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**An assessment of the effects of COVID-19  
pandemic on Kenya's trade**

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**Abstract:** We examine the impact of the COVID-19 pandemic on Kenya's foreign trade using quarterly trade data for the period 2019 to the second quarter of 2021. The exploratory analysis shows that growth of Kenya's merchandise exports remained resilient, largely supported by traditional exports of tea and horticultural products. However, the service exports, particularly travel and transport services, were adversely affected. Heterogeneous effects of the COVID-19 pandemic on exports are observed across sectors. The collapse of international oil prices in 2020 led to significant savings on imports. Given the disruptions to supply chains, some shift to alternative non-traditional markets for both exports and imports was witnessed. A differentiated speed of export recovery is observed. A long-term recovery strategy for the service exports is needed, given ongoing pandemic effects. Increased diversification of exports and markets, coupled with increased value addition and deepening of regional trade integration, is bound to boost exports and enhance resilience.

**Key words:** trade, Kenya, exports, COVID-19, pandemic

**JEL classification:** F1, F10, F19

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## 1 Introduction

The COVID-19 pandemic has led to a significant loss of lives and caused large disruptions to the global economy. The World Health Organization (WHO) officially declared the COVID-19 crisis as a pandemic on 11 March 2020. The following month, in April 2020, the International Monetary Fund (IMF) revised global growth downwards by more than six percentage points relative to its January 2020 update, an extraordinary revision within a very short span of time.<sup>1</sup> One of the areas that was adversely affected is global trade, following the restrictions that governments put in place to mitigate the spread of COVID-19. The interventions included border closures, limiting social interactions, school closures, and restrictions on movement and public gatherings, among others. Increased infections reduced labour supply and socio-economic activity in sectors that rely on social interactions such as travel, hospitality, tourism, and entertainment. There were also significant disruptions to supply chains and reduced productivity, particularly in the early stages of the pandemic. These disruptions reduced the cross-border flow of goods and services. The pathway to the pandemic, intensity and efficacy of COVID-19 containment efforts, supply-chain disruptions, and behavioural changes coupled with volatile commodity prices created a sizeable amount of uncertainty (IMF 2020).

Globally, the first wave of COVID-19 that occurred in the second and third quarters of 2020 was the severest in terms of the containment measures and the impact on economic activity (Hayakawa and Mukunoki 2021). World exports declined by 16.2 per cent in the second quarter of 2020 (2020Q2), with a sharper decline of 20.9 per cent for developed economies. Similarly, import volumes on a quarter-on-quarter basis declined by 15 per cent in 2020Q2, with a marked decline for the developed economies at 17.3 per cent. Manufacturing and new export orders as measured by the Purchasing Managers' Index (PMI) were affected. In particular, new export orders and manufacturing sub-indices declined to 27.1 per cent and 39.6 per cent, respectively, in April 2020 before recovering to 51.1 per cent and 53.8 per cent in December 2020. However, quarter-on-quarter growth rates in volumes of exports saw a gradual recovery in the third and fourth quarters of 2020.

Kenya plays a leading role in regional trade and integration in the East African Community (EAC) and Common Market for Eastern and Southern Africa (COMESA) region, accounting for about 35 per cent of intra-EAC trade. It also acts as a major logistic hub for traded goods and services for hinterland neighbouring countries such as Rwanda and Uganda. Despite the devastating impact of the COVID-19 pandemic on global trade, a comprehensive assessment of its effects on Kenya's cross-border trade is lacking. Globally, studies on the impact of COVID-19 on foreign trade and trade-related issues are still limited but starting to emerge (e.g., Hayakawa and Mukunoki 2021; Morsy et al. 2020; Lin and Zhang 2020; Mold and Mveyange 2020; Nechifor et al. 2021). With regard to Kenya, Lashitew and Socrates (2020) undertook an event study to assess the response of trade to lockdown policies imposed by Kenya's trading partners using data for the period 1 July 2019 to 30 June 2020. The analysis showed an average modest increase of weekly exports and a large decline of imports estimated at 12 per cent and 28 per cent, respectively. However, the study only covered three months of the pandemic period.

This paper analyses the effects of the COVID-19 pandemic on Kenya's foreign trade using quarterly trade data from 2019 to the second quarter of 2021. The trade data are based on the standard international trade classification (SITC) at the two-digit level, as compiled by the Kenya

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<sup>1</sup> See the *World Economic Outlook* (IMF 2020).

National Bureau of Statistics (KNBS) and United Nations Conference on Trade and Development (UNCTAD). Kenya experienced three waves of COVID-19 infections during this period, in the second and fourth quarters of 2020 and in the second quarter of 2021. The exploratory analysis covers the period since the start of pandemic, including differential effects across disaggregated export and import product categories, in the context of the identified channels of transmission. The channels encompass a combination of demand-side and supply-side disruptions, as well as disruptions in the global supply value chains. We assess the performance of merchandise trade in terms of industry and by trading partner in order to provide a holistic view of the impact of the pandemic. A comprehensive analysis covering the first wave, during which the economy was hit hard, as well as the ensuing gradual recovery period up to the first half of 2021, is undertaken in order to establish heterogeneous impacts on trade. The paper provides useful policy insights so far and contributes to the literature on the impact of the pandemic on international trade, focusing on Kenya. That notwithstanding, it is worth noting that the COVID-19 pandemic is not over yet. Its socio-economic impact is still unfolding, especially in light of repeated waves of infection and new variants.

The analysis shows that Kenya's merchandise exports remained resilient to grow by 3.3 per cent in 2020 compared to a decline of 3.5 per cent in 2019, largely driven by notable growth in traditional exports of tea and horticultural products. Further analysis shows that global value chain (GVC) sectors benefitted from the increased demand for products used for the treatment and containment of COVID-19, especially from the region. The GVC analysis is based on the World Bank's tool utilizing a list of intermediate and final goods in three key GVCs: apparel and footwear, electronics, and automotive goods. On the contrary, services exports, particularly travel and transport services, have been severely affected, as evidenced by the historic significant decline of 72.3 per cent in international tourism arrivals in 2020. A differentiated speed of recovery in Kenya's exports in terms of the respective products as well as the destination markets (countries) is observed. A relatively faster recovery of exports to the Africa markets compared with the rest of the world is noted.

The rest of the paper is structured as follows. Section 2 provides an overview of the literature on COVID-19 and global trade, including channels of transmission. Section 3 provides an exploratory analysis of the effects of the pandemic on Kenya's exports and imports. In Section 4, we examine the impact on trade in services focusing on tourism arrivals as a key indicator. Section 5 concludes and provides some policy insights.

## **2 Literature review**

Literature on quantitative frameworks to help understand the economic impact of COVID-19 continues to emerge. In response to the pandemic, many governments took measures to stem the spread of COVID-19 and safeguard lives and healthcare systems. The measures, which involved a combination of school, border, and business closures; restrictions on internal movement, international travel, and size of public gatherings; and social distancing inadvertently affected economic activity (Pragyan et al. 2020). These measures significantly reduced workplace, retail, and recreational mobility (IMF 2020). The impacts on industry have been shown to be asymmetric, affecting both the supply and demand side with consequences for trade and growth. In addition, the categorization of business activity into essential and non-essential affected consumer patterns. Recreational activities such as restaurants and travel experienced a slump while essential retail, food, and technology industry was minimally affected. Infection rates and intra-household transmission was also found to be higher for essential workers (Song et al. 2021). Additionally,

reduced mobility of goods and people and certain trade policy actions taken, such as export bans and restrictions, have affected trade (Karunska 2020).

Different approaches have been used to study the likely economic impact of COVID-19. Equilibrium approaches incorporating the interactions between economic decisions and epidemic dynamics show that a trade-off exists between the extent of the recession and the spread of infection (Eichenbaum et al. 2021). The economic agent's decisions result in a competitive equilibrium, which is not pareto optimal due to an infection externality. However, there is a positive welfare effect arising from a reduction in deaths, although the containment policies affect consumption and labour supply and reduce aggregate output. In the United States, the reduction in deaths was estimated at roughly half a million in a benchmark model where health capacity is constrained and the treatment and vaccinations delayed, the discovery of which makes people engage in economic activity (Eichenbaum et al. 2021). The containment measures were largely successful in reducing the rate of growth of infections following the emergence of the pandemic. Hsiang et al. (2020) find that in the absence of the policy actions, early infections of COVID-19 were estimated to grow exponentially by about 38 per cent per day. The analysis is based on a compilation of data on 1,717 local, regional, and national non-pharmaceutical interventions deployed in China, Korea, Italy, Iran, France, and the United States. Pradhan et al. (2020) show that containment measures led to lower levels of infections and deaths.

The main supply-side effects of the pandemic reflect a reduction in labour supply, especially for those industries in which remote work was not feasible, and a decline in productivity. The closure of workplaces led to significant disruptions in labour supply, which in turn affected output, supply chains, and productivity (IMF 2020). Some industries were able to adjust to remote work and hence were less affected. For instance, analysis of the impact of workers' ability to work remotely across industries and on expected revenues showed that industries with the highest COVID-19 exposure—measured as one minus the proportion of workers that were able to work remotely—were most affected (Papanikolaou and Schmidt 2021). From the analysis, entertainment, hotels, retail, wholesale, and real estate faced significant COVID-19 exposure and were, thus, affected. The IT industry was the least affected. Stock returns for transportation and entertainment were also found to be negatively associated with the COVID-19 work exposure variable, while a positive association was found for business services. As a result, the supply of exportable commodities reduced especially for those activities that could not be undertaken remotely.

A survey conducted by KNBS in September 2020 showed that the proportion of individuals absent from work because of COVID-9-related challenges increased to 61.9 per cent from 49.9 per cent in May 2020, with about 77.8 per cent unsure of when they would resume work. Labour supply in terms of hours worked were much lower than usual with the largest declines recorded in the education sector compared with human health and social work activities, as well as water supply, sewerage, waste management, and remediation activities, which recorded the lowest reductions (KNBS 2020).

