Fund established for resource mobilization • Closure of borders but no restrictions on cargo movements from Djibouti to Ethiopia
Kenya	• Closure of borders and other entry ports and the government imposed a lockdown on the Nairobi Metropolitan area • Mandatory PCR-COVID-19-19-Free certificate for all international arrivals valid for 96 hours prior • Government registries and the courts closed except for the handling of emergency matters • Suspension of international flights • Learning was suspended in all education institutions • A 100-percent tax relief for low-income-earning persons up to Ksh 24,000 and reduced the top Pay-As-You-Earn (PAYE) rate from 30 percent to 25 percent • The reduction of the standard VAT rate from 16 percent to 14 percent • Suspension of school, public gatherings, restaurants and higher learning institutions • 24-hour Call Centre and information portal set up and manned by Kenya Private Sector Association (KEPSA)

Libya	• Suspension of international flights and closure of borders • The European Union mobilized €20 million (LYD 33 million) to assist Libya in responding to the COVID-19 pandemic • The Government of National Accord based in Tripoli imposed a lockdown in areas it controls for a period of 5 days. The lockdown replaced the previous curfew that had been in place from 9 pm – 6 am • Screening of travelers arriving from affected areas established at all points of entry
Madagascar	• Suspension of all international flights and closure of the border • Cruise ships not allowed in any port • All land, sea, and air borders remain closed. Cargo and humanitarian flights permitted to operate • Public markets to open for only three days a week • Temporary suspension of all exports of drugs and other health products
Malawi	• Closure of all markets, shops and businesses that are in close proximity to hospitals • Suspension of All flights into and out of Malawi exempting flights carrying medical professionals, essential health equipment and • emergency relief items • Recruitment of 2000 health workers to support the fight against COVID-19 • Opening of institutional isolation and treatment centers in the cities of Blantyre, Lilongwe and Mzuzu • Reduction of fuel prices to lower the transport costs • Application of tax waivers on the importation of essential goods for Corona Virus management
Mauritius	• Closure of borders and banning of commercial flights • Provision of a Special Relief Fund to economic operators to meet cash flow and working capital • Lines of credit and soft loans made available to support vulnerable • companies/ SMEs from the import-export sector and tourism industry • Setting up of a standing committee to explore ways to limit the impact of the COVID-19-19 on trade and businesses

Rwanda	• Suspension of learning institutions • Closure of borders and suspension of commercial flights • Suspension of tourist activities • The Central Bank of Rwanda provided a Rwf50 billion ($54 million) facility and reduced the reserve requirement ratio for commercial banks from 5 per cent to 4 per cent to support the country's banking sector • Rwanda benefited from USD $11 million (RWF 10.5 billion) debt service relief from the International Monetary Fund for an initial period of 6 Months
Seychelles	• Controlled movement in and out of Seychelles • Closure of international airport • Additional $3.6 million provided to health sector through national budget amendments • Ban on all cruise ships in Port Victoria until end of 2021 • Suspension of tourist activities on Cousine Island, Fregate Island and North Island • Central Bank of Seychelles cut Monetary Policy Rate (MPR) to 3% from 4% to promote economic stability
Somalia	• Closure of immigration services at all entry points • Restriction on imported KHAT to Somalia from neighbouring countries (Kenya and Ethiopia) • Exemption of tariffs on all imported foodstuffs including rice, dates, wheat flour and cooking oil ahead of the month of Ramadan • The Government waived all duties and taxes on all medical supplies and equipment imported to fight COVID- 19
Sudan	• The government declared a lockdown • Closure of 3 border entries between Ethiopia and Sudan • Suspension of Sudan exports on Egyptian trucks • Restriction of local travel within Sudan including transport for fuel and other essential commodities

Tunisia	• Closure of sea, land, and air borders • A 2.5 billion TND emergency plan ($0.71 billion or 1.8 percent of GDP) was announced • The government will delay tax debts, postpone taxes on small- and medium sized businesses, delay repayment of low-income employee loans and provide financial assistance to poor families • Lowering of the interest rate to 6.75% • Exemption from VAT for sales of pharmaceuticals by retailers and wholesalers
Uganda	• Closure of Entebbe International Airport and land border restrictions put in place • Use of electronic cargo tracking technology to track drivers whose results test positive for COVID-19 • Encouraged importers and manufacturers to take on tax exemptions as provided for under the laws and allowed general extension of payment of duties upon request • Use of Online systems for cargo clearance and to respond to queries and inquiries
Zambia	• All travelers coming into Zambia will be required to provide a negative COVID-19 PCR test result • Government released Kwacha 2.5 billion (app. US$140 Mill) to reduce arrears owed to domestic supplies of goods and services, paid outstanding arrears of pensioners and retirees to support easing of liquidity • Zambia Revenue Authority (ZRA) suspended excise duty on imported ethanol based sanitizers and other medicine-related activities based on guidelines issued by ZRA • VAT payments on imported spare-parts, lubricants, and stationery were • removed to ease pressure on companies • restricted movement at all entry points
Zimbabwe	• Restriction on inter-city movement • Suspension of domestic and regional flights • Zimbabwe Electoral Commission (ZEC) suspended electoral activities • Suspension consular services in Eswatini and Mozambique • Lockdown restrictions were put in place • Suspension of tourism activities

Source: Various Country Reports

Table A2: Serial correlation test

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	5.637	Prob. F(2,3)	0.1055
Obs*R-squared	9.786	Prob.Chi-Square(2)	0.3041

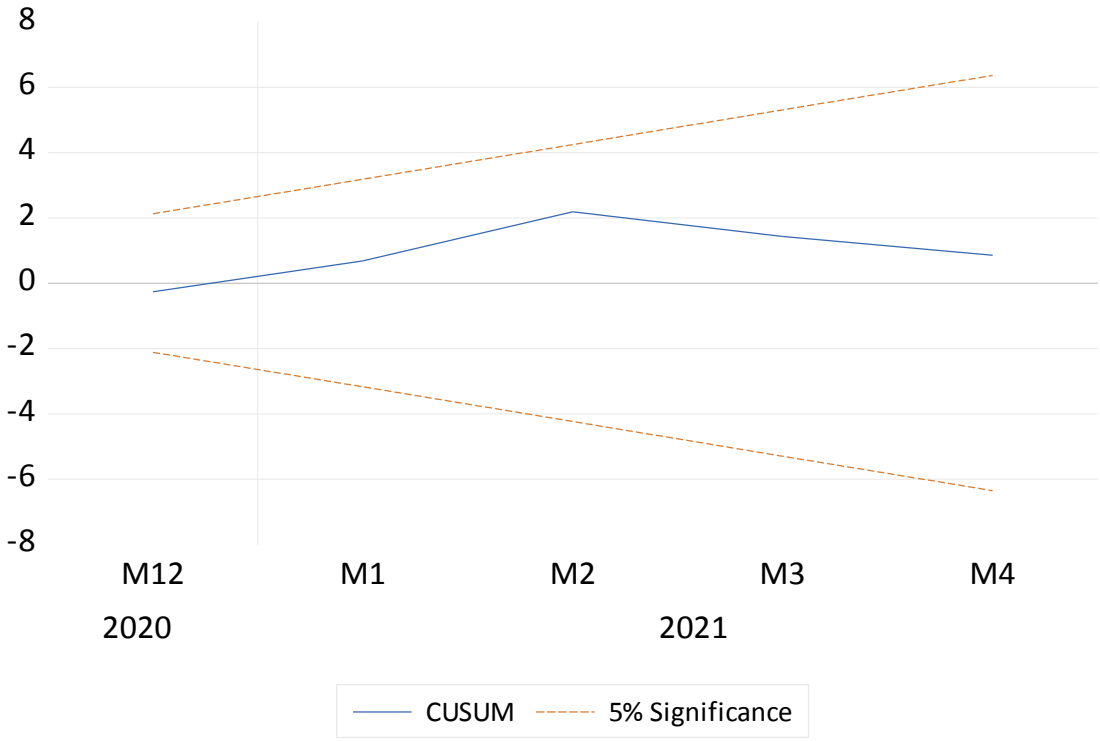
Source: Author's own computation from study data using Eviews software

Table A3: Heteroskedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
Null hypothesis: Homoskedasticity			
F-statistic	0.533	Prob. F(8,5)	0.7190
Obs*R-squared	7.313	Prob. Chi-Square(4)	0.5662

Source: Author's own computation from study data using E-views software

Figure A4: CUSUM test



Source: Author's own computation from study data using E-views software

Table A5: Multicollinearity test: Correlation matrix of independent variables

	LNGDPU	LNMCOMV	LNINT	LNSIU	LNSIK	LNCOVU	LNCOVK	LDK
LNGDPU	1.000000	0.596048	0.393493	-0.235023	-0.410121	0.674220	0.699404	-0.547087
LNMCOMV	0.696048	1.000000	0.887319	-0.443900	-0.480864	0.569069	0.618891	-0.216118
LNINT	0.393493	0.887319	1.000000	-0.457164	-0.374434	0.215286	0.458130	0.102020
LNSIU	-0.235023	-0.443900	-0.457164	1.000000	0.840876	-0.146977	0.048999	-0.106305
LNSIK	-0.410121	-0.480864	-0.374434	0.640876	1.000000	-0.259292	-0.057902	0.072152
LNCOVU	0.674220	0.569069	0.215286	-0.146977	-0.259292	1.000000	0.692066	-0.666601
LNCOVK	0.699404	0.718891	0.458130	0.048999	-0.057902	0.692066	1.000000	-0.444910
LDK	-0.547087	-0.216118	0.102020	-0.106305	0.072152	-0.666601	-0.444910	1.000000

Source: Author's own computation from study data using E-views software

Deciphering Agri-Food Trade in COMESA Amidst COVID-19

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Abstract

This study assesses agricultural-food trade in COMESA and explores opportunities to catalysing agri-food trade towards sustainable food security amidst COVID-19 pandemic. The analysis covers the 21 COMESA Member States over the period 2014-2020. The findings indicate that Member States exchange more of processed food, grains, sugar, and cash crops amongst themselves. However, the share of intra-COMESA agri-food exports as a percentage of total COMESA agri-food exports remains low for meat, fish, and cash crop commodities while the share of imports reveals that majority of the agri-food imports are sourced outside COMESA. COVID-19 led to an overall increase in food price index particularly, in periods when the containment measures were relatively high. Nevertheless, the improved intra-trade shares of some commodities such as grains, meat and fish, dairy, eggs, fruit and vegetables during the COVID-19 provides opportunities for stimulating intra-COMESA trade. The paper recommends the promotion of trade relations; formulation and implementation of policies that develop and sustain shorter value chains to counter negative effects on food systems during economic shocks; and establishment of diversified and vibrant cross border value chain systems in the agri-food sector.

1.0 Introduction

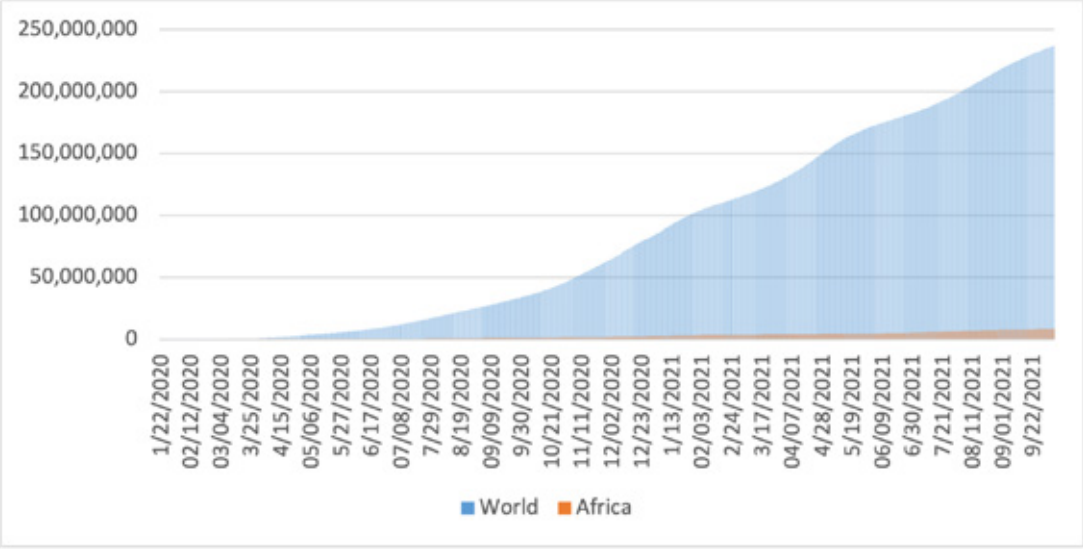
Agri-food trade systems involving food production and distribution are imperative for food and nutrition security. While agri-food trade can have both positive and negative impacts on each of the four dimensions of food security namely -food availability, access, utilization and stability as discussed in FAO, (2016), agri-food trade plays an instrumental role in supporting food security for local and international community. Considering that not all regions are endowed with favourable conditions for agricultural production, some communities would be significantly food insecure in the absence of food trade.

There are a number of risks that adversely affect agri-food trade and as a consequence threaten food security. These range from production risks such as climatic risks, markets risks, to environmental risks (World Bank 2016). The COVID-19 pandemic is one such risk that has disrupted the global economy not only agri- food trade, but global trade as a whole. Therefore, this paper seeks to investigate the agri-food trade in COMESA amidst COVID-19.

1.1 COVID-19 and Food Security Situation Globally, in Africa and COMESA

The pandemic continues to produce unprecedented shocks globally with economies in the world likely to take years to recover to their pre-COVID-19 levels (Nechifor et al., 2020). Globally, as of 7 October 2021, there were 236.8 million confirmed cases of COVID-19 of which 8.4 million cases were in Africa (Figure 1). Although Africa seemed to have had comparatively low COVID-19 cases, the pandemic was anticipated to have disastrous impacts on the region, characterized by strained health, social and economic systems (OECD, 2020a).

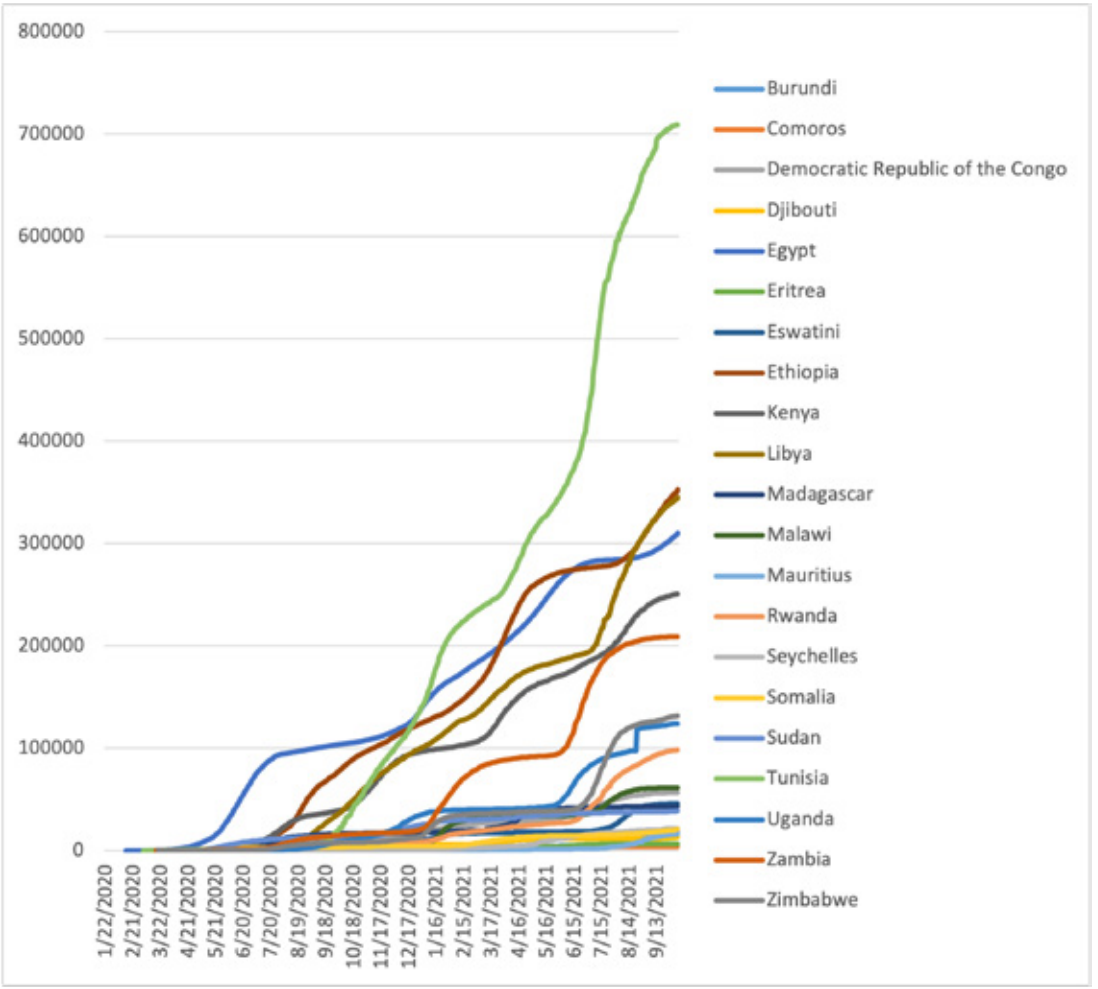
Figure 1: Total confirmed COVID-19 cases (Globally and in Africa)



Source: Ritchie et al., (2020). Available at: https://ourworldindata.org/covid-cases. Accessed October,7, 2021

Among the COMESA Member States, the number of confirmed COVID-19 cases continued to increase, topping 2,933,484 as of 7 October 2021 (Figure 2). While the spread of the pandemic seems to be slower in COMESA than in other world regions, the pandemic was expected to aggravate major crises in the region.