On the demand side, disturbances to aggregate demand mainly arose from the reduction in consumer spending. Four mechanisms through which the pandemic affected demand include reduced consumption of non-essential goods and services, lower private investment caused by a fall in current and expected demand, declining consumption and investment caused by financial market losses on account of flight to safety, and increased financial constraints as banks tightened lending standards (UNCTAD 2020). Because of job losses and the associated income declines, coupled with lingering uncertainty, structural shifts in firm and household behaviour led to a reduction in spending, which further triggered closure of establishments and volatile commodity prices (IMF 2020). This resulted in a reduction in incomes from work and businesses and a drop in aggregate demand except for countries with sizeable fiscal stimulus measures in place.

The impact on the demand for non-essential goods<sup>2</sup> and durable goods was more pronounced as consumers and investors took a precautionary approach to new spending and investment decisions. Industries most affected include those producing plastics and rubber, leather, wood, textiles, footwear, precious metals, machinery, and transport equipment (Hayakawa and Mukunoki 2021). The impact on spending on essential goods was estimated to have been less pronounced (Alvaro et al. 2021). On the contrary, demand for essential goods improved because of the uncertainty over the course of the pandemic, which led to ‘panic purchases’. These goods include food and vegetables and products used for the control and containment of the pandemic such as sanitizers and face masks (Hayakawa and Mukunoki 2021).

Reduced consumer demand also affected commodity prices. Prices, especially those of energy and metal, declined sharply because of reduced demand after the first wave. Oil prices fell sharply in the first half of 2020, owing to reduced global demand for fuels for international air travel as well as road travel. In addition, failure by OPEC+ (Organization of the Petroleum Exporting Countries, including Russia and other non-OPEC oil exporters) to reach agreement on how to respond to low global demand exacerbated the reduction in oil prices (IMF 2020). Oil prices declined by 60 per cent between February and April 2020. The impact of falling oil prices on national incomes was more pronounced on high-cost-producing countries heavily dependent on energy exports, especially in Africa. An increase in domestic infections, tighter global financial conditions, and weaker external demand compounded the COVID-19 shock. On the contrary, lower oil prices benefitted oil-importing countries such as Kenya.

Aside from disruptions to labour supply, the pandemic caused significant disruptions to global supply and value chains because of the interdependency of local and global production networks (Banga et al. 2020; Eppinger et al. 2020; Bonaïdo et al. 2021; Karunska 2020; Vidya and Prabheesh 2020). Specifically, the disruptions affected the supply channel because of production stoppages and the shortage of raw materials leading to reduced production of goods and services and the demand channel on account of subdued economic growth and reduced or loss of incomes. Supply-chain disturbances attributed to manufacturing firms in China were significant. The fragmentation of international production characterized by the offshoring of tasks and parts of the production process as a dominant feature of global trade (UNCTAD 2013). This structure of production accentuated the supply-side issues brought about by COVID-19-related disruptions.

Industries that produce intermediate goods were subject to a bull-whip effect as firms further down the supply chain reduced demand and opted to run down inventories before re-ordering (Dunn 2021). These demand distortions were more pronounced in activities that are undertaken within global production networks such as in the machinery and transport equipment industry (Hayakawa and Mukunoki 2021). The supply disruptions were compounded by dislocations in transport and logistic networks following cessation of movement and rising trade costs caused by border closures and checks, as well as increased transit times (Bachetta et al. 2021). Difficulties in obtaining intermediate components and materials led to increased prices especially for metals.

The manufacturing sector was the most affected because of a combination of supply disruptions affecting industrial production hubs in East Asia and Western Europe, contagion to countries that rely on imported intermediate inputs, and reduced aggregate demand because of the postponement of consumption and investment decisions (Alvaro et al. 2021). COVID-19-related disruptions affected the expected payoffs from investment, leading to a postponement of capital-related decisions.

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<sup>2</sup> Goods whose purchases can be postponed.

An analysis of the impact of COVID-19 on productivity in the UK using survey data of about 3,000 firms showed a reduction in total factor productivity by up to 5 per cent in 2020Q4 and by around 1 per cent in 2022 and beyond. Businesses anticipated a large reduction in productivity within firms, partly because measures to contain COVID-19 are expected to increase intermediate costs. There were also replacement effects as high productivity firms replace low productivity firms, but overall, the effects did not increase output. In particular, for some industries like travel and accommodation, the practicability of other industries expanding in order to offset the reduction was limited.

Supply shortages continued, for instance, in the steel industry even after major economies such as China re-opened, leading to firms sourcing materials from alternative markets. European supply chains improved in the second half of 2020 with the number of firms reporting disruptions reducing to 8 per cent in July and 18 per cent in October 2020, from a high of 28 per cent at the peak of the first COVID-19 wave. The impacts that initially affected manufacturing subsequently spilled over to retail, construction, and real estate (Dunn 2021). The concentration of global capacity for some essential goods in selected advanced economies, especially chemicals and medicines, has become a major concern (Fernando and Radel 2020). For instance, the production of high-tech medical equipment is domiciled in the EU and US and personal protective equipment (PPE) in China. In addition, about 80–90 per cent of global capacity for ascorbic acid and antecedents for penicillin-based antibiotics are concentrated in China (Shih 2020).

Globally, governments enacted trade policy measures in the form of export and import restrictions in response to the pandemic. The measures were targeted at vital medical supplies as well as other products that are essential to the identification, control, and treatment of COVID-19. They increased significantly in March and April 2020 following WHO's declaration of the COVID-19 pandemic. While some of the measures have lapsed, most of the measures are still in place. As of 19 August 2021, 98 countries had in place export restrictions, while 12 countries had import restriction measures (ITC 2020). Examples of these measures include a ban on exports of certain medical supplies by India, increased export tax rebates on chemicals (China), and efforts to re-shore the production of chemicals and pharmaceuticals (Japan and France). Import restriction measures include a ban on purchases of non-medical face masks (Bahamas) and meat, fish, and seafood (China) from countries affected by COVID-19. Analysis by the World Trade Organization shows the need for more global cooperation in the provision of essential goods especially in crises rather than the use of discriminatory trade policies. Efforts by advanced economies to re-shore production are likely to be driven more by rising costs in emerging markets and automation of production rather than by the pandemic (Bachetta et al. 2021).

Some analysis has been undertaken on the nature of the expected economic recovery following the lifting of restrictions. Buera et al. (2021) predict a V-shaped economic recovery especially in the case where labour frictions are minimized. This would be in the case where employees can resume their previous jobs without having to go through the labour market. A longer lockdown causes a deeper recession but recovers after the lockdowns are lifted. In addition, shifts in preferences for goods and services in a permanent way can have long-lasting effects on the economy (Buera et al. 2021). Examples include increased preferences for online shopping and food delivery and decreased preferences for cruises. In the model, the shift in preferences is captured as a permanent reallocation shock that reshuffles productivity with no decline in average productivity, coupled with a temporary shutdown that leads to a long-lived recession. Because of the reallocation, productive firms (considered non-essential) face credit constraints as capital is reallocated to firms that are not necessarily productive, leading to a persistent negative effect on total factor productivity and GDP. There is also a balance sheet impact on non-essential firms, leading to permanent closures. Balance sheet support to non-essential firms in the form of income insurance and wage subsidies increased the speed of recovery. Cross-country disparities in the

speed of economic recovery are therefore explained by the nature of fiscal stimulus, lockdown duration, or reallocation shocks (Buera et al. 2021).

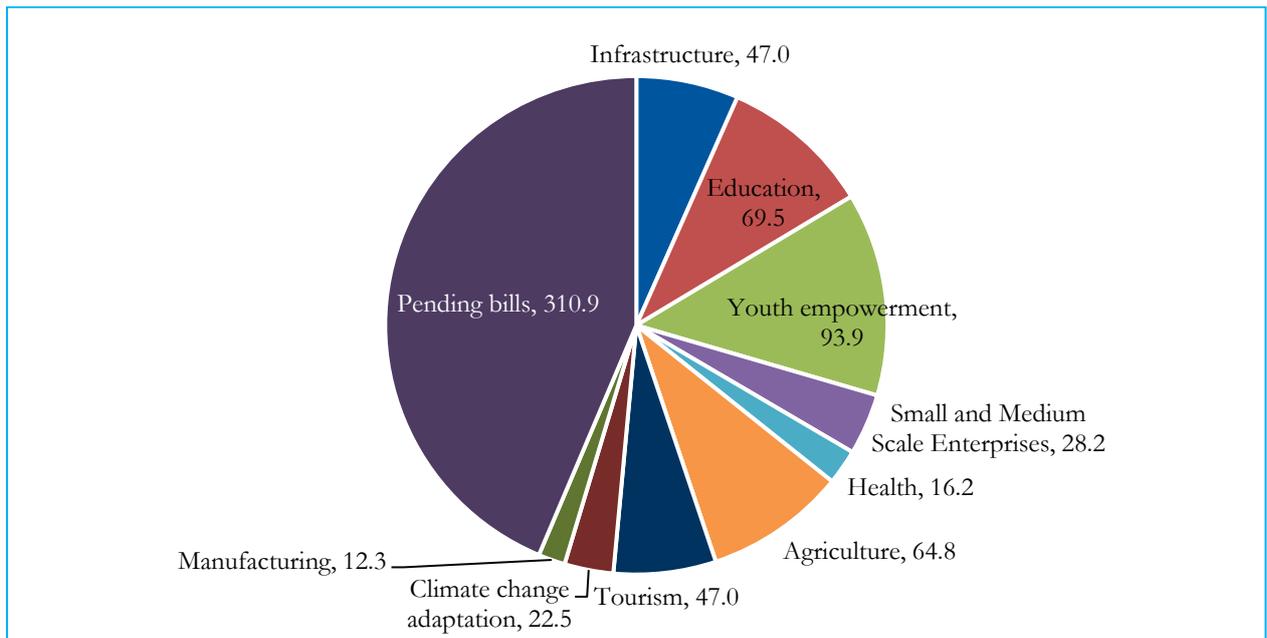
## **2.1 Kenya's COVID-19 response measures**

The government began to take measures in early February 2020 advising Kenyans against non-essential travel to affected countries. However, substantive measures were introduced in March 2020 following the confirmation of COVID-19 in the country on 13 March 2020. The measures included social distancing, curfews, work from home directives for non-essential businesses, closure of learning institutions, and directives to operate a minimum workforce on a 24-hour shift rotation for manufacturers and industries. Kenyans and foreigners with valid residence permits travelling into the country were required to self-quarantine for a period of 14 days. However, on 25 March 2020, international passenger flights were suspended with the exemption of cargo and repatriation flights. Public transportation was limited to a 60 per cent maximum seating capacity. In early June 2020, the nationwide lockdown measures were extended to 6 July 2020 and included restrictions on road, rail, and air movements in and out of the Nairobi metropolitan area, Mombasa and Mandera counties. In terms of COVID-19 measures directly impacting trade, Kenya introduced an export prohibition on face masks. In general, the intensity of COVID-19 restriction measures has varied depending on the intensity in the spread of the infections, with a view to contain escalation of infections.

To cushion households and businesses against the adverse economic impact of the pandemic, the government instituted tax relief measures in March 2020. These included 100 per cent tax relief for individuals with a gross income of up to about US\$230, reduction in income tax from 30 per cent to 25 per cent, and value added tax from 16 per cent to 14 per cent. Additionally, an economic relief package was put in place covering key sectors (Figure 1). These budgetary allocations have an indirect impact on small- and medium-scale enterprises (SMEs) that participate in cross-border trade. About 60 per cent of micro-, small-, and medium-scale enterprises (MSMEs) are in wholesale and retail trade (KNBS 2016). To augment the fiscal measures, the Central Bank of Kenya (CBK) adopted an accommodative monetary policy stance by lowering the policy rate from 8.25 per cent to 7 per cent and cash ratio from 5.25 per cent to 4.25 per cent, thus enhancing liquidity in the economy and access to credit by businesses.

Over time, some of the containment measures restricting movement have largely been reversed or amended. International air travel resumed on 1 August 2020, whereas domestic air travel resumed on 15 July 2020. Ground travel continues to be monitored because of the re-emergence of COVID-19 strains. Schools were re-opened on 4 January 2021. The curfew remained in force until 20 October 2021, though the curfew hours had been reduced to run between 10 pm and 4 am. Similarly, most of the supportive or mitigating policy measures were reversed. In particular, the tax relief measures were reversed effective January 2021. Furthermore, in view of the elevated expenditures amid revenue shortfalls occasioned by the adverse economic impact of the pandemic, the government instituted a series of taxes including taxes on digital services.

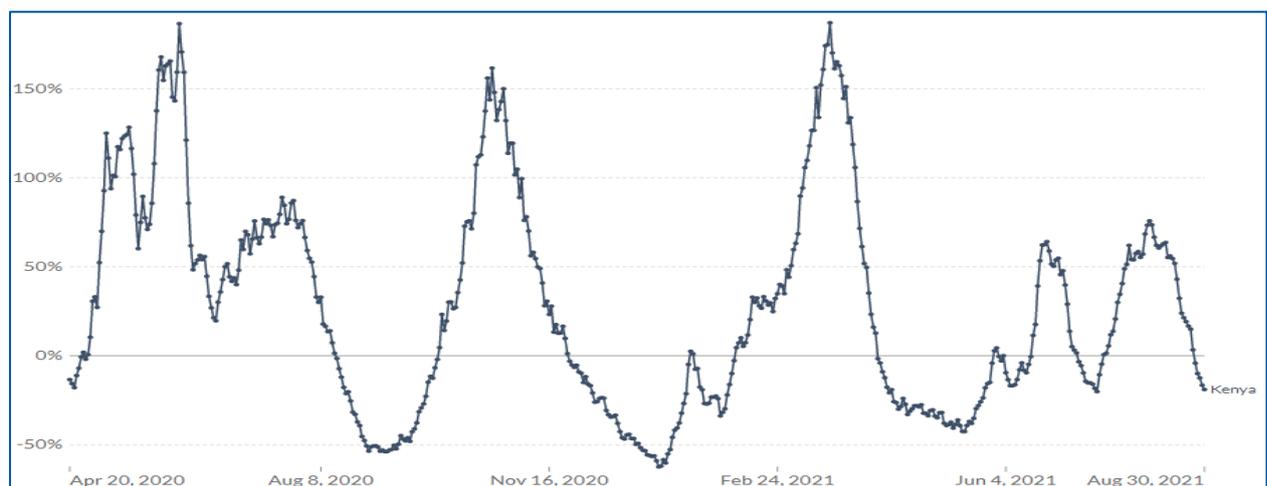
Figure 1: COVID-19 stimulus package, US\$ million



Source: authors' illustration based on data from The National Treasury (2021).

The country has experienced four distinctive waves of COVID-19 infections since the outbreak in March 2020 up to the period 30 August 2021, including the two that occurred in the second and fourth quarters of 2020 (Figure 2). We identify the waves using the biweekly growth rate, which is measured by the percentage change in the number of new confirmed cases over the last 14 days relative to the number in the previous 14 days. In the analysis, we focus more on the effects of the first two waves of COVID-19 infections that occurred in 2020Q2 and 2020Q4, which were more severe in terms of infections and the ensuing containment measures.

Figure 2: Biweekly change of confirmed COVID-19 cases



Source: authors' illustration based on data from Ritchie et al. (2020).

In view of the continuing COVID-19 impacts, the government is set to implement an elaborate Economic Recovery Strategy as outlined in the 2021–22 budget to build on the economic stimulus package. Specifically, investment in information and communication technology (ICT) and digital infrastructure, the role of the private sector, and increased access to credit by MSMEs are key priorities. Incentives are to be provided to the manufacturing sector in order to support domestic

production of imported food and pharmaceutical products, as well as diversification of product and raw material sources.

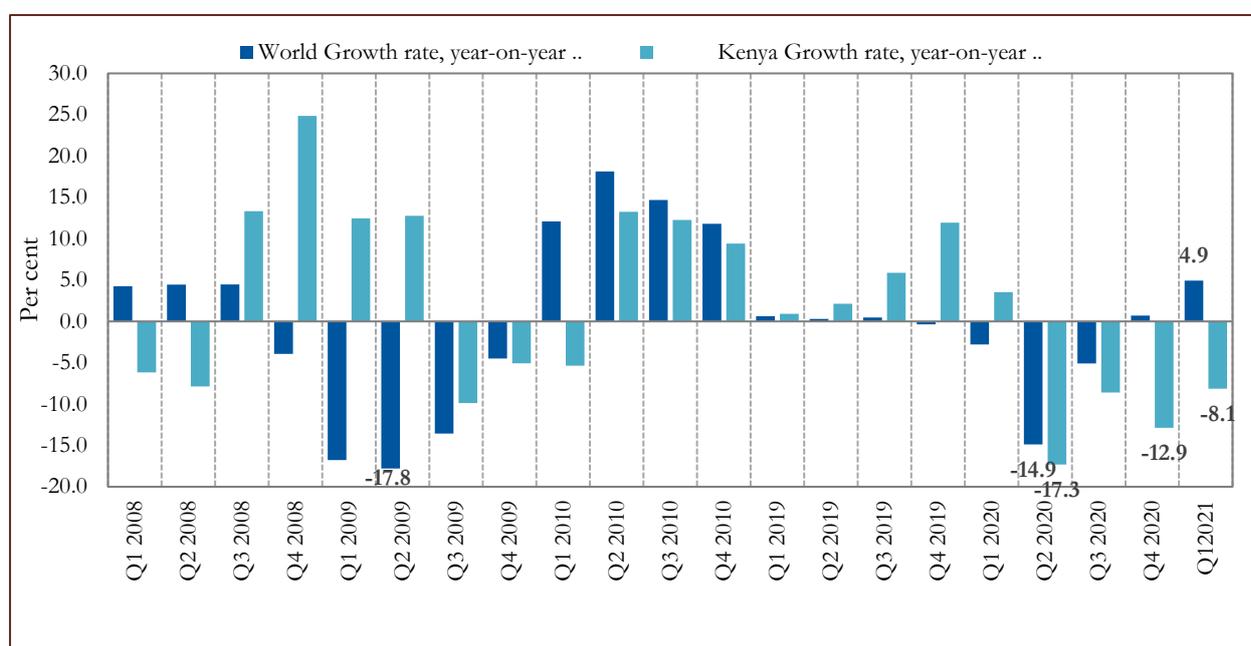
### 3 Impact of the COVID-19 pandemic on Kenya’s trade

Overall, the analysis shows that Kenya’s merchandise trade declined notably by 20.4 per cent in 2020, from a growth of 4.3 per cent in 2019, largely on account of decline of imports. Merchandise exports showed resilience and recorded a modest growth in 2020, while services exports weakened significantly.

The COVID-19-induced recession led to a 14.9 per cent decline in world imports in 2020Q2. The reduction in import growth eased in the third quarter before recovering to a growth of 4.9 per cent in 2021Q1. Although the triggers of COVID-19 differ from previous downturns, a comparison to the 2008 global financial crisis (GFC) shows that the recovery of imports was less protracted relative to the GFC, during which the rebound of import growth took more than four quarters (Figure 3).

Similar trends were observed for Kenya’s imports. In particular, import growth declined by 17.3 per cent in 2020Q2. However, the rebound of imports has taken longer when compared with global trends with a partial recovery observed in 2021Q1. The decline in 2020Q4 was less severe compared to that of the second quarter and reflected pent up demand for intermediate inputs (Figure 3).