Figure 2: Total confirmed COVID-19 cases in COMESA



Source: Ritchie et al., (2020). Available at: https://ourworldindata.org/covid-cases. Accessed October,7, 2021

A major crisis in Africa, as well as among COMESA Member States, is the deteriorating food insecurity as shown in Table 1. Many food systems in the region are already falling short of the Sustainable Development Goal (SDG) 2 aspiration which aims to achieve "zero hunger" by 2030.

The Global Report on Food Crises (GRFC) highlights that 155 million people in 2020 were in Crisis or worse (IPC/CH Phase 3 or above) or equivalent (FSIN & Global Network Against Food Crises, 2021). Phase 3 or above in the IPC/CH acute food insecurity phase description refers to people in households that either: have food consumption gaps that are reflected by high or above-usual acute malnutrition; or are marginally able to meet minimum food needs but only by depleting essential livelihood assets or through crisis-coping strategies (FSIN & Global Network Against Food Crises, 2021). The global

severity of people in Crisis or worse in 2020 was an increase of around 20 million people from 2019; and was driven by persistent conflict, pre-existing and COVID-19-related economic shocks, and weather extremes (FSIN & Global Network Against Food Crises, 2021).

A regional overview of food crises indicated that Africa remains the most affected continent by food crises (FSIN & Global Network Against Food Crises, 2021). In 2020, the region accounted for 63 per cent up from 54 per cent in 2019 of the global people in Crisis or worse (IPC/CH Phase 3 or above). COMESA Member States with high numbers of acutely food-insecure people in 2020 included: Burundi, Democratic Republic of the Congo, Djibouti, Eritrea, Eswatini, Ethiopia, Kenya, Libya, Madagascar, Malawi, Somalia, Sudan, Uganda, Zambia and Zimbabwe. Of these Democratic Republic of Congo, Eswatini, Madagascar, Malawi, Zambia, Zimbabwe, Burundi, Eritrea, Ethiopia, Kenya, Rwanda (refugees), Somalia, Sudan and Uganda were identified as being in major food crises in 2020 (FSIN & Global Network Against Food Crises, 2021).

Table 1:Population in food crisis or worse (IPC/CH Phase 3 or above) or equivalent (Millions)

Countries/Region	2019	2020	2021
Global	135	155	142
Africa	73	97.9	100.3
Democratic Republic of the Congo	15.6	21.8	27.3
Ethiopia	8	8.6	12.9
Sudan	5.9	9.6	No forecast
Zimbabwe	3.6	4.3	3.4
Malawi	3.3	2.5	2.6
Kenya	3.1	1.9	2
Zambia	2.3	2.3	1.7
Somalia	2.1	2.1	2.7
Uganda	1.5	2.6	2.5
Madagascar	1.3	1.1	1.3
Libya	0.3	0.7	No forecast
Burundi	0.2	1.4	0.75
Eswatini	0.2	0.4	0.3
Rwanda	0.1		No forecast
Djibouti	Data Gap	0.2	0.2
Egypt	Insufficient evidence	0.05	No forecast
Eritrea	-	-	-
Mauritius	-	-	-
Tunisia	-	-	-
Comoros	-	-	-
Seychelles	-	-	-

Source: The 2021 Global Report on Food Crises

While the global food crises forecast for 2021 indicates a possible reduction in acute food insecurity, GRFC gives a worrying outlook for Africa as high levels are likely to persist in worst food crises in the region as well as COMESA (Table 1). The recent food crises are majorly driven by persistent conflict, pre-existing and COVID-19-related economic shocks, weather extremes, locusts, other pests and diseases (FSIN & Global Network Against Food Crises, 2021.

1.2 Potential Effects of COVID-19 on Food Systems and Food Security

Focusing on the COVID-19 pandemic as a key driver of food insecurity, the GRFC indicates that according to analyses for 27 countries carried out between March and September 2020, the COVID-19 peak period, 101–104.6 million people were classified in Crisis or worse (FSIN & GNAFC, September 2020). In 2019 over the same period, around 97.6 million people were classified in Crisis or worse in the same 27 countries. Further, the report finds that out of the 27 countries, an additional 130.5 million people in 20 countries were classified as stressed over the same period (FSIN & GNAFC, September 2020). It is however noted that many other countries beyond the 27 faced acute food insecurity in the COVID-19 peak period but did not have updated analyses.

African countries have equally suffered vagaries of the pandemic despite favourable rains at the beginning of 2020 leading to good harvests and a promising outlook on the food supply side (FSIN, 2020). Notwithstanding the good harvest in Africa, some COMESA Member States, experienced the worst food crises. Acute food insecurity estimates between March and September 2020 were reported in the Democratic Republic of the Congo (21.8 million people) Ethiopia (8.5 million people) and Sudan (9.6 million people) (FSIN & GNAFC, September 2020).

Various channels, both on the supply and demand sides, through which food and nutrition security could have been affected by COVID-19 have been identified (FSIN & GNAFC, September 2020; UNCTAD, 2020; OECD, 2020b). On the supply side, movement restrictions imposed to contain spread of the virus slowed down agri-food supplies thus potentially affecting food production and supply (UNCTAD, 2020; Figure 3 and Appendices A). Movement restrictions and closure of borders disrupted the distribution network and in turn the seamless transportation of food, increasing delivery times and reducing access of food items (FSIN, 2020). In addition, limited mobility and lockdowns affected labour supply particularly in agricultural areas characterized by peak seasonal labour demand or labour-intensive production (OECD, 2020b). Further, social distancing protocols led to additional production and distribution costs disrupting the functioning of agri-food supply chains.

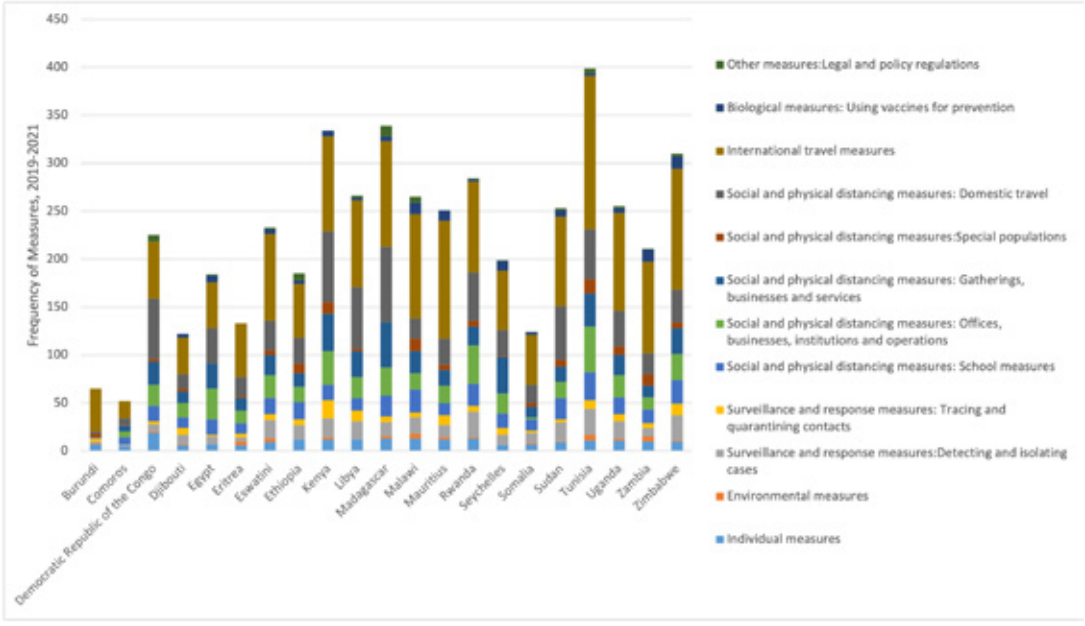
Another possible supply shock could have emanated from food export controls that included export taxes and outright export bans (UNCTAD, 2020). A slowdown in economic activity led to loss of employment for many actors along the food value chain, such as traders, required for seamless distribution of agri-food products. Further disruptions in the supply chain affected access to key agricultural inputs likely affecting production (FSIN, 2020). Inability to access produce markets, particular livestock markets across borders, affected agricultural sales thus putting a strain on farmers' incomes (OECD, 2020b; FSIN, 2020).

The macroeconomic shocks experienced by countries as a result of contractions in global economic activities, depressed trade, commodity prices and significantly constrained government finances for countries that rely on export of primary commodities (FSIN & Global Network Against Food Crises,

2020). Government finances have further been constrained by an expansion of social protection programmes to protect the most vulnerable against the effects of COVID-19. These challenges have affected net food-importing countries' ability to procure agri-food commodities.

Demand side factors are potential sources of food insecurity in developing countries including COMESA countries. At the global level, lockdown measures and travel restrictions led to the collapse in demand for products leading to a decline in export revenues. This may have further impacted negatively on net-food importing countries that depend on export earnings to procure agri-food products (FSIN & GNAFC, September 2020; UNCTAD, 2020). At the micro level, many poor households faced loss of income and employment resulting from COVID -19 related restrictions. Reduced incomes coupled with disruption of agri-food markets - such as closure of restaurants, schools, hotels and other social gatherings - affected demand for farm products leading to accumulation of agri-products in farms and increase in farm losses particularly for perishables. The severe supply chain and demand disruptions are likely to have led to losses of perishable agri-food products, localized food scarcity and price spikes.

Figure 3: Public health and social measures (PHSM) to COVID-19 in COMESA



Source: WHO PHSM Datasets, 2019/20 and 2021. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/phsm

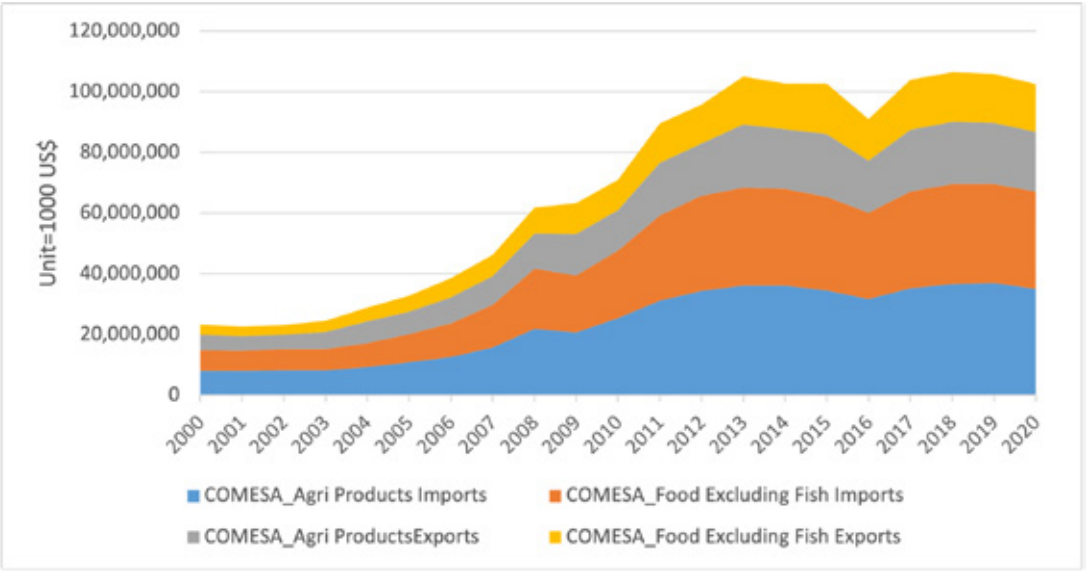
1.3 Problem Statement

Apart from the COVID-19-related socio-economic shocks, food security of millions of people in various regions including COMESA was threatened by extreme weather conditions, the desert locust outbreak, persisting conflict, economic challenges, and high food prices (FSIN, 2020). Given the various underlying shocks and stressors present at the peak period of the pandemic, it is important to ascertain that the COVID-19 pandemic was a dominant driver worsening the food situation in countries. This is a gap identified in recent related studies (FSIN & GNAFC, September 2020). Thus, this study contributes to existing research by investigating if the pandemic was truly a dominant underlying shock and stressor in the agri-food sectors.

In addition, the COVID-19 pandemic exposed the strong interconnectedness of the agri-food economy and vulnerabilities that net food-importing countries face. While COMESA's trade in agri-food commodities has more than tripled in the last two decades, Member States are increasingly becoming net agri-food importers thus increasing their vulnerability to global shocks and stressors (Figure 4). This shows the need to create shorter value chains, such as within COMESA region to increase market flexibility and predictability.

This study, therefore, contributes to the discussion on making regional integration in Africa work in the discourse on trade, trade policies, mitigating risks, and enhancing food security.

Figure 4: Gross agri-food trade trends , 2000–2020



Data Source: http://www.fao.org/faostat

1.4 Study Objectives

This study seeks to assess the impact of COVID-19 on food security, the performance of intra-COMESA agri-food trade and opportunities to catalyse it towards sustainable food security. The specific objectives are to:

- Examine whether key food security indicators in COMESA were subject to structural

breaks due to the COVID-19 pandemic; and

- Analyse recent agri-food trade patterns and developments in COMESA in relation to COVID-19.

2.0 Literature Review

2.1 Theoretical Review

There are two main schools of thought in the agri-food trade and food security discourse; i.e., the food self-sufficiency proponents and the pro-trade proponents. Food self-sufficiency proponents opine that trade in food products can hurt smaller and poor producers especially in developing countries by exposing them to increased price volatility and competition.

Pro-trade adherents argue that agri-trade is an important factor in improving access to food for consumers, and a source of income for small holder farmers (Martin, 2017). In the pro-trade school of thought, Mrdalj and Bilali (2021) and Martin (2017) argue that agri-food trade affects food security and nutrition through: food prices volatility, income changes resulting from opening to trade, productivity gains from trade, and changes in dietary diversity and quality. Martin (2017) argues that income generated through agri-trade can enhance household food security, as it makes the share of food expenditure smaller in total household consumption and provides a buffer against threats to food security. In addition, Smith and Glauber (2020) discussed the Ricardian and Hecksher-Ohlin theoretical models of international trade noting that free trade does not lower the welfare of individual countries when pareto- equivalent compensations are made. They also note that policy makers, especially countries with extreme poverty, may ignore free trade policies when food prices spike and therefore not 'adhere' to the theoretical models.