Figure 3: Goods imports (growth rate, year-on-year)

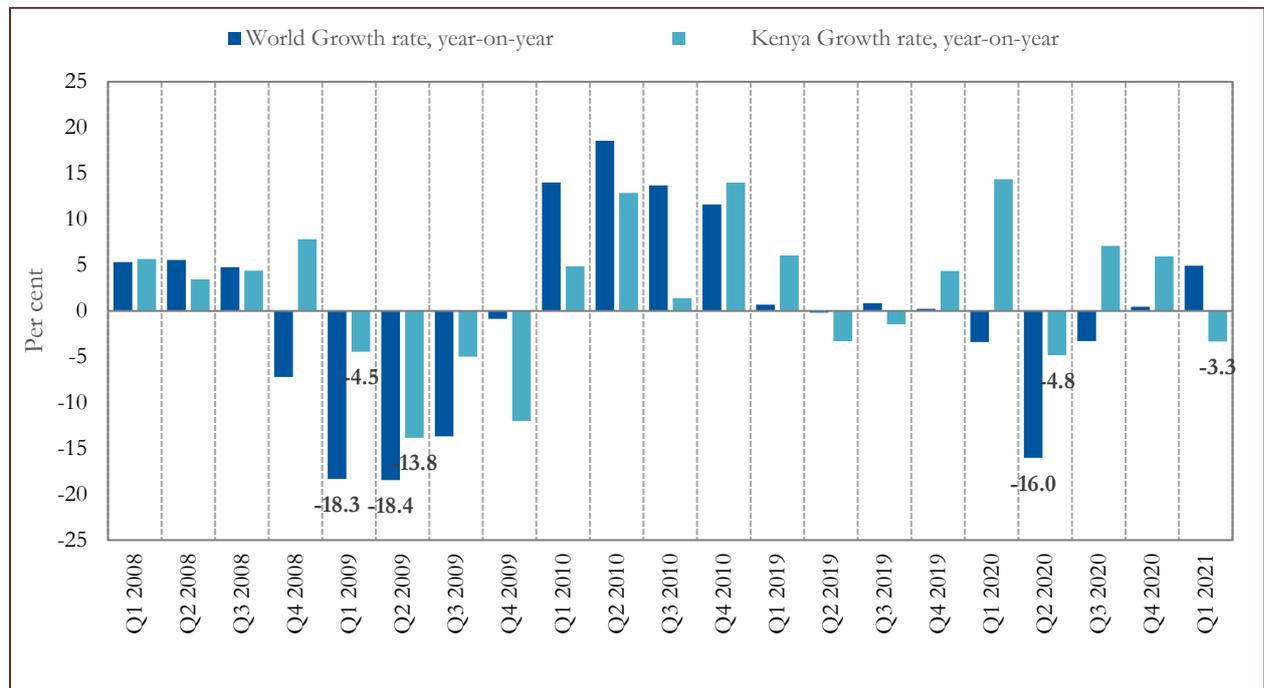


Source: authors’ illustration based on data from UNCTADstat (2021) and KNBS (2021).

Kenya’s goods exports remained resilient in 2020 compared to global trends. In 2020, exports grew by 3.3 per cent compared to a 3.5 per cent decline in 2019. That notwithstanding, Kenya’s exports declined by 4.8 per cent in 2020Q2 compared with 16.0 per cent for the world economy, before a rebound in 2020Q3 and 2020Q4 (Figure 4). In addition, the rebound was much faster compared to trends observed during the GFC in 2009. However, merchandise exports declined in

2021Q1 compared with 2020Q1, largely because of reduced earnings from tea attributed to low international prices.

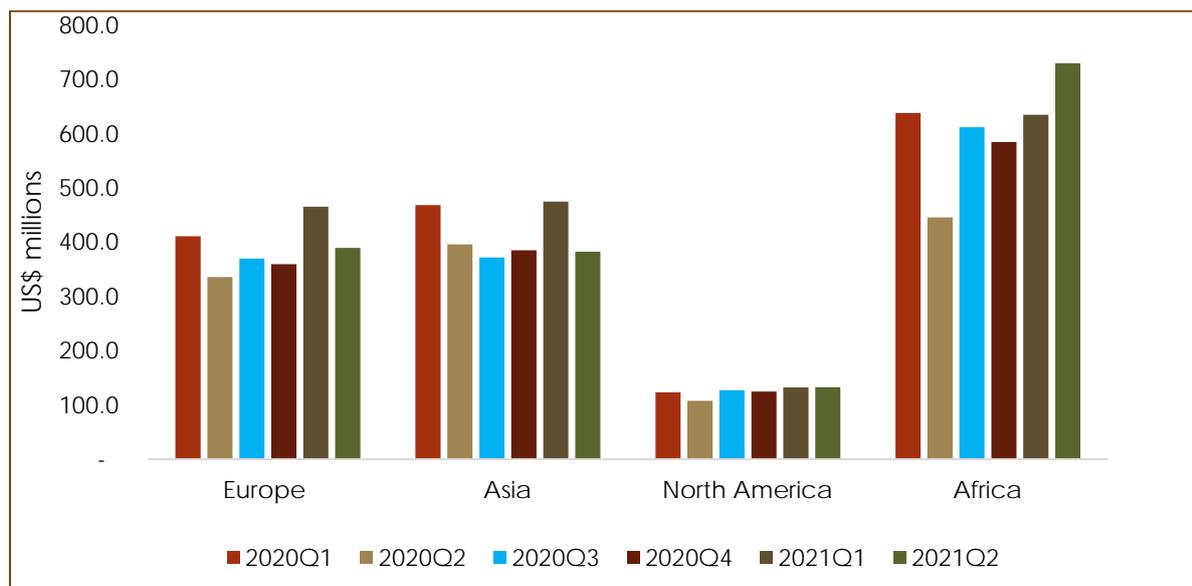
Figure 4: Goods exports (growth rate, year-on-year)



Source: authors' illustration based on data from UNCTADstat (2021) and KNBS (2021).

A differentiated speed of recovery in Kenya's exports to the various destinations is observed (Figure 5). In particular, a much faster and more sustained recovery of exports is recorded with regard to the internal Africa markets compared with the rest of the world. This is consistent with a related previous analysis, which shows, for instance, that extra-EAC exports dropped by a larger magnitude compared with intra-EAC exports (UNECA 2021). Measures by governments in the region to ease bottlenecks to cross-border trade brought about by COVID-19 protocols resulted in a quick recovery of cross-border trade. The identified initiatives included the Regional Electronic Cargo and Driver Tracking System (RECDTS), a mobile phone application system that enabled the issuance of mutually recognized EAC COVID-19 digital certificates to minimize the cross-border delays.

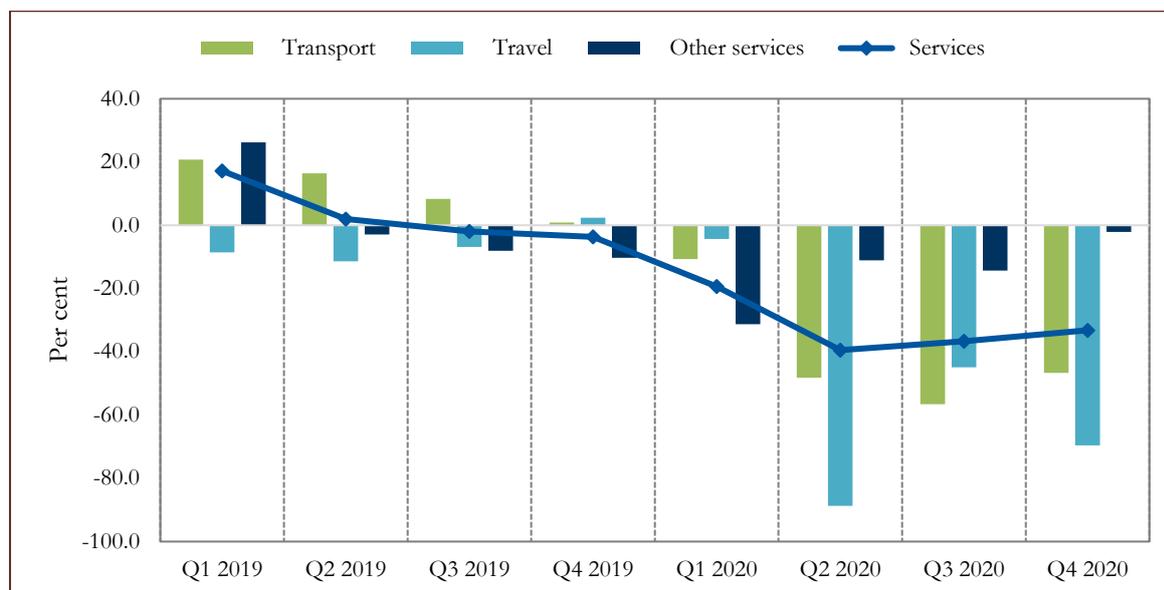
Figure 5: Export destination by main continent



Source: authors' illustration based on data from KNBS (2021).

The services account, which has been a major source of foreign exchange inflows for Kenya primarily from transport and travel-related services, was adversely affected. Whereas the positive balance on the services account increased by 10.7 per cent in 2019, the services account recorded a deficit in 2020. It declined significantly primarily because of lower receipts from service exports that remained at about two-thirds of their pre-pandemic levels (Figure 6). Earnings from travel and transport service exports, which respectively account for about 40 per cent and 20 per cent of total receipts, declined the most because of COVID-19 restrictions on international travel and transport.

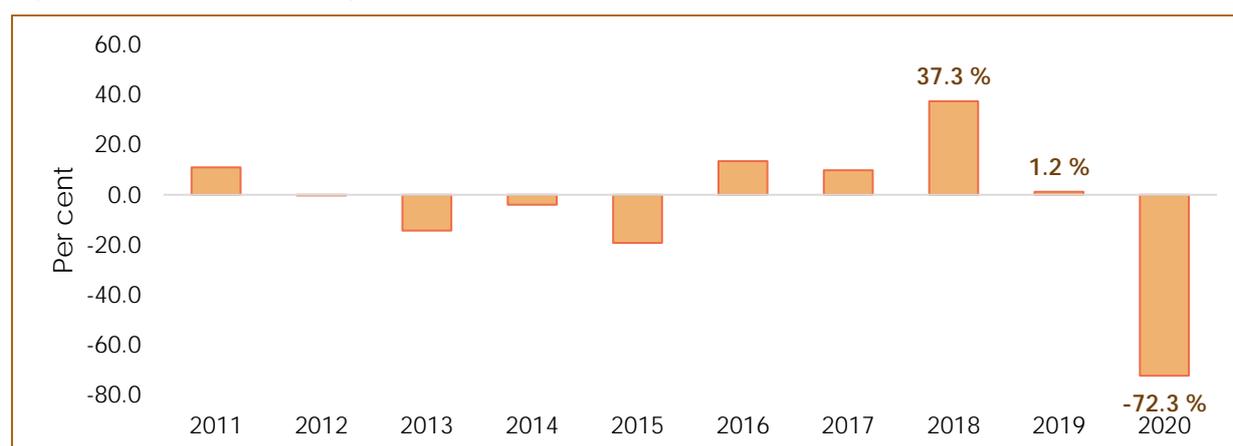
Figure 6: Services exports (growth rate, year-on-year)



Source: authors' illustration based on data from UNCTADstat (2021) and KNBS (2021).

The COVID-19 pandemic is considered the largest shock to commercial air travel and aviation since World War II. It caused significant disruptions to trade in cross-border services because of its negative impact on entertainment and recreational activities. Tourism arrivals declined by 72.3 per cent in 2020 following a four-year period of positive annual growth rates (Figure 7). Adverse events such as the terrorist attacks in September 2001 and the 2007–08 GFC, which were significant, led to much lower losses compared with the current crisis. Export earnings from travel and transport services were severely affected and reduced by US\$535 million and US\$895 million, respectively, in 2020.

Figure 7: International arrivals, growth



Source: authors' illustration based on data from Tourism Research Institute (2021).

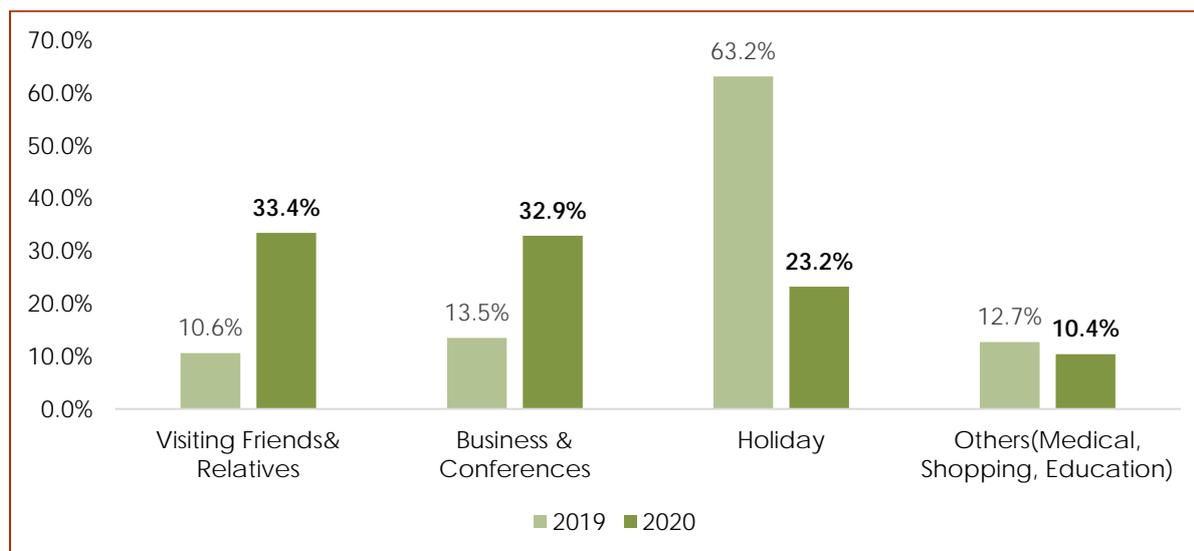
International tourist arrivals by the top 10 source markets that account for about two-thirds of the total declined by between 60 per cent and 80 per cent in 2020. The largest declines occurred with respect to travellers from China (-80.6 per cent), India (-75.7 per cent), the US (-73.4 per cent), and the UK (-72.5 per cent).

Following the re-opening of Kenya's airspace for non-essential travel in August 2020,<sup>3</sup> visiting friends and relatives accounted for 33.4 per cent of the total arrivals whereas business and conferences accounted for 32.9 per cent (Figure 8).

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<sup>3</sup> Data on purpose of travel for international tourism are available from August 2020 because of improvements in the system of collecting arrivals data.

Figure 8: International arrivals by purpose of visit, shares



Source: authors' illustration based on data from Tourism Research Institute (2021).

The recovery in international travel and tourism is expected to take much longer because of repeated waves of elevated COVID-19 infections and subsequent re-introduction of travel restrictions in some regions. There are also concerns that shifts in consumer behaviour may lead to more permanent effects on travel. For instance, business travel may experience a weaker recovery as enterprises adapt to new methods of conducting meetings such as online conferencing. Corporate travellers who account for 12 per cent of passengers generate up to 75 per cent of profit (Godley and Riley 2021). In addition, because of weaker financial positions, companies have cut back on travel. Climate considerations are also on the forefront on corporate decisions reflecting efforts to reduce travel carbon emissions, which implies reduced business travel.

In the next subsections, we examine the impact of the pandemic on exports and imports at the product level by examining the year-on-year changes in the values of exports and imports in each quarter of 2019, 2020, and 2021. We also assess the performance of trade in terms of industry and by key markets. The analysis on trade in goods is undertaken for individual products at the two-digit SITC level. We focus on the top five import and export commodities whose values increased and decreased in 2020 relative to 2019 (Appendix A3 and A4). While it is difficult to disentangle supply and demand effects, the price index for non-oil exports increased marginally by 0.7 per cent in 2020, attributed to beverages and tobacco (13.3 per cent), inedible crude materials (36.9 per cent), and manufactured goods (12.6 per cent). Price indices for animal and vegetable oils, food, and machinery and transport equipment declined by 14.2 per cent, 6.3 per cent, and 46.9 per cent, respectively (Appendix 5). The quantum index for non-oil exports increased by 8.0 per cent attributed to food (21.5 per cent); animal and vegetable oils (79.6 per cent); and miscellaneous manufactured articles (20.3 per cent).

### 3.1 The trade effects on exports

We focus more on the high-peak COVID-19 periods that occurred in the second and fourth quarters of 2020 in order to establish heterogeneous impacts on trade, if any. Nonetheless, the analysis extends to 2021Q2 and gives insights on the recovery patterns.

Detailed analysis of trade effects shows the impact of the first wave of the pandemic, which occurred in 2020Q2, was more severe. Depending on the specific end-use sectors, divergent trends across the goods are observed. In some cases, export demand was adversely affected by the first

wave, but the losses were wholly offset by the gains in the second half of 2020. In other cases, full recovery in export demand did not occur in 2020.

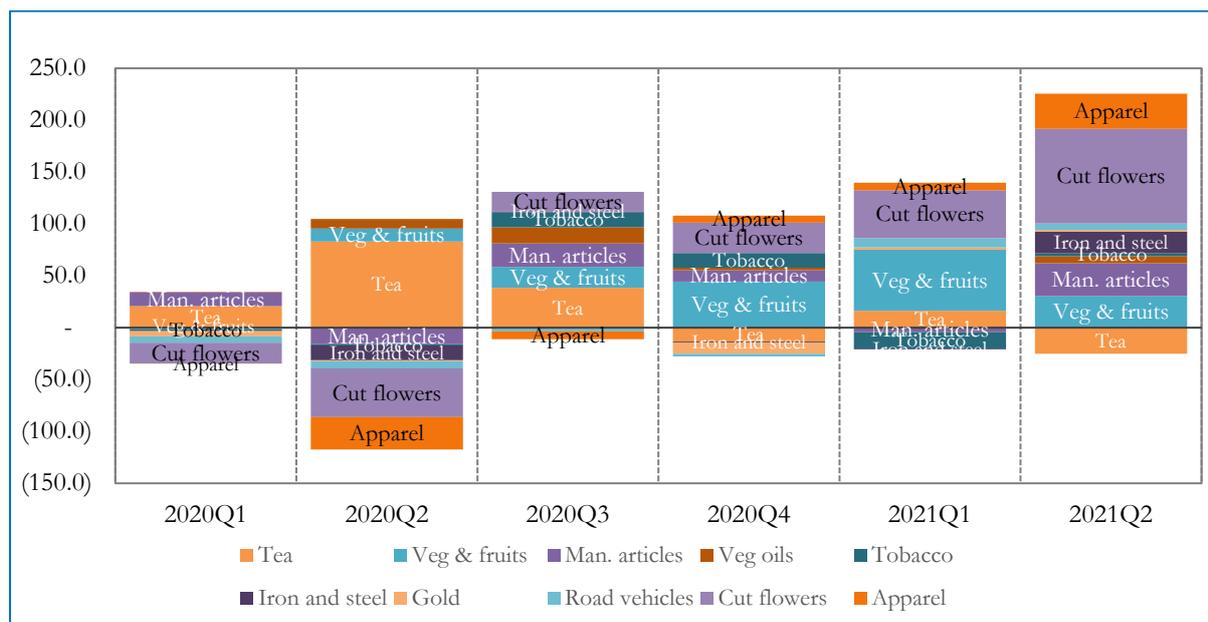
The effects on consumable agricultural products were less intense than on the other product categories. These sectors were classified in the essential services categories. In fact, exports of tea, vegetable oils, and vegetables and fruits increased in 2020Q2 (Figure 9). Earnings from tea improved significantly as the logistics chain for tea remained largely unaffected by COVID-19-related disruption. Furthermore, favourable weather conditions that prevailed in Kenya for most of 2020 ensured adequate supply.