2.2 Empirical Literature

Recent research contributes to the discussion as to whether agri-trade openness has the potential to achieve developmental goals including its implications on food security. Mrdalj and Bilali (2021) argues that the dynamics in the agri-food markets and trade have implications for long-term outcomes such as food and nutrition security. Changes in policies and diets, urbanization and globalization have affected agri-food markets with implications in terms of international agri-food trade and food and nutrition security. Dynamics in agri-food markets affect all actors in the food chain, from farmers to processors to consumers. Most importantly, agri-food markets influence access of consumers to adequate food in the right quantity and quality. Markets are also associated with the availability, utilization and stability dimensions of food security.

According to Mrdalj and Bilali (2021), the operation of agri-food markets is essential to attaining sustainable food security and improved nutrition for all. Hence, any interruption to these markets, such as through COVID-19 occasioned lock downs, would have adverse impacts on agri-trade and consequently food security.

Workie, et al., (2020) assessed the effect of COVID -19 on food and agriculture in developing countries by analysing quantitative data on food and agriculture supply and demand chains, import and export activities and diverse choke points. They found that the pandemic impacts shocked the global and national food systems with restrictions to control the pandemic likely to intensify food insecuritfy for food insecure developing countries. They observed that food accessibility will be severely affected followed by its availability compared to other food security dimensions. Using examples from available data, they observed that due to the fear of anticipated logistical interruptions in the consumer markets

of China, which is a major soya beans importer, the prices of soya beans hiked in response to this demand. Similarly, countries that were major suppliers of cereals reduced their exports to ensure local availability of food to cope with the pandemic. They conclude that in the long term or post-pandemic period, food availability could be harshly impacted if no actions are taken by those concerned.

In support of the food-sufficiency school of thought, Assoumou-Ella (2019) analysed the effect of external trade on food security in Central African Economic and Monetary Community (CEMAC) countries, for a period covering 1961-2017. The study used instrumental variables, correcting for endogeneity and omitted variables. The key finding was that external trade negatively affects food security in the CEMAC region. Specifically, external trade had a negative effect on food production and household food consumption which are implied factors of food security indicators. Further, it was observed that external trade had a positive effect on consumer price index, and it did not lead to food imports.

Smith and Glauber (2020) explored the theoretical and empirical evidence on the impact of external trade in agricultural and processed food commodities on food security, with a focus on low-income households in developing countries that are food insecure. They also examined the extent to which barriers to trade and domestic supports have affected food security globally and within individual countries. The study was qualitative in nature applying literature review methodology. They found that free trade policies allow countries to exploit their comparative advantages in economic activity, increasing average per capita incomes, longer-term growth rates and a country's capacity to fund social safety nets for the poor. They also found that as trade expands for staple food commodities, per capita consumption of those commodities becomes more stable. Further, more open international markets lead to less volatile prices and mitigate price spikes that arise due to local and global production shortages.

When developing countries react to food shortages by introducing trade policies that increase supplies from domestic and overseas markets, they cause food prices to increase and reduce food availability in other countries. They noted that World Trade Organisation (WTO) policies on agricultural commodities and requiring minimum levels of access for agricultural exports in domestic markets, resulted in lower tariff and non-tariff barriers to trade in both developed and developing countries, and thereby had positive effects on food security.

Yami et al., (2020) studied the impact of production shocks (bumper harvest and drought shocks) on maize markets and trade in Ethiopia. They applied simulation analysis and estimated behavioral equations using a combination of Ordinary Least Squares (OLS) (for stationary equations) and an error correction model (ECM) (for non-stationary and cointegrated series). The study found that a 20 per cent increase in maize yield would reduce maize price by 81 per cent. When maize exports are profitable, there is a shift in trade to an export parity regime, while the effects of a drought could increase maize prices by 61 per cent in the short term. They concluded that lifting export ban on maize, even during normal harvest seasons, would not harm domestic prices.

Nakuja & Kerr (2019) investigated whether international trade can be relied upon to alleviate threats to food security in the absence of stockholdings in developing countries. They used a model of cereal consumption conceptualised within the context of utility maximization. They estimated consumption functions measuring the effects of own price, price of related cereals, trade openness and income on consumption in the long run and applied the panel error correction approach. The study found that

international price negatively affects rice consumption in the long run, implying that a price increase generally leads to a more devastating impact on long-term consumption and food security than in the short-term. Trade openness and income were found to positively affect long-term rice consumption in developing countries, hence improving food security. The study further found that consumption shocks would not be restored by relying solely on trade generated by market forces.

In a similar study, Dithmer and Abdulai (2017) investigated the impact of trade openness and other factors on food security (measured as dietary energy consumption). Using panel data from 151 countries over the period 1980-2007 and applying dynamic panel regression and two step GMM estimator. The study found that trade openness and economic growth has positive and significant impacts on dietary energy consumption, and also contribute to improvements in dietary diversity and diet quality aspects of food security.

Brooks et al., (2013) analysed the relationship between food security and trade. They focused on world trade in rice, wheat, maize and soybeans, the four major staples central to food security. They computed a bilateral import penetration index (BIPI), which gauges the degree to which a country depends on another or a small set of others for food imports. They found that measures aimed at diversifying supply sources reduced vulnerability. It was also found that bilateral agreements with non- traditional suppliers, regional trade agreements and institutional set ups highly influenced the ability of a country to diversify its supply base.

Wu and Guclu (2013) analysed patterns of maize trade among nations and examined where vulnerabilities in food security might arise if maize availability decreased due to factors such as diversion to non-food uses, climatic factors, or plant diseases. The methodology entailed constructing a weighted and directed network model, with nodes representing countries, and edges representing export/import connections between the countries with weights equal to amount of maize traded. The study found that the United States plays a significant role in global maize production, trade, and supply; particularly to a certain group of nations to which it exports maize. Therefore, any disruption in the production of maize in the US would cause vulnerability and reduce food supply in the maize trading network and increase in global prices. It was also found that the reduced export supply from one maize exporting nation raises maize prices from that nation and that if other maize-producing nations produce large crops; their prices will also be higher if there is a supply disruption in another major producer.

A study by Olabisi, et al., (2021) measured the effectiveness of tariffs in prompting households to switch from imported palm oil to domestically produced sunflower oil. The study used data from household budget survey and consumer survey on household use and purchase transactions and household socio-economic data applying a utility-based structural model based on quadratic almost ideal demand system, with multi-stage budgeting approach. The findings show that tariffs and other trade barriers on food imports would have a limited effect on stimulating consumer demand for domestic edible oils, absent in other policy interventions. This suggests that policies to stimulate demand for locally produced food items by altering the price of imports may be ineffective.

2.3 Overview of Literature

From the literature, it is observed that agri-food protection embedded in self-sufficiency and import substitution can escalate challenges related to food prices, and in turn, cost of nutrient adequate diets

to consumers. On the other hand, coupled with adoption of complementary policies, boosting intra-regional agri-food trade flows can incentivize regional production and increase its competitiveness and diversification in the global market that is currently characterized by few dominant players.

3.0 Methodology

3.1 Research Approach

The study adopts a mixed method approach to assess COVID-19 effects on food security, the performance and policies needed to foster intra-COMESA agri-food trade. Quantitative and qualitative research methods have been employed. Quantitative methods include analysing existing food price data using the Chow Regression Based test and the Supremum Wald test for a structural break to examine whether food prices in COMESA Member States were subject to structural breaks during the COVID-19 pandemic. Food price index, a key food security indicator (Pangaribowo et al., 2013; Mrdalj & El Bilali, 2021), was employed in the structural break analysis as it is available across the COMESA Member States for the pandemic time period considered. The scale of quantitative analysis was informed by data gaps experienced regarding agri-trade flows of various countries, the food security indicators, additional macro-economic aspects affecting the agri-food sector and the pandemic time series considered.

The qualitative approach is used in the analyses of key food and nutrition security related policy responses to COVID-19 and performance of intra-trade by food aggregates among COMESA Member States.

To examine whether COMESA Member States food prices were subject to structural breaks due to the COVID-19 pandemic, the Chow Regression Based test and the Supremum Wald test for a structural break at an unknown break date were carried out. The break points used in the dates used in the Chow Regression Based test are based on graphical visualization of the time-series plots and cumulative sum of recursive residuals with confidence bands (see appendices).

3.2 Data Types and Sources

To evaluate the performance of intra-trade by food aggregates among the COMESA Member States, annual trade volume data from International Trade Centre (ITC) was used. The analysis covers the 2018-2020 period as dictated by data availability. In carrying out the analysis, the 01–24 food aggregates HS[53] chapters (FAO, 2020b), are utilized as presented in Table 2.

53 The Harmonized Commodity Description and Coding System of the World Customs Organization.

Table 2: Definition of food aggregates as used in the intra-COMESA food trade analysis

Short name	Description	HS chapters	HS chapter descriptions
Meat and fish	Meat, fish and preparations	01, 02, 03, 16	Animals, live; meat and edible meat offal; fish and crustaceans, molluscs and other aquatic invertebrates; meat, fish or crustaceans, molluscs or other aquatic invertebrates, preparations thereof
Dairy and eggs	Dairy products and eggs	4	Dairy produce; birds' eggs; natural honey; edible products of animal origin not elsewhere specified or included
Fruit and vegetables	Fruit and vegetables	07, 08	Vegetables and certain roots and tubers, edible; fruit and nuts, edible; peel of citrus fruit or melons
Grains	Cereals and oilseeds	10, 11, 12	Cereals; products of the milling industry; malt, starches, inulin, wheat gluten; oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit, industrial or medicinal plants; straw and fodder
Sugar and cocoa	Sugars, cocoa and confectionary	17, 18	Sugars and sugar confectionery; cocoa and cocoa preparations
Processed food	Food preparations and beverages	19, 20, 21, 22	Preparations of cereals, flour, starch or milk; pastrycooks' products; preparations of vegetables, fruit, nuts or other parts of plants; miscellaneous edible preparations; beverages, spirits and vinegar
Coffee and tea	Coffee, tea and spices	9	Coffee, tea, mate and spices
Fats and oils	Animal or vegetable fats and oils	15	Animal or vegetable fats and oils and their cleavage products; prepared animal fats; animal or vegetable waxes
Others	Other agrifood products	05, 06, 13, 14, 23, 24	Animal originated products not elsewhere specified or included; trees and other plants, live; bulbs, roots and the like; cut flowers and ornamental foliage; lac; gums, resins, and other vegetable saps and extracts; vegetable plaiting materials; vegetable products not elsewhere specified or included; food industries, residues and wastes thereof; prepared animal fodder; tobacco and manufactured tobacco substitutes

Source: Categorizations as per the FAO (2020b)

The structural break analysis covers January 2019 to December 2020, with data sourced from the FAOSTAT monthly food Consumer Price Index (CPI). The monthly food CPI measures the price change between the current and reference period (base year of 2015) of the average basket of food commodities purchased by households. Data on commencement of COVID-19 related measures is obtained from the ACAPS COVID-19 Government Measures Dataset.

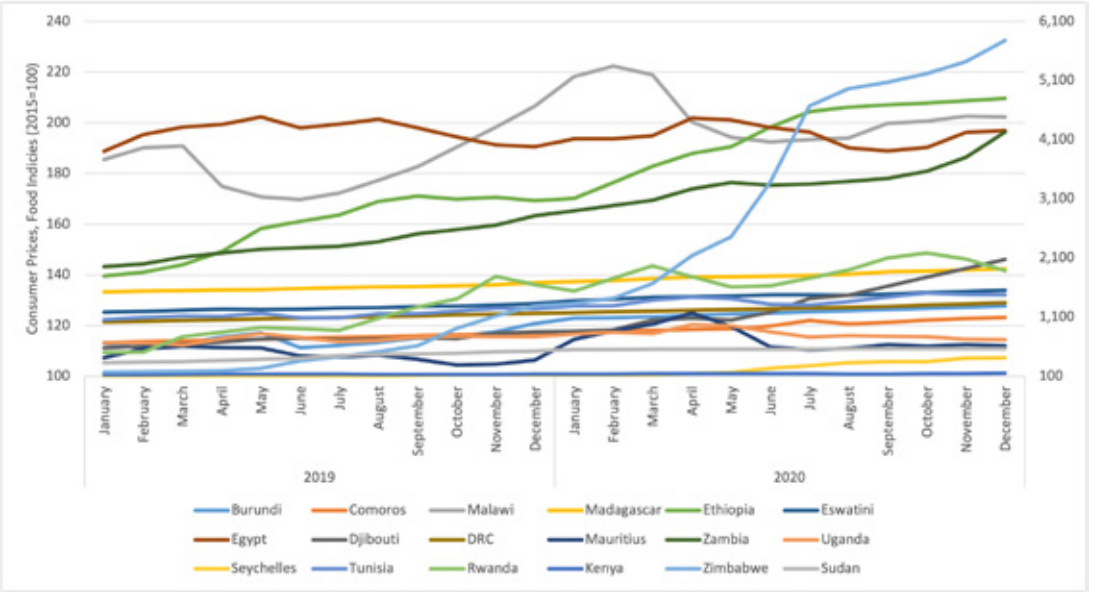
4.0 Presentation and Discussion of Results

4.1 Impact of COVID-19 on Food Prices: A Structural Break Analysis

Given that COVID-19 pandemic continues to evolve and thus the full extent of its effects still largely unknown, the results of the structural break assessment are interpreted with caution.

The graphical visualizations of the food price index time-series plots are presented in Figures 5 (and B.1 & B.2 in the appendices).

Figure 5: Consumer prices, food indices



Data Source: The FAOSTAT monthly Food CPI http://www.fao.org/faostat/en/#data/CP(FAO, 2020a) (Accessed June 2021)

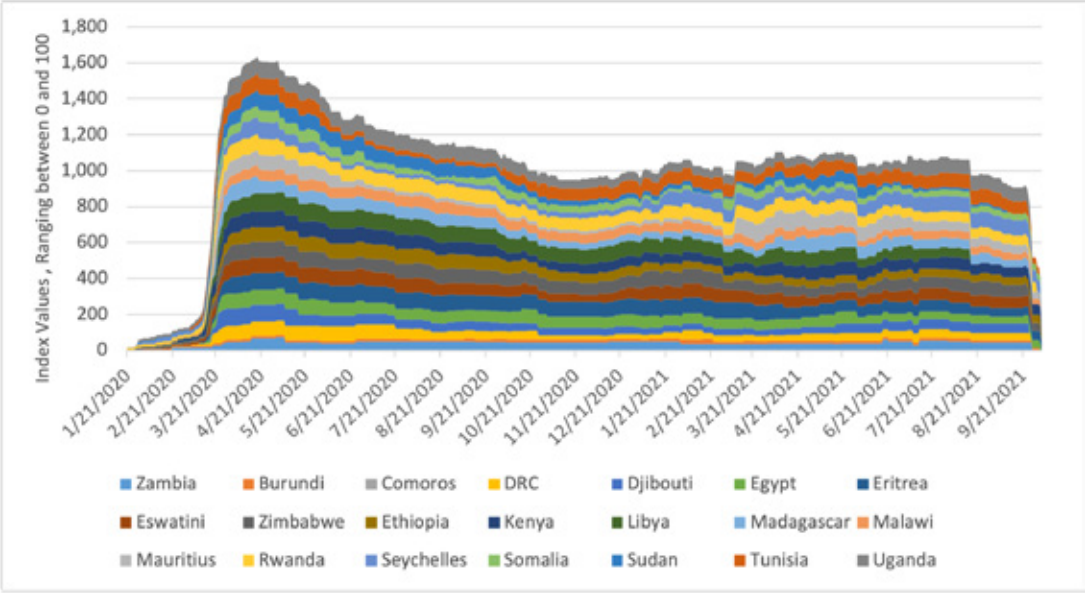
Note:

1. The Food CPI Values for Sudan and Zimbabwe are plotted on the secondary vertical axis due to their magnitude in comparison to those of other COMESA Member State Countries

2. Data for Eritrea, Libya and Somalia missing

The results show an overall increase, albeit irregular, in the food price index in the period associated with the COVID-19. In particular, spikes in food prices are shown to occur in periods when the COVID Stringency indices[54] are relatively high (Figure 6).The results are similar to GRFC 2021 which found that supply chain disruptions contributed to spikes in food prices particularly in the initial period following movement restrictions (FSIN & Global Network Against Food Crises, 2021).

Figure 6: COVID stringency index in COMESA member state countries



Source: Ritchie et al., (2020). Available at: https://ourworldindata.org/covid-stringency-index (Accessed October 2021)

Regarding break points, the graphical visualization of cumulative sum of recursive residuals (see appendices B1 and B2) and the statistical structural break analysis (Table 3) further indicate the presence of significant breaks at various instances between January 2019 and December 2020, in different COMESA countries. The Statistical assessment of the break points is carried out using the Chow test and Supremum Wald test. The Chow Regression Based test assesses whether the pattern in the price data is significantly different before and after the identified break points. Using this test, of the COMESA Member States assessed, it is observed 12 countries experienced statistically significant breaks between January and September 2020. The period was associated with movement restrictions, suspension of transport networks, border closures, closure of open-air markets and social distancing requirements in majority of the countries. As discussed in FAO & AUC (2021), these restrictive measures disrupted essential activities in the agri-food sector such as food production and processing, transportation and other key elements of agricultural supply chains in many African countries, including COMESA Member States. The disruptions resulted in short-term localised shortages and price spikes of food supplies affecting vulnerable populations due to transportation bottlenecks, panic-buying, fear and speculation (FAO & AUC, 2021). It is however observed that in Rwanda and Madagascar, the statistically significant breaks occurred in the pre COVID-19 period and are related to weather extremes notably drought in Madagascar and heavy rains disrupting trade

54 The stringency index is a composite measure based on nine response indicators including: school closures; workplace closures; cancellation of public events; restrictions on public gatherings; closures of public transport; stay-at-home requirements; public information campaigns; restrictions on internal movements; and international travel controls. A higher score indicates stricter response, where 100 = strictest response. https://ourworldindata.org/covid-stringency-index

flows and leading to increased transport costs in Rwanda (FSIN & GNAFC, 2020 and 2021). Though not significant , the time-series and cumulative sum of recursive residuals plots of monthly Food CPI's do show disturbances in the food price data over the COVID-19 period for the two countries as also observed by the 2021 Global Report on Food Crises (GRFC) (FSIN & GNAFC, 2021)[55].

Table 3: COMESA member states structural break analysis estimates

Tests		The Chow Regression Based Test			The Supremum Wald test for a structural break at an unknown break date		
	Tests whether deviations of the intercept and the slope, pre- break versus post break, are not statistically discernible from zero Null Hypothesis: No structural break			Tests whether the coefficients vary over the periods defined by an unknown break date Null Hypothesis: No structural break			
Country	Commencement of COVID-19 related measures[56]	Break Date in 2020 [57]	F Statistic	Prob > F	Estimated break date:	Statistic	p-value
Rwanda	February	2019m11	11.98***	0.0004	2019m11	23.9503***	0.0002
Madagascar	March	2019m12	43.86***	0	2019m12	87.7215***	0
Burundi	March	2020m1	6.29***	0.0076	2019m12	24.7842***	0.0001
Eswatini	February	2020m1	25.28***	0	2020m1	50.5605***	0
Mauritius	February	2020m1	17.40***	0	2020m1	34.7953***	0
Sudan	January	2020m1	274.62***	0	2020m1	549.2421***	0
Malawi	January	2020m2	3.54**	0.0482	2019m11	20.8158***	0.0008
Seychelles	January	2020m3	140.84***	0	2020m6	477.7963***	0
Uganda	March	2020m3	14.31***	0.0001	2020m4	47.3297***	0
Comoros	March	2020m5	18.36***	0	2020m7	37.1746***	0
Djibouti	January	2020m5	152.27***	0	2020m5	304.5305***	0
Ethiopia	February	2020m7	3.68**	0.0437	2019m10	12.9258**	0.028
Egypt	March	2020m8	3.18*	0.0631	2019m6	7.9209	0.2112
Kenya	February	2020m8	1.27	0.3039	2019m6	22.0688***	0.0004
Democratic Republic of the Congo	March	2020m9	1.5E+12***	0	2020m9	3.07E+12***	0
Zambia	February	2020m9	14.46***	0.0001	2020m9	28.9259***	0
Eritrea*	March						
Libya*	February						
Zimbabwe	March	2020m6	72.23***	0	2020m6	144.4594***	0
Tunisia	March		5.65**	0.0101	2020m6	11.3090*	0.0555
Somalia*	March						

Source: Authors' computations using the FAOSTAT monthly Food CPI http://www.fao.org/faostat/en/#data/CP/metadata

*Data missing

55 see appendices B1 and B2
56 From COVID-19 Government Measures Dataset https://www.acaps.org/covid-19-government-measures-dataset
57 From graphical visualization of the time-series plots and cumulative sum of recursive residuals with confidence bands. See appendices

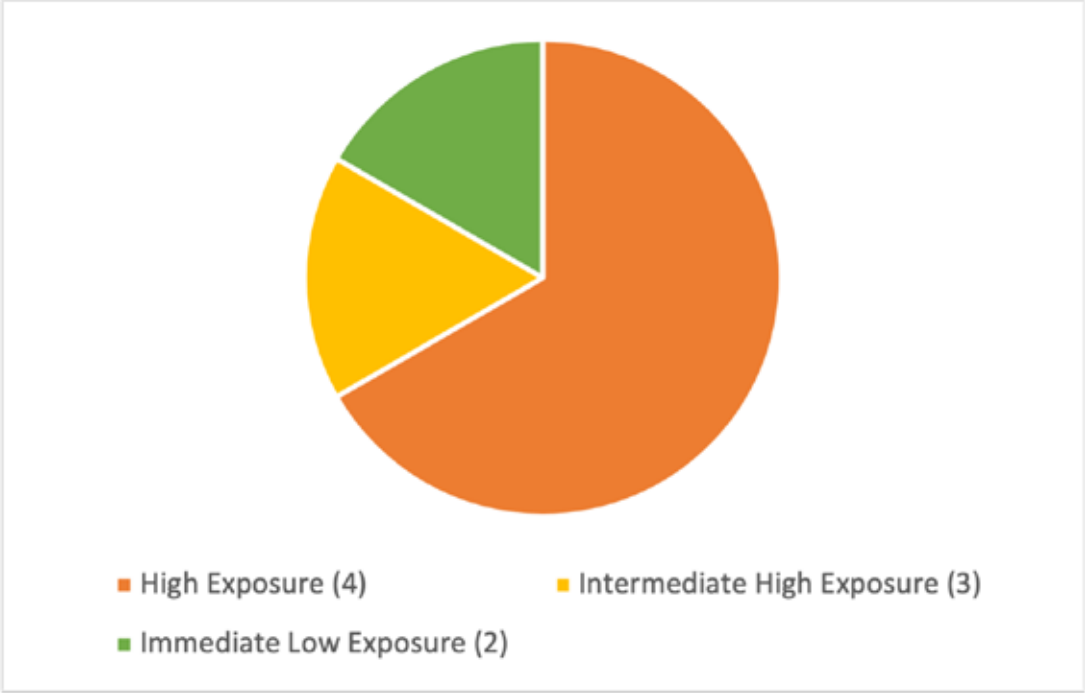
In addition to the Chow Regression Based Test, the study examined the presence of additional breaks at unknown break dates using the Supremum Wald test (StataCorp, 2019). In addition to the break points identified with the Chow Test, the Supremum Wald test identifies additional breaks, some within the COVID-19 pandemic period while others prior the pandemic. As anticipated and indicated in FSIN & GNAFC (2020 & 2021), the results indicate that between 2019 and 2020, most COMESA Member States did experience abrupt changes in their food prices in periods other than those related to the COVID- 19 pandemic. Other than the COVID-19 pandemic, notable additional major factors that affected food prices, and food security in general, in the 2019-2020 period included weather extremes, crop pests, economic factors, and conflict/insecurity (FSIN & GNAFC, 2020 and 2021).

4.2.1 Key Food and Nutrition Security Related Policy Responses to COVID-19

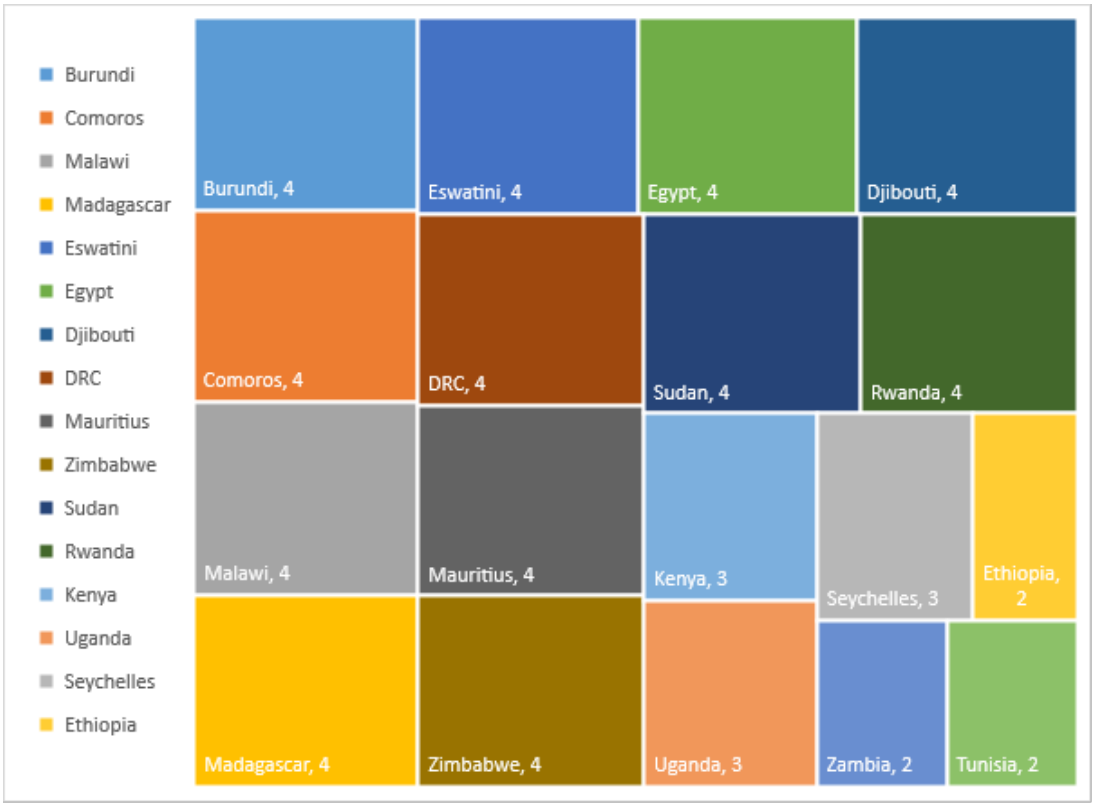
Disruptions in food prices particularly weigh on poor households' food access especially in import dependent countries where consumers have limited savings and access to public safety nets (FAO & AUC, 2021; Schmidhuber et al., 2020). Reliance on food imports coupled by limited savings and access to public safety nets exposes COMESA Member States to demand side risks (Schmidhuber et al., 2020; Figure 7).

Figure 7:Overall demand exposure of COMESA member states

A) Shares of overall exposure



B) Exposure levels per member state



* High Exposure (4); Intermediate High Exposure (3); Immediate Low Exposure (2); Low Exposure(1).

* Values for Somalia, Libya and Eritrea missing

Source: Exposure levels obtained from Schmidhuber et al., (2020)

The declaration of agri-food sector as essential activities coupled with cushioning policy measures by governments are likely to have lessened the disruption of the agri-food supplies, and in turn, food price indices. Among the measures taken by COMESA countries include: reduction or suspension of import tariffs and other import barriers; trade facilitation measures; temporary export restrictions; temporary price controls and restrictions on private hoarding; and expansion of local production and support to producers (FAO & AUC, 2021). In COMESA, policy options taken to mitigate the impact of COVID-19 related disruptions with likely positive impacts on food systems are presented in Table 4 (see appendix C for measures specification). The first five measures are fiscal policy measures that are likely to enhance farm productivity and food supply, minimize demand-side risks related to income losses and create a more favourable environment for domestic and international food trade. The last four measures are monetary policy measures that helped cushion agro-industries and agribusiness value chains, including micro, small and medium-sized enterprises (MSMEs) producing daily food necessities, from the abrupt contraction in firm's incomes and deterioration of the liquidity situation from the COVID-19 crisis.

From the analysis, it is observed that trade policies, such as promoting the creation of shorter value chains, can help counter negative effects that influence food systems during emergencies. Creation of shorter value chains in the region is an opportunity that can be leveraged to catalyse food security, especially during times of crisis. Given the potential role of trade in enhancing food security, in the next sections, the study assesses COMESA's agri-food performance and potential ways to boost it.

Table 4: Key policy responses to COVID-19 for food and nutrition security in COMESA as of July 1, 2021

Measures	1. Support to the agri-food sector (including funding, replenishing food stocks and subsidized inputs)	2. Social safety nets (including Cash Transfer programmes; in-kind transfers; social pensions; cash and food based public works programmes; and school feeding programs)	3.Measures to support exports and imports related to agri-food sector (including operational facilitation of logistics in export and import process; stimulus packages for imports and exports)	4. Measures to support businesses (including funding and measures to ease taxes for SMEs and large businesses, formal and informal businesses)	5. Tax measures (including pay-as you earn rate, corporate income tax rate, turnover tax, VAT rate)	6.Interest rate measures (including Policy rate cut, discount rate and interest rate reductions)	7. Reserve Policy (including Reserve Requirement ratio/ compliance)	8. Lending operations (including liquidity provision, targeted lending, increased lending, extension of loan maturities and moratorium)	9. Asset Purchases (including Government bonds, Commercial paper, Corporate bonds among others
Burundi		√			√			√	
Comoros	√		√	√	√	√	√	√	
Democratic Republic of the Congo			√		√	√		√	
Djibouti		√							
Egypt	√	√	√	√	√	√		√	
Eritrea	-	-	-	-	-	-	-	-	-
Eswatini		√	√	√	√	√	√	√	
Ethiopia	√	√	√		√				
Kenya		√		√	√	√	√	√	
Libya							√		
Madagascar		√		√	√			√	
Malawi		√	√	√	√	√	√	√	
Mauritius		√	√	√	√	√	√	√	
Rwanda	√	√		√	√	√	√	√	√

Seychelles	√	√		√	√	√	√	√	√
Somalia			√	√	√				
Sudan		√							
Tunisia	√	√		√	√	√		√	
Uganda	√	√	√		√	√		√	√
Zambia	√				√	√		√	√
Zimbabwe	√	√		√	√	√	√		

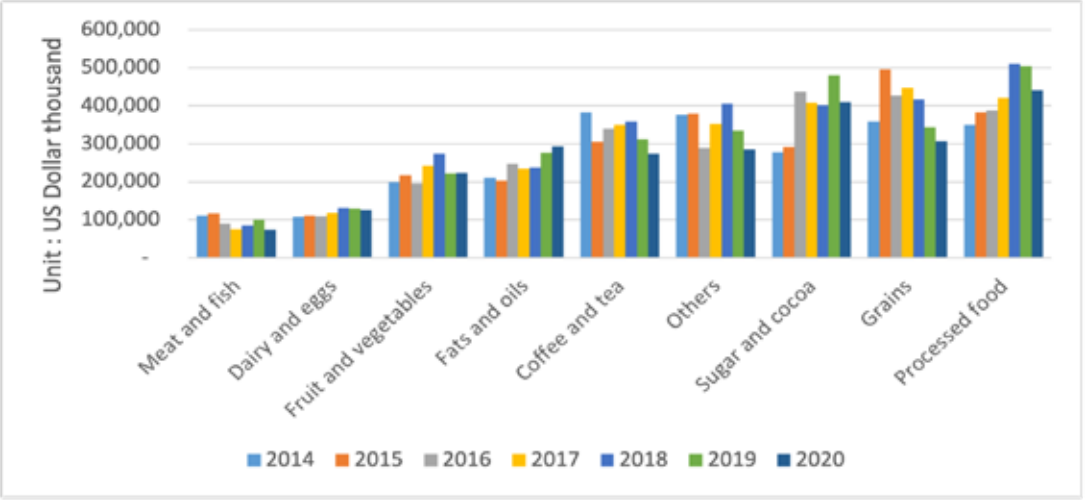
Source: IMF- Policy Responses To COVID-19- Policy Tracker. https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#

4.2 Intra-COMESA Agri-Food Trade and Developments in Relation to COVID-19

Using available data, the study further carried out an analysis of the performance of intra- COMESA agri-food trade (Figure 8). The definition of food aggregates used is based on HS[58] chapters. The details of the food aggregates considered are presented in the data section. The data shows that when COMESA Member States trade with themselves, they exchange more of processed food, grains and sugar, and cash crops (coffee and tea) with relatively minimal values in animal products.