International demand for fruits and vegetables remained resilient despite the presence of air freight challenges in March and April 2020. On an annual basis, Kenya's exports such as tea, fruits, and vegetables surpassed 2019 levels, increasing by 10.2 per cent, 5.4 per cent, and 21.1 per cent, respectively, in 2020. However, while fruit and vegetable exports surpassed pre-pandemic levels, reflecting robust demand, tea exports declined in the first half of 2021. The reduction in tea exports in 2021 is partly attributed to the impact of accelerated purchases in 2020 as buyers brought forward their contracts to mitigate against expected supply-chain disruptions because of the COVID-19 outbreak.

Cut flower exports faced significant disruptions in 2020Q2, attributed to reduced international demand following strict supply restrictions in place at the Netherlands auction, a significant destination market. Second, the suspension of all international flights to and from Kenya on 25 March, with the exception of cargo flights, caused severe constraints to capacity. In particular, cut flower exporters faced significant challenges because of the absence of air cargo capacity following the cessation of international travel. The horticulture industry relies on the belly space of passenger flights for transport; hence, the closure of the Jomo Kenyatta International Airport on 23 March 2020 significantly reduced air cargo.

Nonetheless, measures taken by the government to scale up cargo freight capacity mitigated the transport constraints. Kenya's main airline Kenya Airways resumed international flights on 1 August 2020 and repurposed one of its passenger aircrafts into a cargo freighter. As international demand resumed, cut flower exports recovered in 2020Q3 despite the re-imposition of supply quotas at the auction in Netherlands. Notably, the supply restrictions in place at the auction in the second half of 2020 were more flexible. The increase in demand in the third quarter also reflects Mother's Day festivities and holidays in other parts of the world served through the direct sale channels. The rebound of horticulture exports continued into 2021 (Figure 9) and reflects demand from traditional markets, with no disruptions in the cut flower auction market.

Figure 9: Goods exports (change, year-on-year), US\$ millions



Source: authors' illustration based on data from UNCTADstat (2021) and KNBS (2021).

Exports of apparel, road vehicles,<sup>4</sup> and iron and steel declined in 2020Q2 because of reduced demand. Exports of miscellaneous manufactured articles and iron and steel improved in 2020Q3, which reflects pent up demand. Iron and steel exports, mainly destined for the regional market were significantly affected by a decline in economic activity. Apparel produced in the export processing zone (EPZ) declined markedly in 2020Q2 because of lockdowns in the US as well as inadequate supplies of imported raw material. To support the industry, the Government of Kenya waived the restriction that allows EPZ entities to offload only 20 per cent of their production in the local market in order to qualify for tax benefits, thus giving them access to the domestic market. In addition, EPZ companies were allowed to compete for domestic contracts for PPE kits used to help stop the spread of COVID-19. These measures helped mitigate the losses occasioned by the reduced demand from the US market in the context of COVID-19. Notably, Kenya benefits significantly from the US Africa Growth and Opportunity Act (AGOA) and is one of the three leading exporters utilizing preferences in apparel trade. Exports of apparel improved in 2021Q2 (Figure 9).

Unlike flower exports, the recovery of apparel exports has taken much longer, which is attributable to exposure of the industry to one market as well as its positioning in the GVC. Apparel EPZs operate further down the supply chain, specifically in the *cut, make, and trim* segment and are therefore susceptible to disruptions that emanate further up the value chain. Returns can be improved if firms are able to create a niche in the upper echelons of the value chain.

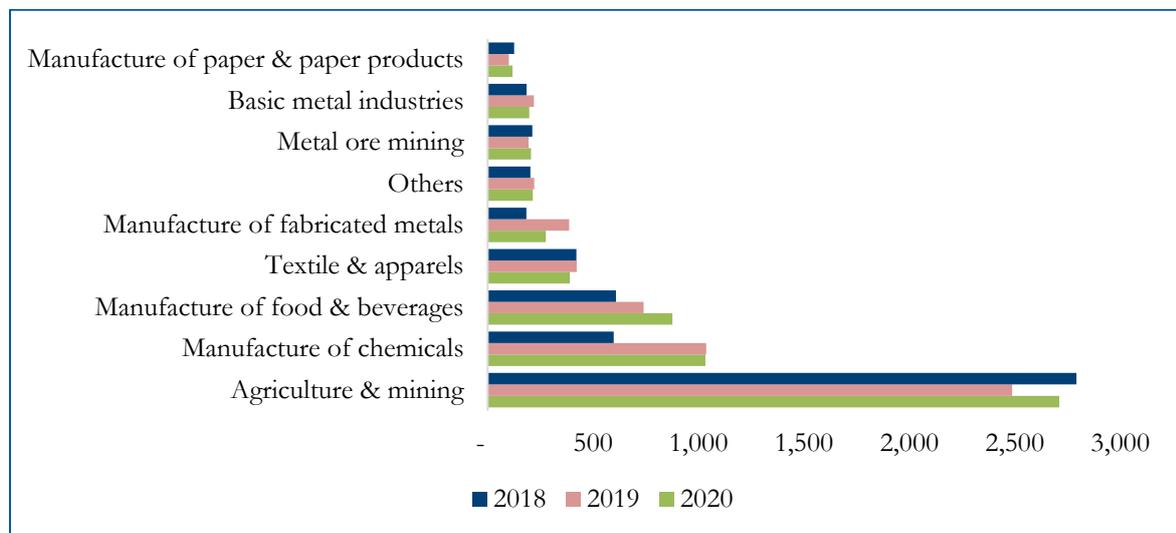
From an industry classification perspective, the improvement in Kenya's exports in 2020 was mainly attributed to the food and beverage manufactures, as well as chemicals, as shown in Figure 10.<sup>5</sup> The food and beverages industry, which was an essential services provider, remained largely

<sup>4</sup> From the assembly plants in Kenya.

<sup>5</sup> The International Standard Industrial Classification (ISIC) of all economic activities is an industry classification maintained by the UN.

open in Kenya and, being the dominant export category, accounted for the highest value of exported goods. Fewer disruptions to the sector that enabled it match demand for essential goods.

Figure 10: Exports by industry, US\$ millions



Source: authors' illustration based on data from UNCTADstat (2021).

We also examine direction of trade in the context of COVID-19 by examining import and export shares with respect to source and destination markets. The import and export shares are computed by taking the respective imports and exports of goods from and to the respective source and destination countries as a proportion of the Kenya's imports (exports) globally for each of these products at the two-digit SITC level.

Destination markets remained relatively stable with some elements of diversification and intensification (Table 1). Exports of fruits and vegetables to the main traditional markets remained steady with the exception of the Netherlands. There were also increased exports of fruits and vegetables to non-traditional markets in Asia, notably India and Pakistan, indicative of alternative markets in the context of the COVID-19 pandemic. Similar trends were observed for tobacco and related products, packaging, and palm oil. However, in the case of apparel, the US remains the destination market under the AGOA. As a result, the reduction in demand from the US market in 2020 was not compensated for by other markets.

Table 1: Main exports by destination market and product, shares

Product	Destination country	Shares		Product	Destination country	Shares	
		2019	2020			2019	2020
<b>Fruits&amp;veg (+76)</b>	UK	25.0	25.0	<b>Cutflowers (-18)</b>	Netherlands	47.0	44.0
	Netherlands	16.0	13.0		UK	15.0	18.0
	France	11.0	11.0		Germany	6.0	6.0
	USA	9.0	6.0				
	UAE	7.0	7.0		<b>Palm oil (+28)</b>	Uganda	54.0
India	0.3	2.7	Rwanda	16.0		10.0	
Pakistan	0.4	1.8	Mexico	7.0		6.0	
<b>Packaging (+27)</b>	Uganda	26.0	22.0		DRC	4.0	3.0
	Tanzania	12.0	11.0		Spain	0.0	7.0
	South Sudan	12.0	21.0	<b>Apparel (-33)</b>	US	94.0	92.0
	Ethiopia	10.0	7.0		<b>Iron &amp; steel (-15)</b>	Uganda	39.0
	Rwanda	8.0	9.0	Tanzania		18.0	15.0
<b>Tobacco (+26)</b>	Somalia	32.0	27.0		Rwanda	16.0	20.0
	Belgium	13.0	11.0		Burundi	5.0	7.0
	DRC	13.0	13.0		Zambia	0.2	1.0
	Sudan	12.0	13.0		Ethiopia	0.1	0.5
	Egypt	3.0	9.0				

Note: figures in parentheses are export changes between 2019 and 2020 in US\$, - denotes a reduction in export values between the two years whilst + denotes an increase.

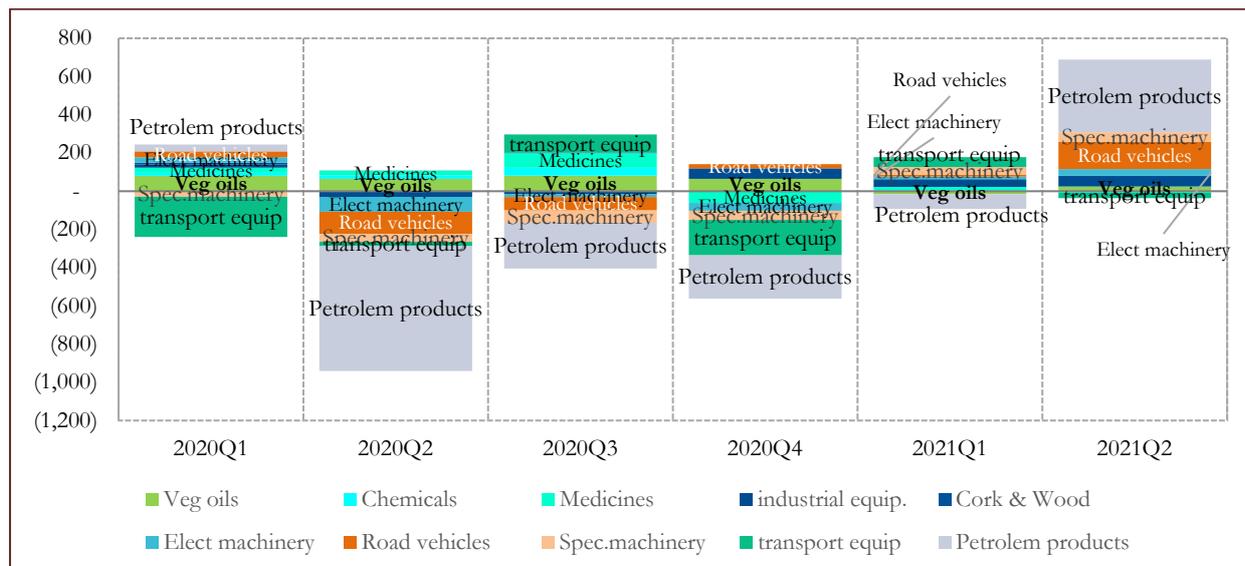
Source: authors' calculations based on data from UNCTADstat (2021) and KNBS (2021).