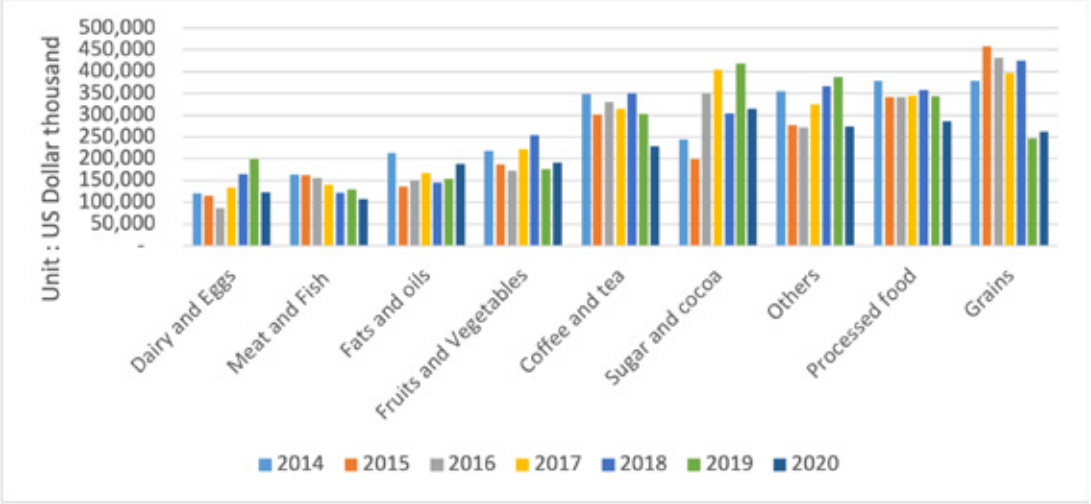
Figure 8: Intra-COMESA agri-food trade

a) Exports



*Data By Exporting Country

b) Imports



*Data By Importing Country , Data Source: International Trade Centre (Accessed March 2022).

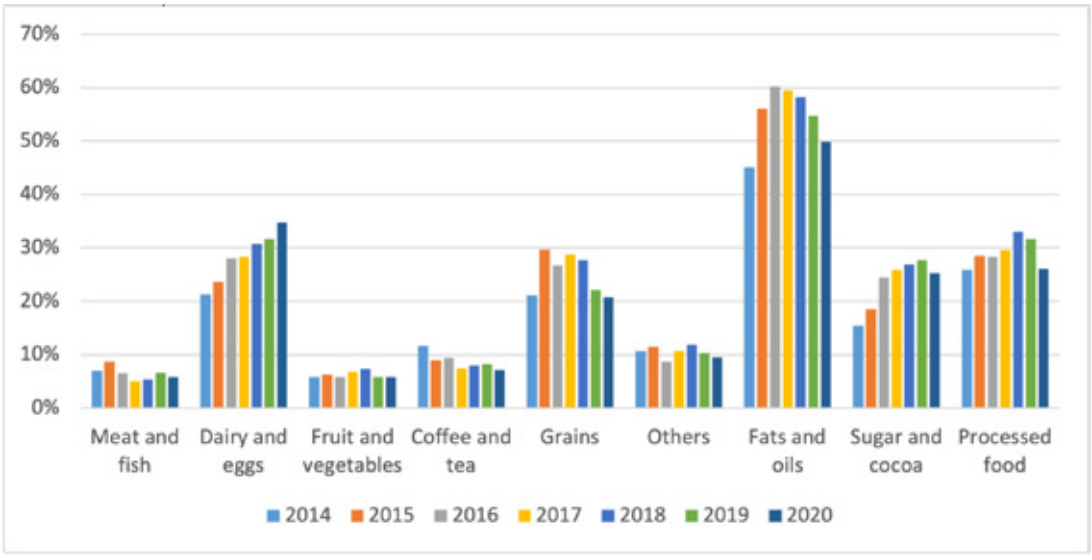
58 The Harmonized Commodity Description and Coding System of the World Customs Organization.

During the COVID-19 pandemic, in 2020, the data indicates intra-COMESA exports in fruit and vegetables, and fats and oils expanded compared to previous year. In addition to grains, similar observations were made on intra-COMESA imports of agri-food products. The observations are an indication of the opportunity intra-COMESA trade presents to minimize exposure to shocks in the global food system and catalyse the region towards sustainable food security.

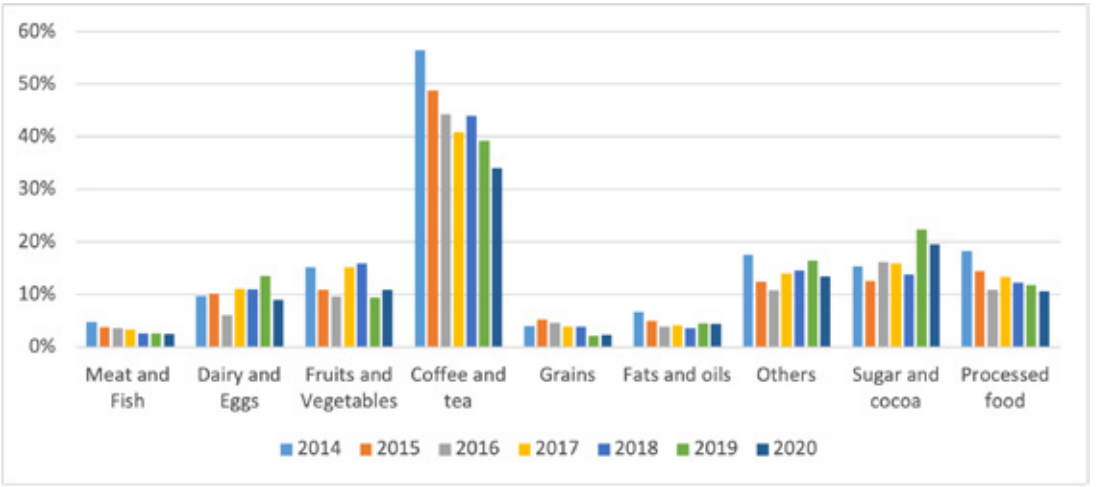
An assessment of the share of intra-COMESA agri-food exports as a percentage of total COMESA agri-food exports reveals that the shares of processed food, sugar, dairy and eggs have relatively grown overtime. However, the shares remain low for meat and fish, fruit and vegetables, and coffee and tea while those of grains, and fats and oils have been on a decline in the recent past. Similar observations are made by AUC & FAO (2020) which highlight that while cash crop commodities, such as fruit and vegetables, coffee and tea, have relatively limited markets in the African region as a whole, they are identified as having significant potential for intra-regional trade. Further, during the COVID-19 pandemic, intra-COMESA export shares in dairy and eggs increased to levels higher than the pre-COVID-19 years, highlighting the potential for boosting intra-COMESA trade and its role in mitigating the effects of global supply shocks. Therefore, opportunities for promoting sustainable food security exist in creation of markets and enhancing intra-COMESA trade for meat and fish, dairy, eggs, fruit and vegetables.

Figure 9: Share of intra-COMESA agri-food trade as a percentage of total COMESA agri-food trade

(a) Share of intra-COMESA agri-food exports as a percentage of total COMESA agri-food



a) Share of intra-COMESA agri-food imports as a percentage of total COMESA agri-food imports



Data Source: International Trade Centre (Accessed March 2022).

On imports, other than for coffee and tea, analysis indicates the intra-COMESA agri-food import shares have remained relatively low over the study period. As with the African region (AUC & FAO, 2020), the results show that COMESA Member States are more globally oriented in their agri-food imports, including in basic food items such as grains, meat and fish, where majority of the agri-food imports are sourced outside the region. Thus, there lies an opportunity for promoting intra-COMESA trade in imports of these basic commodities to promote food security in the region. Further, while the shares of intra-COMESA coffee and tea imports to total COMESA coffee and tea imports have been relatively high, the shares have been on a decline from about 56 percent in 2014 to around 34 percent in 2020. The declining shares support the earlier observation of limited markets of cash crops in the African region as a whole. It is however noted that shares of fruits and vegetables expanded during the COVID-19 pandemic period in 2020 compared to the previous year. Marginal improvements also observed for grains highlight the potential for accelerating intra-COMESA imports for agri-food commodities.

From the analysis, the trend in the intra-COMESA agri-food trade can be explained by the fact that most countries in the region mainly export either unprocessed or lightly processed agri-food products, leading to very high forward but low backward linkages in the global economy (FAO, 2020b). These factors lead to relatively weak value chain linkages in the agri-food sector. Similar observations are made in FAO (2020b) and FAO et al. (2020) which show that food trade is dominated by a few high-income countries characterized by well-developed and export-orientated processing industry whereas the food industry in low-income countries is less developed. However, the growth in shares for some food aggregates in the COVID-19 period highlights the potential opportunity and importance of creating shorter value chains. Notably, COMESA has a great opportunity in enhancing intra-COMESA trade for basic food commodities such as grains, meat and fish, dairy, eggs, fruit and vegetables. Creation of shorter value chains, such as within COMESA, can help increase market flexibility and predictability thereby reducing the vulnerabilities net food-importing countries face during disturbances at the global level.

5.0 Conclusion and Policy Implications

5.1 Conclusion

Agri-food trade plays an instrumental role in supporting food security for local and international communities. When agri-food trade disruptions occur, they impair the dimensions of food and nutrition security- availability, access, utilization and stability. The unprecedented COVID-19 health crisis has disrupted global agri-food trade and exuberated pre-existing threats to food security in many parts of the globe. The pandemic has exposed the vulnerability of local food prices to global shocks with negative effects on food and nutrition security.

The analysis revealed the presence of significant structural breaks in food prices in COMESA during the COVID-19 pandemic. The share of food trade in agricultural commodity trade among COMESA Member States was observed to be relatively low. The effects of the current pandemic attests to the importance of strengthening intra-COMESA agri-food trade especially with the observed low share of intra-bloc trade among member countries. Promoting the creation of shorter value chains for basic food commodities within bloc and a focus on value addition for a shift to export -oriented processing industries are some of the opportunities that can be leveraged towards achievement of sustainable food security.

5.2 Policy Implications

From the findings of the study, the following policy implications are drawn:

1. There is need for COMESA Member States to establish diversified and vibrant cross border value chain systems in the agri-food sector. This can be realized by increasing participation in regional value chains and enhancing value addition and backward and forward linkages in the agri-food sector.

2. Member States are encouraged to focus on promoting trade relations, particularly within the COMESA regional market, as a way of supporting food security.

3. Member-state governments, together with Agri-Food Regulatory and Enforcement Agencies, need to ensure that producers, distributors, retailers, wholesalers and consumers are equipped with resources, knowledge and skills necessary to comply with necessary standards so as to exploit the export markets in COMESA and beyond.

4. Member States need to focus on formulating and implementing policies that develop and sustain shorter value chains amongst them to counter negative effects that influence food systems during economic shocks.

5. There is need to device mechanisms to exploit and enhance the potential opportunity of intra-COMESA trade for basic food commodities such as grains, meat and fish, dairy, eggs, fruit and vegetables to enhance food security.

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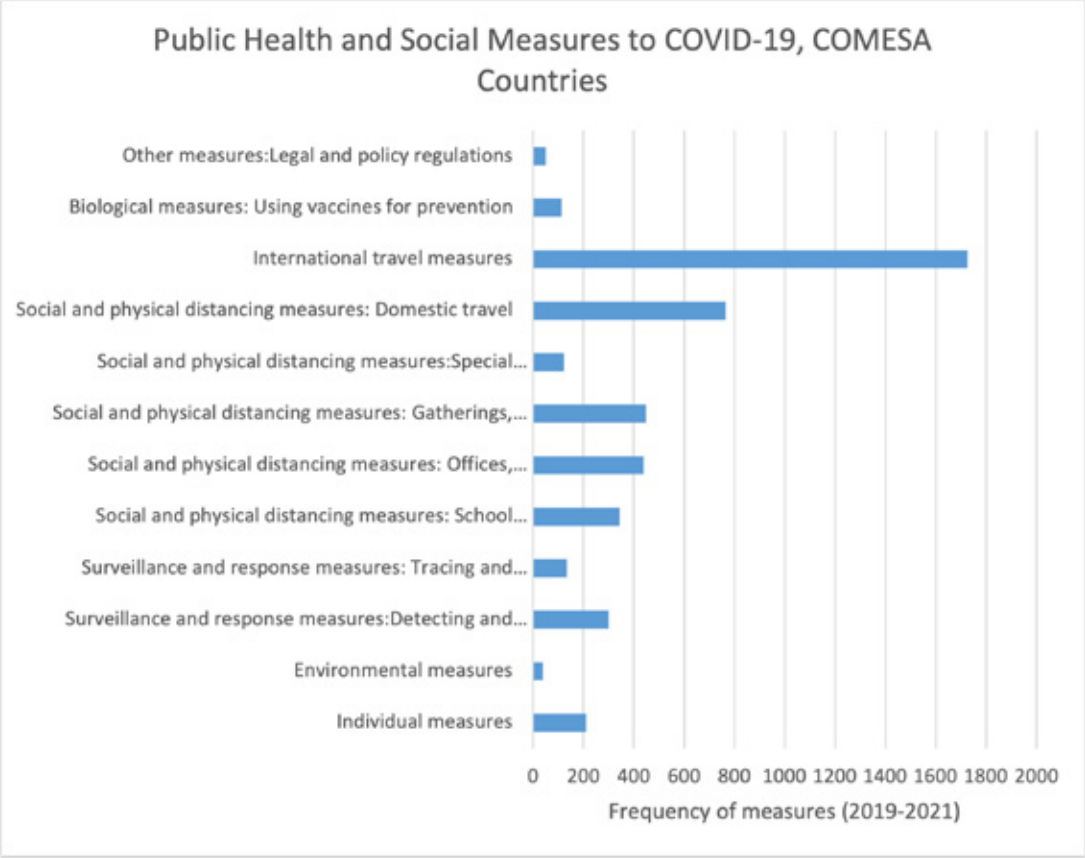
Appendices

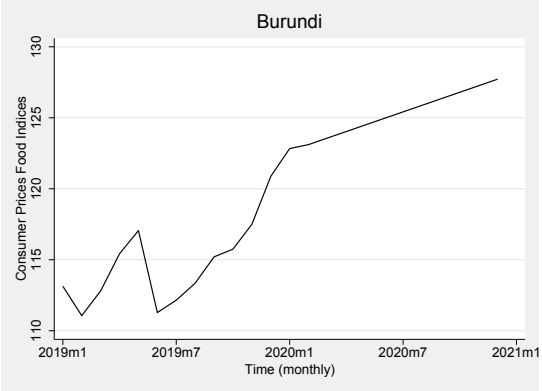
A: Public health and social measures (PHSM) to COVID-19 in COMESA

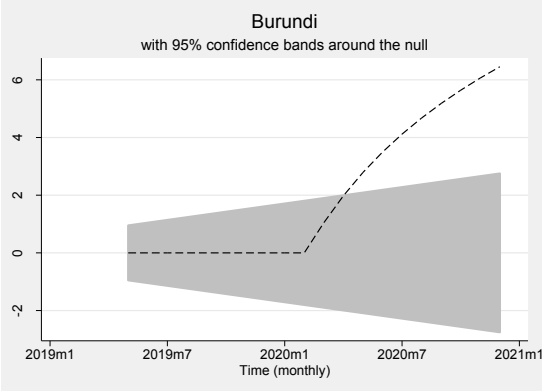


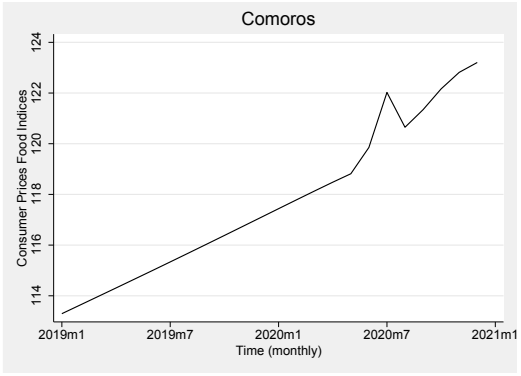
Source: WHO PHSM Dataset. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/phsm

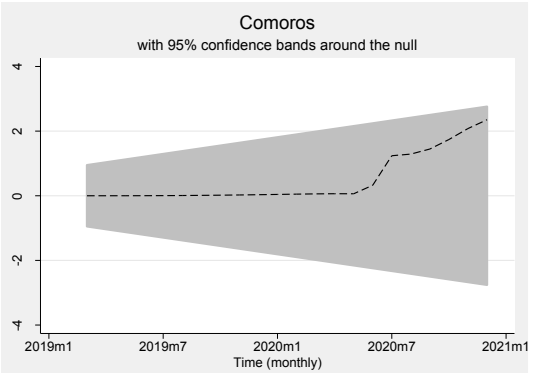
B: Time-series plots and cumulative sum of recursive residuals of monthly food CPI's

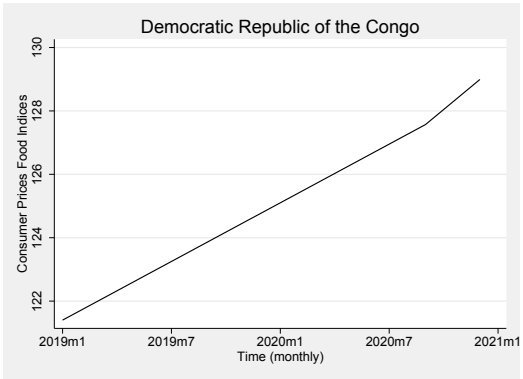
B.1) Time-series plots **B.2) Cumulative sum of recursive residuals**

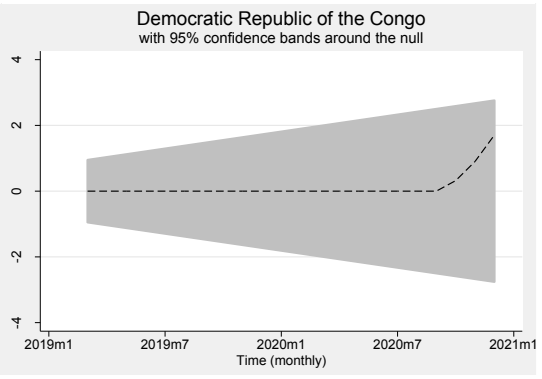


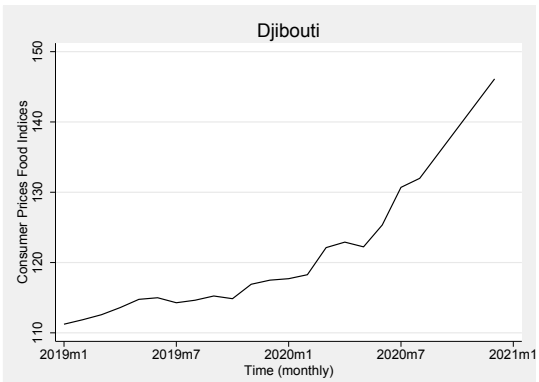


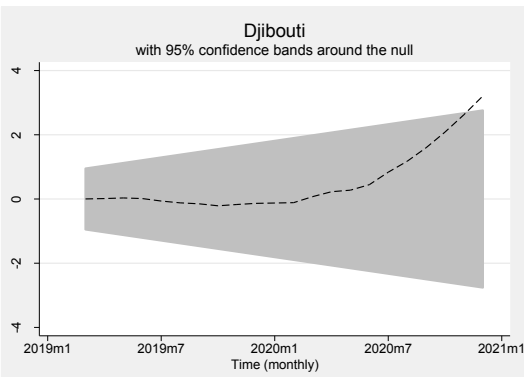

Comoros
Consumer Prices Food Indices
114
116
118
120
122
124
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Comoros
with 95% confidence bands around the null
-4
-2
0
2
4
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Democratic Republic of the Congo
Consumer Prices Food Indices
122
124
126
128
130
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Democratic Republic of the Congo
with 95% confidence bands around the null
-4
-2
0
2
4
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Djibouti
Consumer Prices Food Indices
110
120
130
140
150
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Djibouti
with 95% confidence bands around the null
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2019m1
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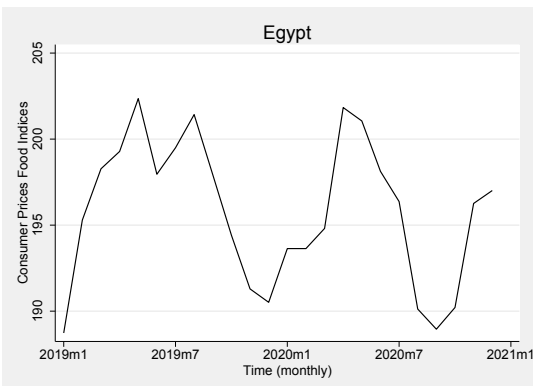
2020m1
2020m7
2021m1
Time (monthly)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Consumer Prices Food Indices
190
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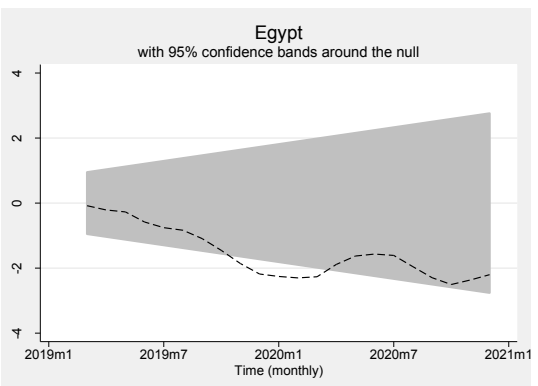
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Egypt
with 95% confidence bands around the null
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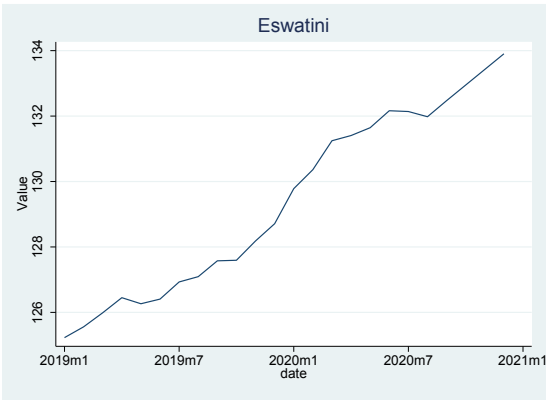
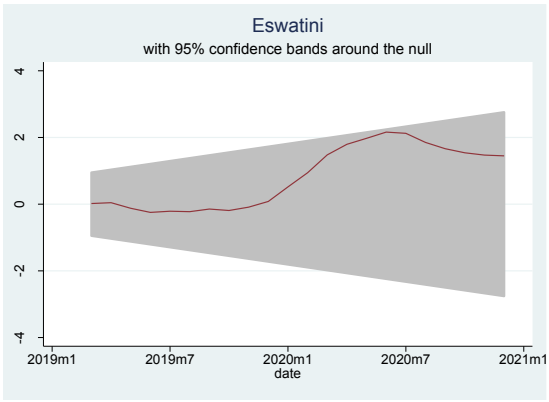
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Eswatini
Value
134
132
130
128
126
2019m1
2019m7
2020m1
2020m7
2021m1
date


Eswatini
with 95% confidence bands around the null
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2020m7
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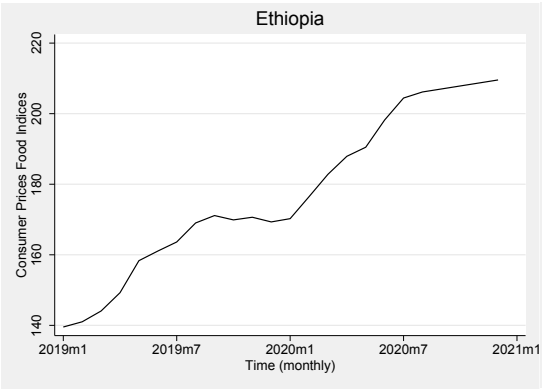
date