### 3.2 Imports of merchandise goods

Imports of petroleum-related products and machinery and transport equipment declined significantly in 2020 (Figure 11). The decline in global oil prices was the most significant channel through which the value of Kenya's imports declined. Kenya benefitted from the relatively lower international oil prices given its reliance on refined petroleum products. Imports of machinery and equipment, specifically road vehicles, specialized machinery, electrical machinery, and other transport equipment also declined. The slowdown is partly attributed to reduced government expenditures on infrastructure projects as revenues were redirected to COVID-19 mitigation measures. The private sector delayed purchases of non-essential goods in the context of lingering uncertainty.

In contrast, imports of vegetable oils, chemical goods, medicines, and other industrial equipment increased. Calendaring equipment (under the other industrial equipment category) used in the textile industry, including the manufacture of PPEs, increased. The increases are largely associated with the domestic fight or efforts to navigate the pandemic. Imports of these goods are pivotal to safe packaging, diagnosis, and pharmaceuticals.

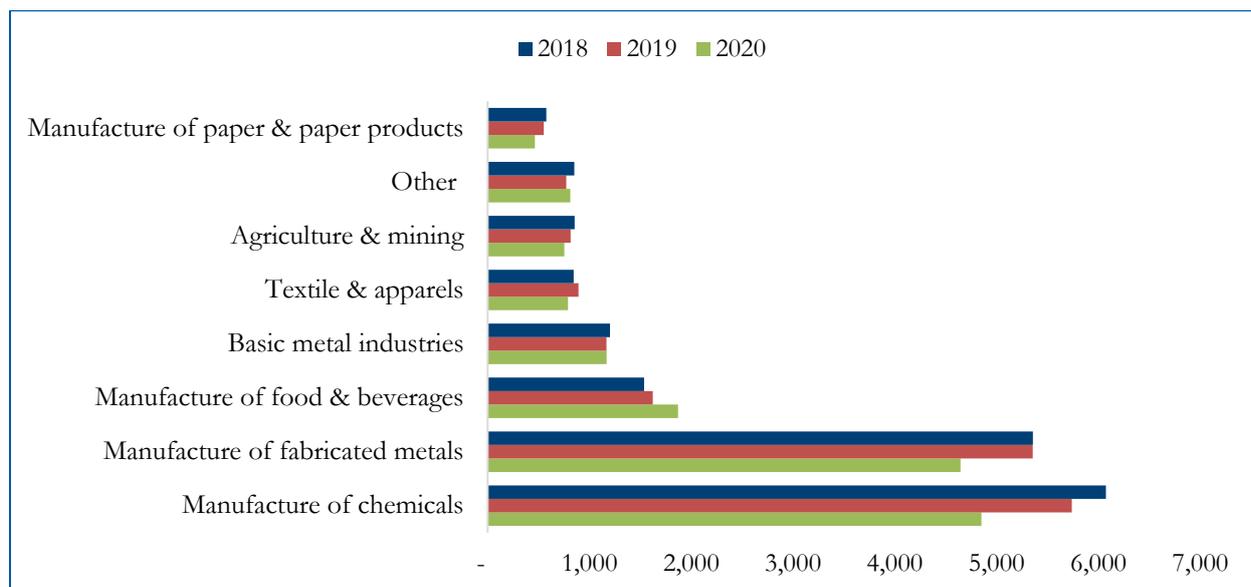
Figure 11: Goods imports (change, year-on-year), US\$ millions



Source: authors' illustration based on data from UNCTADstat (2021) and KNBS (2021).

Imports of the food and beverage industry surpassed the 2019 levels attributable to continued activity in the sector even in the context of COVID-19 (Figure 12).

Figure 12: Imports by industry, US\$ millions



Source: authors' illustration based on data from UNCTADstat (2021).

An assessment of the main import goods by source markets shows that the supply of key products remained largely resilient with some elements of diversification. For instance, about 70 per cent of Kenya's palm oil imports were sourced from Indonesia in 2019 (Table 2). This reduced significantly in 2020 and accounted for about 60 per cent in 2020. In contrast, the share of palm oil imports from Malaysia increased from 20 per cent to 33 per cent in 2020. The reduced supply from Indonesia is partly attributed to COVID-19-related labour supply disruptions. Malaysia's palm oil industry was able to circumvent the labour supply distortions attributed to its relatively high level of mechanization.

Source markets for imports of petroleum-related products were more diverse in 2020 with a sizeable portion of the product being obtained from the Netherlands compared with 2019.

Table 2: Main imports by source market and product, shares

Product	Source market	Shares		Product	Source market	Shares		
		2019	2020			2019	2020	
<b>Palm oil (+291)</b>	Indonesia	70.0	61.0	<b>Chemicals (+73)</b>	China	17.0	21.0	
	Malaysia	20.0	33.0		UK	9.0	14.0	
	Thailand	3.0	1.0		France	12.0	6.0	
	Cambodia	2.0	1.0		India	7.0	8.0	
	USA	1.0	1.0		Germany	7.0	6.0	
	Columbia	0.0	0.6		Belgium	3.0	6.0	
	Peru	0.0	0.5		South Africa	4.0	-	
	India	0.4	0.1		<b>Medicines (+69)</b>	India	46.0	46.0
	Argentina	0.4	-			Germany	7.0	8.0
			China	7.0		6.0		
<b>Petroleum products (-1,084)</b>	UAE	44.0	29.0	Belgium	5.0	7.0		
	Saudi	29.0	20.0	USA	5.0	5.0		
	India	12.0	17.0					
	Oman	2.0	1.0					
	Iran	2.0	2.0					
	Netherlands	1.0	12.0					

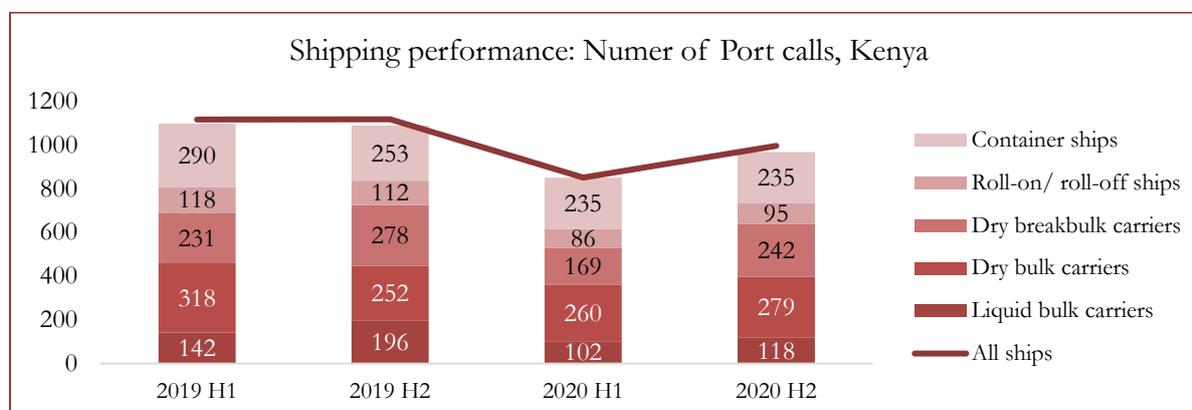
Note: figures in parentheses are import changes between 2019 and 2020 in US\$, - denotes a reduction in export values between the two years whilst + denotes an increase.

Source: authors' calculations based on data from UNCTADstat (2021) and KNBS (2021).

### 3.3 Supply and global value chains

The COVID-19-related disruptions in the major manufacturing hubs affected supply chains and inventory management. A survey conducted by the Kenya Association of Manufacturers (KAM) at the advent of the lockdown showed that over two-thirds of the manufacturers had stocks that could last between zero and three months while only 10 per cent had stocks that could last more than six months. More than three-quarters of the respondents indicated that they faced challenges in obtaining inputs from domestic and external markets and faced significantly higher costs in obtaining intermediate goods (KAM 2020). For instance, the number of calls to the Port of Mombasa, an indicator of shipping activity, declined by 23 per cent in the first half of 2020 (2020H1), attributed to a reduction in dry breakbulk carriers (general cargo) and liquid bulk carriers used for transporting petroleum-related products. Port calls increased by 17 per cent in 2020H2 following improved import demand from easing of lockdown restrictions (Figure 13).

Figure 13: Shipping performance



Source: authors' illustration based on data from UNCTADstat (2021).

On the contrary, the performance of Kenya’s main GVC sectors showed an improvement, although they still remain at a low level. An assessment of Kenya’s export performance in terms of the seven GVC sectors, i.e. intermediate and final goods in apparel and footwear, electronics and vehicles, and final textiles, shows an improvement. The main GVC sector for Kenya is final apparel and footwear, final textiles, and intermediate apparel and footwear. Exports of final apparel and footwear and final textiles improved, as depicted by the increased market shares in 2020 in spite of the COVID-19 disruptions.