Ethiopia
Consumer Prices Food Indices
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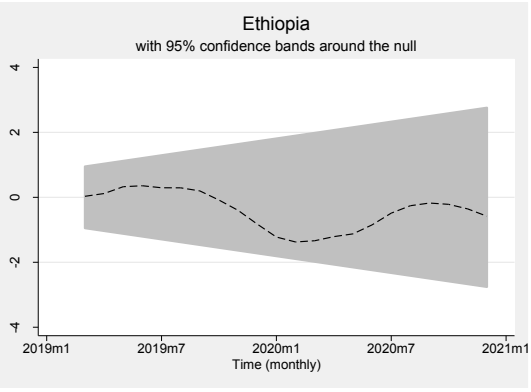
140
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Ethiopia
with 95% confidence bands around the null
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2
0
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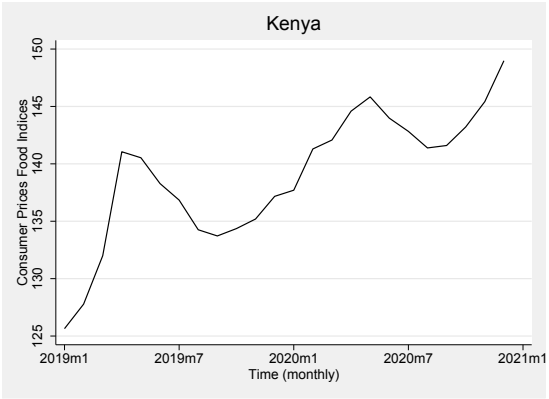
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Kenya
Consumer Prices Food Indices
150
145
140
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130
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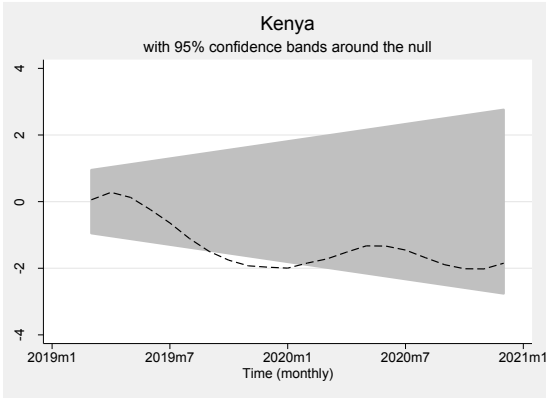
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Kenya
with 95% confidence bands around the null
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2019m1
2019m7
2020m1
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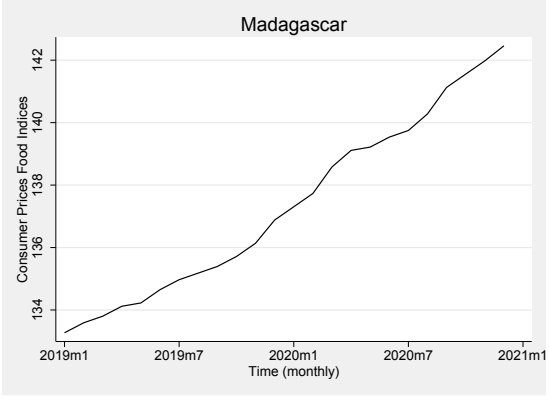
2021m1
Time (monthly)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Consumer Prices Food Indices
142
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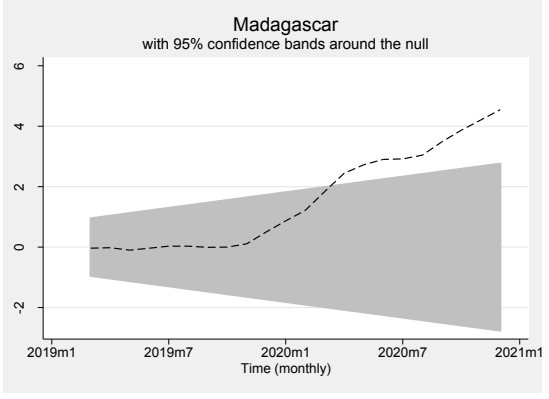
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Madagascar
with 95% confidence bands around the null
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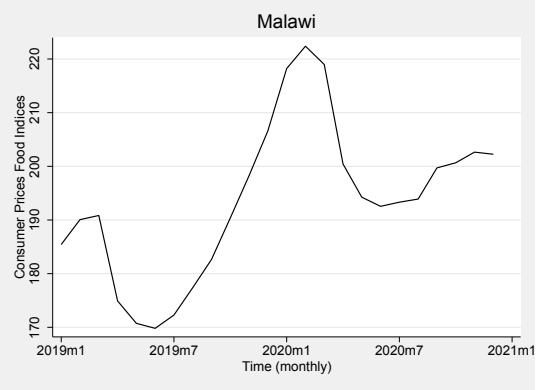
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)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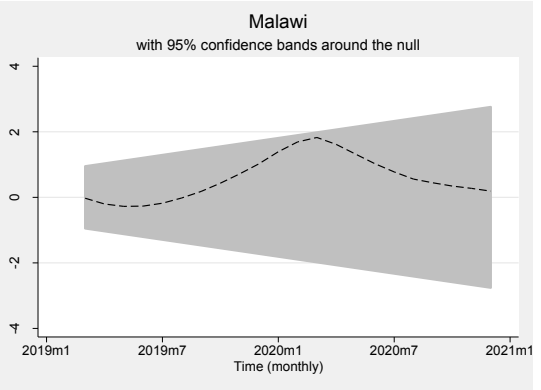
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Malawi
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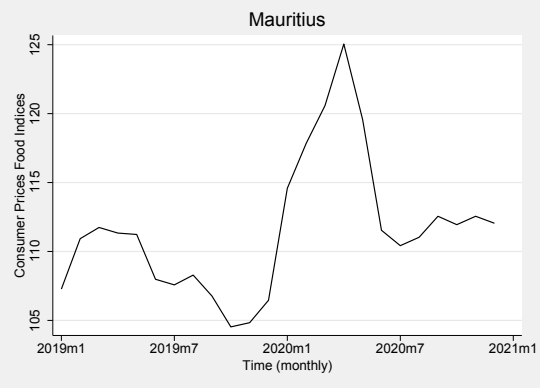
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Mauritius
Consumer Prices Food Indices
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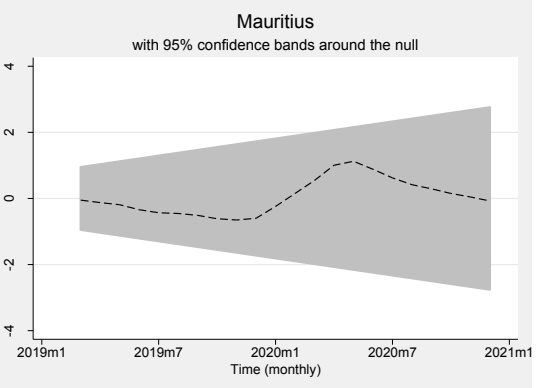
110
115
120
125
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Mauritius
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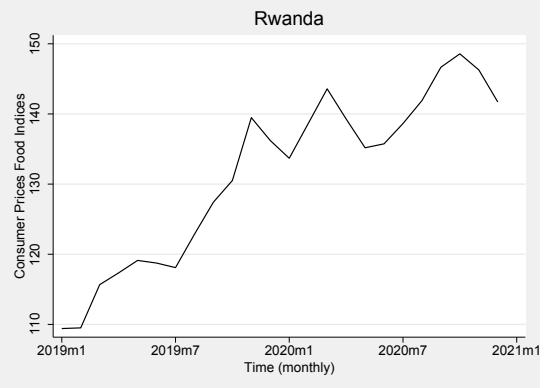
0
2
4
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)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Consumer Prices Food Indices
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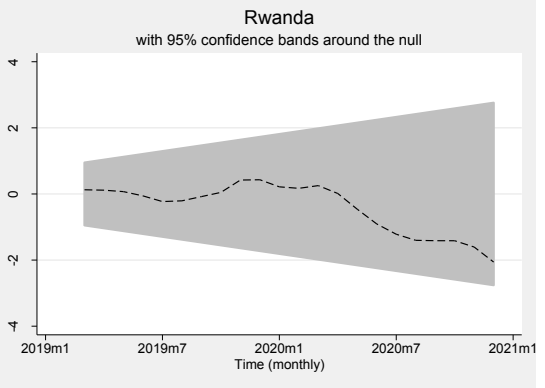
140
150
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Rwanda
with 95% confidence bands around the null
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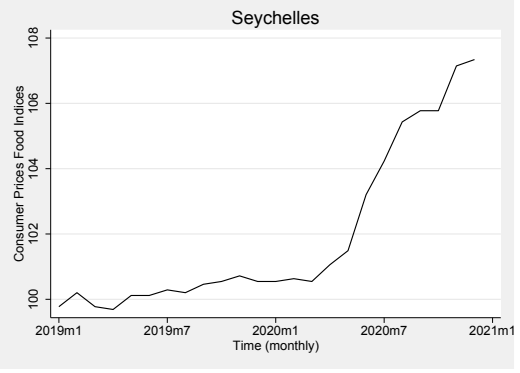
-2
0
2
4
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)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Consumer Prices Food Indices
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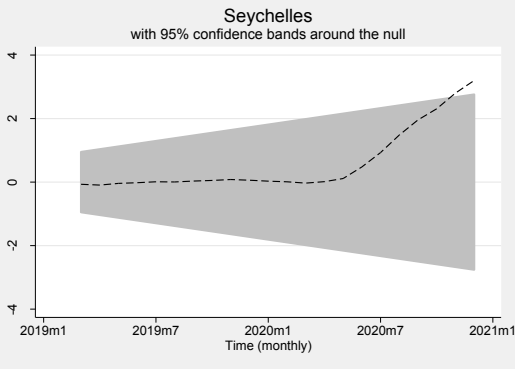
104
106
108
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Seychelles
with 95% confidence bands around the null
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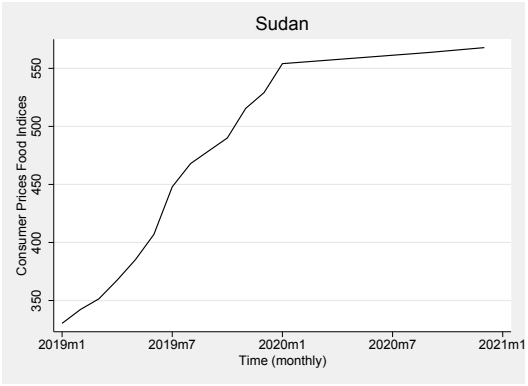
-2
0
2
4
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Sudan
Consumer Prices Food Indices
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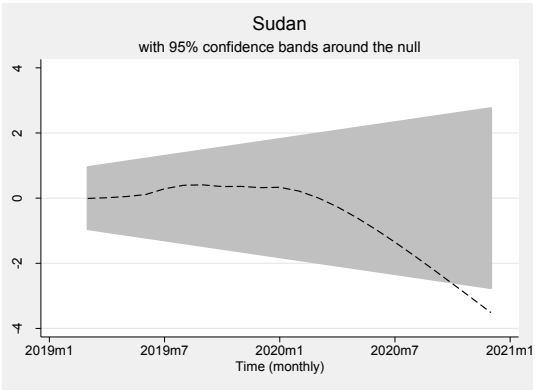
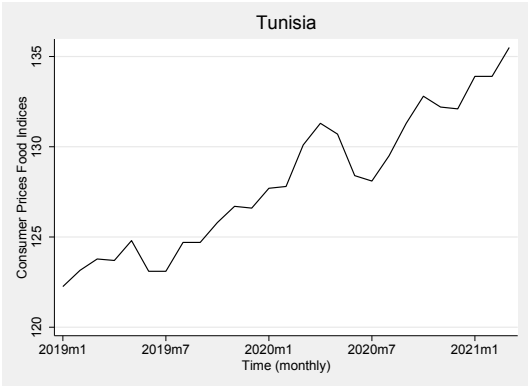
450
500
550
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Sudan
with 95% confidence bands around the null
-4
-2
0
2
4
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Tunisia
Consumer Prices Food Indices
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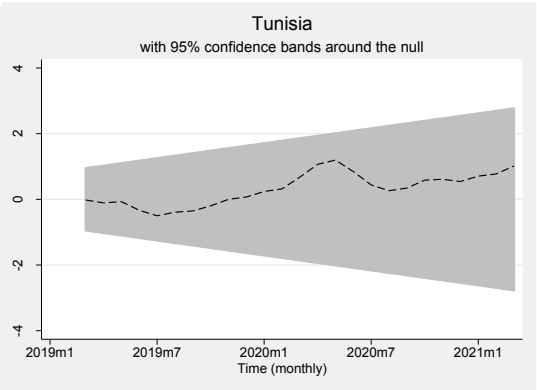
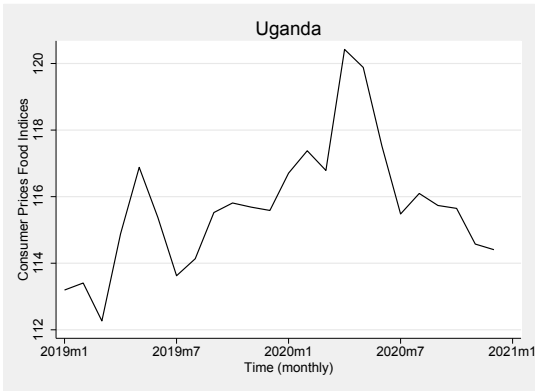
125
130
135
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Tunisia
with 95% confidence bands around the null
-4
-2
0
2
4
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)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Consumer Prices Food Indices
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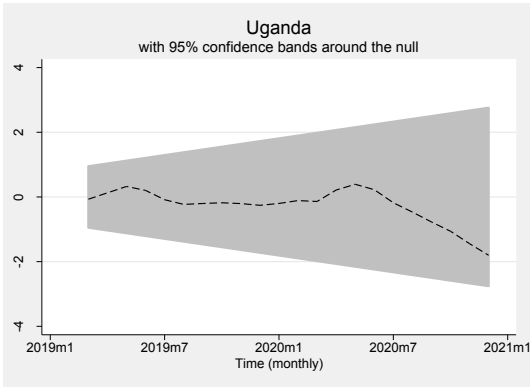
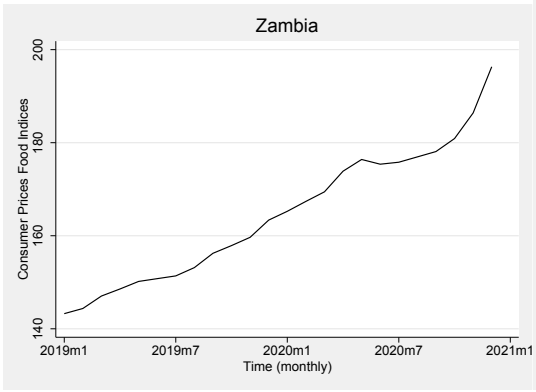
118
120
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Uganda
with 95% confidence bands around the null
-4
-2
0
2
4
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Zambia
Consumer Prices Food Indices
140
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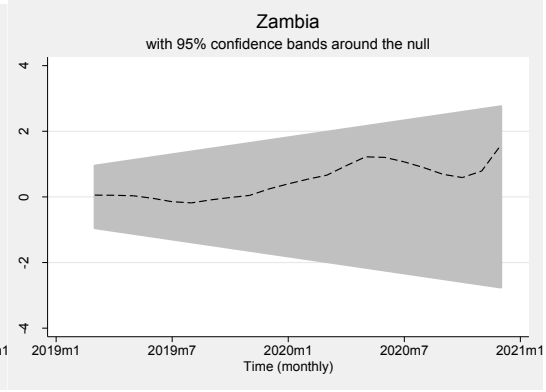
200
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)


Zambia
with 95% confidence bands around the null
-4
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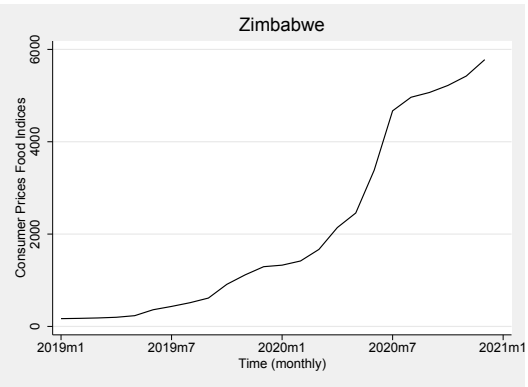
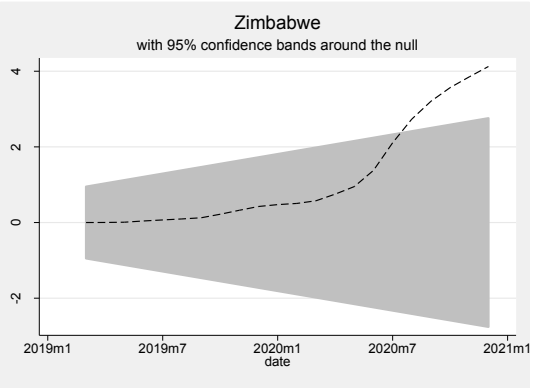
2019m1
2019m7
2020m1
2020m7
2021m1
Time (monthly)





Data Source: The FAOSTAT monthly Food CPI http://www.fao.org/faostat/en/#data/CP/metadata

C) Key policy responses to COVID-19 (As of July 1, 2021)

1. **Libya**	2. **Comoros**
• Emergency COVID-19 related spending. • To protect declining reserves, the government announced a 20 percent pay cut for civil servants in April 2020.	• Expanded spending on health care • A delay in the payment of taxes for the formal sector businesses. • Import taxes on food, medicines, and items related to hygiene reduced. • The government announced a program to support agriculture and tourism • The central bank reduced reserve requirements • Restructuring of commercial loans and freezing of interest rates in some commercial loans
3. **Djibouti**	
• Increases in health spending, • Support to firms impacted by the pandemic • Food vouchers to vulnerable households. • The central bank of Djibouti has stepped up its financial sector surveillance.	
4. **Eritrea**	
• No measures	
5. **Madagascar**	6. **Burundi**

• Targeted investments to strengthen the health system following the activation of the national contingency plan
• Expansion of social assistance to the most vulnerable, including cash-transfers and in-kind necessities to the poorest and those unemployed
• Supporting private sector through tax relief, suspension of government fees and waived social contributions.
• Medicine and medical equipment exempted from paying import duties.
• The central bank
  ○ Provided liquidity to the commercial banks,
  ○ relaxed some mandatory deposit limits to encourage banks to defer delayed payments on existing loans and increase lending to businesses.
• A flexible exchange rate regime is being maintained and has made interventions in response to market tensions on the foreign exchange market and large fluctuations in the EUR-USD exchange rate
	• Subsidized the price of soap and water for standpipes
	• Strengthening the health care system, the social safety net, and parts of the road network.
	• Provision of support to hard-hit sectors such as the transport and hotel sectors
	  ○ Taxes owed forgiven for hotels and industries not able to pay; Subsidies planned to help pay salaries in these sectors and avoid massive layoffs; and Salaries for suspended government services to be paid by the government.
	• Banks encouraged, on a targeted and time-bound basis, to offer an extension of loan maturities to borrowers in hard-hit sectors, applying existing regulation in a flexible manner.
	• Banks encouraged to reduce bank fees for electronic transfers, and mobile money transfers in order to reduce the need to go to banks

7.	**Sudan**
•	Increased government spending on healthcare to include subsidies on medicines and additional funding to support both the local production and the imports of medicines.
•	Sudan Family Support Program providing qualified individuals with$5 dollar per month for12 months to help them cope with high inflation

8.	**Malawi**
•	Increased spending on health care and targeted social assistance programs
•	tax waivers are being granted on imports of essential goods to manage and contain the pandemic.
•	An Emergency Cash Transfer Program was implemented
•	The Reserve Bank o Reduced the policy rate o The domestic currency Liquidity Reserve Requirement (LRR) reduced o the Lombard Rate reduced. o An Emergency Liquidity Assistance (ELA) framework introduced to support banks in the event of worsening liquidity conditions and to provide support to banks on a case-by-case basis.
•	To support small and medium enterprises (SMEs), commercial banks and micro-finance institutions will be, on a case-by-case basis, restructuring SME loans and providing a moratorium on their debt service until end-June 2021. o Fees on mobile money transactions have been temporarily waived to encourage cashless transactions.

9.	**Somalia**
•	Authorities introduced a 3-month tax holiday on some specific basic commodities (including rice), reduced consumption tax on some additional basic goods and lifted restrictions on imports of rice from Vietnam.
•	In response to the second wave of the virus, tax relief on core basic food commodities (rice, cooking oil, flour, dates, etc.) was reinstated from March 2021.
•	The Central Bank: o Released lending support targeted at medium and small enterprises through commercial banks. o To better monitor financial and liquidity conditions, increased the frequency and granularity of data collection, including employing one-off surveys.
•	exploring measures to ease the inflow of current transfers, including remittances

10. **Democratic Republic of the Congo**	11. **Ethiopia**
• Strengthened early detection and surveillance and foster technical and operational coordination within the government • Improved the quality of medical care to infected patients • Developed effective preventive communication strategies and enhance medical logistic platforms. • A 3-month VAT exemption on pharmaceutical products and basic goods, • Suspension of tax audits for companies, • A grace period for businesses on tax arrears, • Full tax deductibility of any donations made to the COVID relief fund. • Provision of water and electricity for a period of two months, free of charge, • Prohibition to evict renters in case of no payment of financial obligations from March to June 2020, • Suspension of VAT collection on the production and on the sales of basic goods. • In the context of sustained increases in inflation and exchange rate depreciation, the Central Bank , the Ministry of Finance, and the Ministry of Budget formally signed a Stability Pact that would contribute to maintaining macroeconomic stability • Measures to ease liquidity conditions included: o reducing the policy rate; o eliminating mandatory reserve requirements on demand deposits in local currency; and o creating a new collateralized long-term funding facility for commercial banks to support the provision of new credit for the import and production of food and other basic goods. • Postponement of the adoption of new minimum capital requirements and encouraged the restructuring of non-performing loans. • Measures to reduce contamination risks in bank notes and promote the use of e-payments.	• Package to bolster healthcare spending • A COVID-19 Multi-Sectoral Preparedness and Response Plan with allocations as follows: o Emergency food distribution to millions of individuals vulnerable to food insecurity o Health sector response under a worst-case scenario of community spread o Provision of emergency shelter and non-food items; o Agricultural sector support, nutrition, the protection of vulnerable groups, additional education outlays, logistics, refugees support and site management support. • Measures to support firms and employment including o Forgiveness of all tax debt prior to 2014/2015, o A tax amnesty on interest and penalties for tax debt pertaining to 2015/2016-2018/2019, o And exemption from personal income tax withholding for 4 months for firms who keep paying employee salaries despite not being able to operate due to COVID-19. • Measures intended to support FDI in the country through the crisis and recovery, including: o Operational facilitation of logistics in export and import process o Removal of taxes from the import of raw materials for the production of COVID-19 essential goods, and o Lifting of the minimum price set for horticulture exports. • For the fiscal year 2020/21, the authorities plan to allocate funds for COVID-19 related spending, including buying medical equipment; additional payment for health workers; food assistance for quarantines and isolation areas; procurement of hygiene facilities, disinfectants, and personal protection equipment. • Private banks provided finance to facilitate debt restructuring and prevent bankruptcies. • Injection of liquidity into hotel and tourism sectors through commercial banks.

12. **Seychelles** [59]	13. **Egypt**

• Increases in budgetary allocation for Social Protection, unemployment relief
• Deferment of Employer Pension Contributions
• Tax measures including:
  ○ postponement of Business Tax , Corporate Social Responsibility, Tourism Marketing Tax, and taxes on Non-Monetary Benefits Income
  ○ Tax reductions/Rebates on fuel for licensed ferry services operators carrying passengers
  ○ Suspension of tax payments related to revenue to help businesses maintain their liquidity
  ○ Tax amnesties .
• Interest rates on the facilities such as Agricultural Development Fund and fisheries sector reduced
• Government guaranteeing salaries of employees in the private sector.
• The central Bank:
  ○ Made adjustment (cuts) in the Monetary Policy Rate
  ○ Set-up of a credit facility to assist affected individuals and businesses with their cash flow,
  ○ Moratorium and rescheduling of loan facilities,
  ○ Policy allowing the Central Bank to buy-back and re-sell government securities,
  ○ Strategies on the use of our foreign exchange reserves.
  ○ Scaled down of activities requiring face-to-face interaction
  ○ Digital Payments transfer fee set at 'zero' charge
  ○ Commercial banks prohibition on declaration and payment of dividend
	• Increase of pensions; expansion of targeted cash transfer social programs; and a targeted support initiative for irregular workers in most severely hit sectors
	• A consumer spending initiative launched to offer citizens low-interest loans to pay for discounted consumer goods and provide ration card subsidies.
	• A new guarantee fund formed to guarantee mortgages and consumer loans made by banks and consumer finance companies.
	• Funds allocated, targeted at providing urgent and necessary medical supplies, and disbursing bonuses for medical staff working in quarantine hospitals and labs.
	• Energy costs have been lowered for the entire industrial sector
	• real estate tax relief provided for industrial and tourism sectors
	• Subsidy pay-out for exporters has been stepped up; Stimulus package for the tourism sector
	• The moratorium on the tax law on agricultural land has been extended
	• The stamp duty on transactions and tax on dividends have been reduced.
	• Capital gains tax has been postponed until further notice.
	• A Corona tax on all public and private sector salaries and state pensions have been imposed, the proceeds of which are earmarked for sectors and SMEs most affected by the pandemic.
	• The central Bank:
	  ○ reduced the policy rate; and approved a guarantee to cover lending at preferential rates to the manufacturing, agriculture and contracting loans.
	• The preferential interest rate has been reduced on loans to tourism, industry, agriculture and construction sectors, as well as for housing for low-income and middle-class families.
	• A new lending initiative with soft loans at zero-to-low interest rates from banks is aimed at replacing old cars with natural gas-powered vehicles.
	• The limit for electronic payments via mobile phones raised
	• Microlenders advised to consider delays on a case-by-case basis, of the value of monthly installments for struggling clients,
	• regulations requiring banks to obtain detailed information of borrowers have been relaxed.
	• Initiative that suspends credit score blacklists for irregular clients and waives court cases for defaulted customers under certain conditions, has been

59 https://www.cbs.sc/COVID-19/covid-19.html and https://www.wto.org/english/tratop_e/covid19_e/covid_details_by_country_e.htm?country=SYC

14. **Eswatini**	15. **Kenya**
• Additional expenditure to increase healthcare capacity, ramp up food distribution and social protection transfers, and improve access to water and sanitation facilities for the most vulnerable. • The government has set up a revolving fund to assist SMEs, and a relief fund to aid laid off workers • Revenue measures to mitigate the impact of the virus include: o Taxpayers projecting losses will file loss provisional returns and no payment will be required; o Extension of returns filing deadlines by 3 months before penalties kick-in; o Payment arrangements for taxpayers facing cash flow problems; o Waiver of penalties and interest for older tax debts if principal is cleared by the end of September 2020; and o Tax refunds for SMEs that have complied with tax obligations, retain employees, and continue to pay them during this period. • The authorities have reduced the price of fuel twice and postponed the planned increase in water and electricity prices. • The government is also subsidizing the cost of required COVID-19 tests for informal cross-border traders, many of whom are women whose livelihoods depend on this trading activity. • The Central Bank of Eswatini o Reduced the discount rate and the reserve requirement; o Reduced the liquidity requirement for commercial banks and the development bank; o Encouraged greater use of electronic payments; and • Encouraged banks to consider loan restructuring and repayment holidays.	• Covid-related expenditure, including o health sector (enhanced surveillance, laboratory services, isolation units, equipment, supplies, and communication); o social protection (cash transfers and food relief); and o funds for expediting payments of existing obligations to maintain cash flow for businesses during the crisis. • Economic stimulus package that includes a new youth employment scheme, provision of credit guarantees, fast-tracking payment of VAT refunds and other government obligations, increased funding for cash transfers to cushion vulnerable groups, and several other initiatives. o A package of tax measures has been adopted, including full income tax relief for persons earning below the equivalent of $225 per month, reduction of the top pay-as you earn rate, corporate income tax rate, turnover tax rate on small businesses, and the standard VAT rate. In addition, various pharmaceutical products and medical equipment were offered tax relief. • The Central Bank: o lowered its policy rate; o lowered banks' cash reserve ratio o increased the maximum tenor of repurchase agreements o announced flexibility to banks regarding loan classification and provisioning for loans that were performing before the pandemic, but were restructured due to the pandemic. o encouraged banks to extend flexibility to borrowers' loan terms based on pandemic-related circumstances o encouraged the waiving or reducing of charges on mobile money transactions to disincentivize the use of cash. o suspended the listing of negative credit information for borrowers whose loans became non-performing after April 1 for six months. o A new minimum threshold of was set for negative credit information submitted to credit reference bureaus.

16. **Rwanda**	17. **Mauritius**
• Support to vulnerable households in the form of a food distribution program, cash transfers to casual workers, subsidized access to agricultural inputs, and measures to ensure poor households' access to basic health and education. • Economic Recovery Fund (ERF) to support affected businesses (SMEs and hard-hit sectors such as the hospitality industry) through subsidized loans from commercial banks and MFIs, and credit guarantees. • Tax deferral and relief measures include the following: o suspension of down payments on outstanding tax for amicable settlement, o softening of enforcement for tax arrears collection, o extension of the deadline for filing and paying Corporate Income Tax (CIT) o Fast-tracking of VAT refunds to SMEs, o CIT and Personal Income Tax (PIT) payments based on current year transactions, o PIT exemption for private school teachers and tourism and hotel employees and o VAT exemption for locally produced masks. • The 30-day maturity period for the public health insurance scheme premium was removed to expedite access to medical services • Salaries of top civil servants for the month of April 2020 was redirected to welfare programs. • The "Manufacture and Build to Recover Program" provides for VAT exemptions on construction materials and tax credits. • The revised FY20/21 budget accommodates additional support the hard-hit transport sector in the form of fuel subsidies, ERF loans, and tax relief • The Central Bank: o Extended lending facility available to liquidity-constrained banks o Announced treasury bond purchases through the rediscount window o Lowered the reserve requirement ratio • Loan repayment conditions were also eased for impacted borrowers, and charges on electronic money transactions waived • The central bank cut the policy rate and restricted dividend distribution by financial institutions to preserve capital positions. o The Central Bank also issued guidelines to banks and microfinance institutions	• increased general public health spending • implementation of a wage subsidy to employers under Government Wage Assistance Scheme (GWAS) • income support under Self-Employed Assistance Scheme (SEAS) for those employed in the informal sector or self–employed • Support to Air Mauritius (the national airline) from its National Resilience Fund. • To limit the increase in unemployment: o The Human Resource Development Council (HHRDC) increased the National Training and Reskilling Intake in the construction, manufacturing, logistics, ICT-BPO, agro-industry, renewable energy and the circular economy. o Employment Support Scheme for SMEs o Recruitment of some technically unemployed people for the National Clean-Up Campaign; o The Air Freight Scheme which has two components (i) supervision for the national airline, currently under voluntary administration; and (ii) support for the export sector. • To support the most vulnerable following a new lockdown, the electricity was made free for March and April for individuals under the Social Register of Mauritius (SRM) or under the National Empowerment Foundation (NEF), as well as low-consuming SMEs, and at a discount for the following 4 months. • Off-budget measures include: o Credit to distressed enterprises and cooperatives. o The State Investment Corporation to make equity investments in troubled firms, including SMEs. o All labor contracts set to expire this year have been extended through December 2021. • Introduction of a tax relief, where tax payments with due date falling between November 2020 and May 2021 were deferred to end of June 2021. • Funds allocated to the National Environment and Climate Change Fund, to rehabilitate the coastlines, strengthen environmental monitoring, clean-up the country, and promote greening the economy. • The Bank of Mauritius (BOM): o Reduced the Key Repo Rate o Reduced the cash reserve ratio with the amount released through the cut earmarked to be made available to affected economic operators o special credit line through commercial banks for affected firms to meet their cash flow and working capital requirements;

18. **Uganda**	19. **Tunisia**
• Increased the spending envelope for critical sectors and vulnerable groups to include: o Additional funding to the health sector, including for medical equipment, masks, test kits, and vaccines. o Support to households, including food to the vulnerable and funding for agriculture inputs and entities that support the sector. o Employment support o Support to firms, including in the form of waived interest on tax arrears, deferred payments of Pay-As-You-Earn and corporate income tax and the expedited repayment of VAT refunds. o The expansion of labor-intensive public works programs. o Acceleration of the development of industrial parks. o Clearance of arrears o Import substitution and export promotion by providing funding to Uganda's Development Bank and recapitalizing the Uganda Development Cooperation. • In response to the lockdown announced in June 2021 the government allocated additional funds: o to purchase hospital beds, oxygen and hire additional staff. o Cash relief envisaged for individuals falling into vulnerable groups, mainly based on occupations hit by the lockdown. • The Bank of Uganda o Reduced it policy rate o waived limitations on restructuring of credit facilities at financial institutions that may be at risk of going into distress o worked with mobile money providers and commercial banks to ensure they reduce charges on mobile money transactions and other digital payment charges. o All Supervised Financial Institutions (SFIs) were directed to defer dividend payments and bonuses to ensure capital adequacy. o Purchases of Treasury Bonds held by microfinance deposit taking institutions and credit institutions to ease liquidity pressures o Exceptional permission to SFIs to restructure loans as needed on a case by case basis. o intervened in the foreign exchange market to smooth out excess exchange rate	• Expenditure measures: o for the health sector to finance the Covid-related response (to procure medical supplies and establish specialized COVID-19 units in hospitals); o supported affected businesses and sectors, such as tourism, via an interest rate subsidy on investment loans; o supported unemployed and self-employed people; o expanded direct cash transfers to low-income households; o replenished strategic food stocks. • To support affected businesses, the authorities accelerated VAT reimbursements, rescheduled repayments of tax arrears, and temporarily suspended some penalties. • A guarantee repayment mechanism for new credits to affected enterprises, and several off-budget funds to finance businesses in priority sectors and to procure medical equipment • The Central Bank: o Reduced its policy rate o It expanded its liquidity management toolkit by introducing additional refinancing instruments and broaden the eligible collateral for refinancing operations. o Relaxed a timeframe for adjustments needed to reach 120 percent on loan to deposit ratio for banks that had exceeded such requirements in the past. o Announced a package to support the private sector, requesting banks to defer payments on existing loans and suspend any fees for electronic payments and withdrawals. o Requested banks to postpone credit reimbursement by employees for a period of 3 to 6 months, depending on the net revenue level. o announced a set of financial measures including the creation of investment funds , a state guarantee for new credits , mechanism for the state to cover the difference between the policy rate and the effective interest rate on investment loans

20. **Zambia**	21. **Zimbabwe**
• Import duties on mineral concentrate and export duties on precious metals were suspended to support the mining sector • Waived tax penalties and fees on outstanding tax liabilities resulting from COVID-19. • Suspension of customs duties and VAT on some medical supplies and medical related commodities. • Removed provisions related to claiming VAT on imported spare parts, lubricants, and stationery, in order to ease pressure on companies. • Issued funds to finance COVID-19 related expenses, including o health spending, o arrears clearance, o grain purchases, and o a recapitalization of a non-bank financial institution (NATSAVE). • Zero rating under the VAT for equipment used for full body sanitization for a period of one year • tax breaks for tourism: a permanently lower CIT rate and suspended import duties and fees. • The Bank of Zambia o lowered the policy rate to mitigate the adverse impact of the pandemic. o Provided medium-term liquidity support to eligible financial services providers. o Scaled up open-market operations to provide short-term liquidity support to commercial banks and embarked on a bond purchase program to provide liquidity to the financial sector. o Implemented several measures to stimulate the use of e-money and reduce the use of cash, o revised the rules governing the operations of the interbank foreign exchange market to support its smooth functioning o revised loan classification and provisioning rules o allowed financial service providers to renegotiate the terms of credit facilities with borrowers affected by the pandemic. o Non-bank financial institutions were allowed to use capital instruments that do not qualify as common equity Tier 1 and Tier 2 capital for the purposes of computing regulatory capital.	• Assistance to labor constrained and food poor households through COVID-19 cash transfers • The freeze on government hiring lifted for the health sector • Introduction of a risk allowance to the health sector and a civil service wide COVID-19 Risk allowance • Companies were allowed to extend the payment of corporate taxes (waiving interest and penalties). • Duties and taxes on various goods and services related to COVID-19 were suspended to facilitate speedy procurement of essential goods and services • In support of the tourism sector, the authorities exempted VAT on Domestic Tourists Accommodation and exempted VAT on visitor services. • Stimulus Package for COVID-19 aimed at: o providing liquidity support to agriculture, mining, tourism, SMEs, and arts; o (expanding social safety nets and food grants; o setting up a health sector support fund; and o scaling up investments in social and economic infrastructure in Cyclone Idai affected communities. o supported the food security related program which included wheat farming and maize procurement, and the Pfumvudza Program which support vulnerable households with farming inputs. • Procurement of PPEs and laboratory equipment towards COVID-19. • The Reserve Bank introduced a medium-term bank accommodation lending facility and increased the private sector lending facility o Beneficiaries have included the mining, tourism, manufacturing, construction sectors. o Funds were also set aside for supporting empowerment programs for SMEs, artists and sports, Zimbabwe Women Microfinance Bank, People's Own Savings Bank and Small and Medium Enterprises Development Company. • The statutory reserve ratio on demand and/or call was pegged back to 5 % in 2021 after having been lowered from 5 to 4.5 percent in March 2020, and further lowered from 4.5 percent to 2.5 percent in June 2020. • The Reserve Bank policy rate was increased to 40 percent after being lowered from 35 percent to 15 percent per annum in March 2020 and 35 percent in July 1, 2020.

Source: IMF- Policy Responses To COVID-19- Policy Tracker. https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#I

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