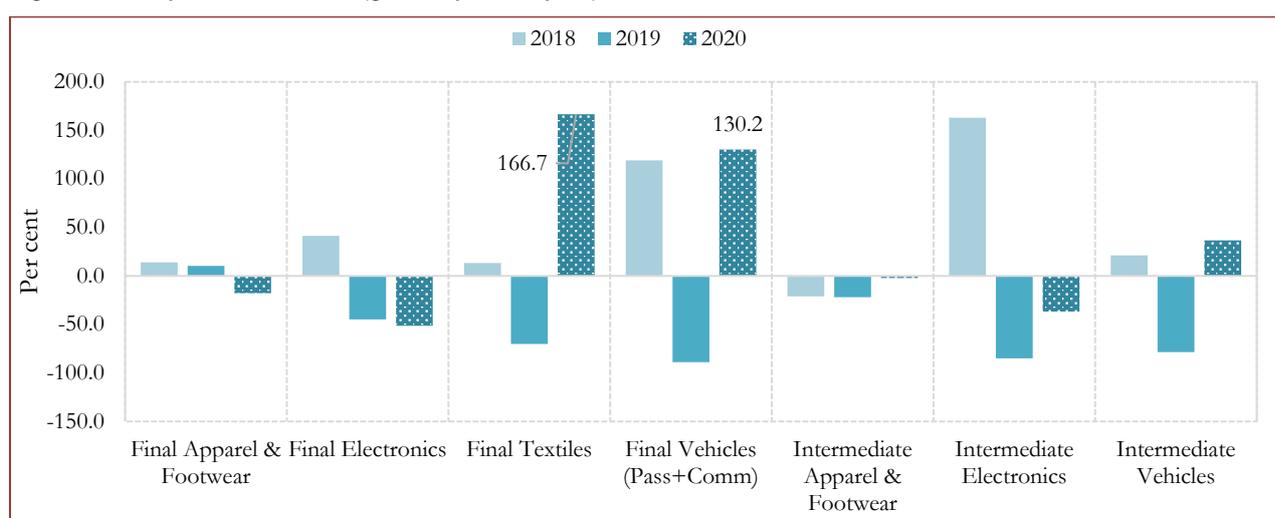
Table 3: Kenya world market shares by GVC sector

GVC sector	2016	2017	2018	2019	2020
Final apparel and footwear	0.080	0.076	0.082	0.092	0.158
Final electronics	0.001	0.001	0.001	0.001	0.001
Final textiles	0.022	0.019	0.021	0.006	0.018
Final vehicles (pass+comm)	0.003	0.002	0.005	0.001	0.003
Intermediate apparel and footwear	0.003	0.003	0.002	0.002	0.010
Intermediate electronics	0.001	0.001	0.002	0.000	0.001
Intermediate vehicles	0.002	0.002	0.003	0.001	0.002

Source: authors’ calculations based on data from World Integrated Trade Solution, World Bank (2022).

Exports of final textiles and final vehicles more than doubled in 2020. The increase in final textiles is attributed to increased demand for PPE mostly—medical masks, gloves, and gowns for frontline healthcare workers. About one-fifth of the manufacturers with a presence in 10 sectors increasingly focused on the production of PPEs, bedding, sanitizers, disinfectants, canned foods, immunity-boosting products, hospital beds, and ventilators (KAM 2020). Industries particularly in the EPZ repurposed and shifted production lines in order to meet the demand financed by international financial institutions. EPZ-based entities shifted manufacturing from men’s apparel to masks starting with three-ply surgical masks and advancing to the more sophisticated N-95 respirator masks (Moyo and Lozansky 2020) . The government also awarded contracts for the production of PPEs to firms, especially those within the EPZ further supporting the sector.

Figure 14: Kenya’s GVC sectors (growth, year-on-year)



Source: authors’ illustration based on data from World Integrated Trade Solution, World Bank (2022).

## 4 Conclusion and policy insights

The COVID-19 pandemic has led to unprecedented challenges including disruptions to international trade. This paper assesses the fairly short-term impact of the COVID-19 pandemic on Kenya's foreign trade using quarterly trade data for the period 2019 to 2021Q2. The analysis shows that merchandise trade declined by 8.6 per cent in 2020, from a positive growth of 0.3 per cent in 2019, largely on account of a notable decline in imports. The latter is mainly attributable to a decline in importation of petroleum products, machinery, and transport equipment, particularly in 2020H1, following a drop in international oil prices and slowdown in infrastructure development activities.

Whereas Kenya's merchandise exports showed resilience, services exports, especially travel and transport services, were severely affected. In particular, merchandise exports increased by 3.3 per cent in 2020 compared to a decline of 3.5 per cent in 2019. The improvement is mainly attributable to increased earnings from exports of tea, horticulture (fruits and vegetables), tobacco, miscellaneous manufactured articles, and vegetable oils. That notwithstanding, exports of horticulture (cut flowers), iron and steel, and apparel declined significantly in 2020. While exports of cut flowers and iron and steel partially recovered in 2020H2 following the resumption of international and regional demand, respectively, those of apparel remained subdued until 2021Q2. The diversification of merchandise exports has nonetheless proved to be beneficial. On the other hand, the tourism sector was adversely affected, on account of a 72.3 per cent decline in international tourism arrivals, thus leading to an adverse effect on services exports.

The analysis further shows that there were elements of diversification towards non-traditional export markets, as exemplified by an increase in export destination country shares to non-traditional markets for certain products, which compensated for the decline in traditional markets. These include India and Pakistan (fruits and vegetables), Egypt (tobacco), and Spain (vegetable oil). In addition, exports to regional markets remained resilient and recovered much faster than those to the rest of the world.

The COVID-19 crisis presents an opportunity to revamp exports through increased diversification of exports and export markets. There is a need to rethink the value chain proposition for the key sectors as well as efforts towards enhancing cargo capacity, which is critical for the horticulture sector and related exports. In particular, measures aimed at re-orienting production in Kenya's apparel sector to enhance value would significantly reduce the industry's exposure to vulnerabilities that occur further down the supply chain and the sole focus on the US market. Furthermore, a clear export recovery strategy for the services sector is needed, especially in view of the severely impacted tourism sector. Key issues worth considering include diversification and sourcing of new markets, as well as innovative strategies in view of the persistent international travel restrictions and social distancing measures to contain spread of new variants of COVID-19. Additionally, although the supply chain for essential imports such as chemicals and medicines, which are pivotal to the containment and treatment of COVID-19, remained resilient, the concentration of global capacity in a few countries is of concern (WTO 2020). Efforts geared towards developing domestic capacity for critical supplies would be welcome. Kenya should leverage opportunities availed through regional trade initiatives such as the recently launched African Continental Free Trade Area (AfCFTA) to boost exports through regional trade, which has shown great potential.

In view of the short span of time coupled with the still evolving COVID-19 pandemic dynamics, the medium- to long-run impacts on Kenya's foreign trade may yet to be fully established. Nonetheless, the country has the necessary levers to revamp the export sector and transform the economy for greater prosperity and resilience.

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## Appendix

Table A1: SITC codes and product description

SITC code	Product Description	SITC code	Product Description
00	Live animals other than animals of division 03	56	Fertilizers other than group 272
01	Meat and meat preparations	57	Plastics in primary forms
02	Dairy products and birds' eggs	58	Plastics in non-primary forms
03	Fish, crustaceans, molluscs and preparations thereof	59	Chemical materials and products, n.e.s.
04	Cereals and cereal preparations	61	Leather, leather manufactures and dressed furskins
05	Vegetables and fruits	62	Rubber manufactures, n.e.s.
06	Sugar, sugar preparations and honey	63	Cork and wood manufactures (excluding furniture)
07	Coffee, tea, cocoa, spices, and manufactures thereof	64	Paper and paper manufactures
08	Feedstuff for animals (excluding unmilled cereals)	65	Textile yarn and related products
09	Miscellaneous edible products and preparations	66	Non metallic mineral manufactures, n.e.s.
11	Beverages	67	Iron and steel
12	Tobacco and tobacco manufactures	68	Non-ferrous metals
21	Hides, skins and furskins, raw	69	Manufactures of metal, n.e.s.
22	Oil seeds and oleaginous fruits	71	Power generating machinery and equipment
23	Crude rubber (including synthetic and reclaimed)	72	Specialised machinery
24	Cork and wood	73	Metal working machinery
25	Pulp and waste paper	74	Other industrial machinery and parts
26	Textiles fibres and their wastes	75	Office machines and automatic data processing machines
27	Crude fertilizers other than division 56, and crude minerals	76	Telecommunication and sound recording apparatus
28	Metalliferous ores and metal scrap	77	Electrical machinery, apparatus and appliances, n.e.s.
29	Crude animal and vegetable materials, n.e.s.	78	Road vehicles
32	Coal, coke and briquettes	79	Other transport equipment
33	Petroleum, petroleum products and related materials	81	Prefabricated buildings, sanitary, heating and lighting fixtures, n.e.s.
34	Gas, natural and manufactured	82	Furniture and parts thereof
35	Electric current	83	Travel goods, handbags, etc.
41	Animal oils and fats	84	Articles of apparel & clothing accessories
42	Fixed vegetable oils and fats, crude, refined or fractionated	85	Footwear
43	Processed Animal and vegetable oils and fats	87	Professional and scientific instruments, n.e.s.
51	Organic chemicals	88	Photo apparatus, optical goods, watches and clocks
52	Inorganic chemicals	89	Miscellaneous manufactured articles, n.e.s.
53	Dyeing, tanning and colouring materials	96	Coin (other than gold coin), not being legal tender
54	Medicinal and pharmaceutical products	97	Gold, non-monetary (excluding gold ores and concentrates)
55	Essential oils for perfume materials and cleaning preparations		

Source: authors' elaboration based on data from UNCTADstat (2021).

Table A2: List of essential services—March 2020

Service category
1. Medical professionals and health workers
2. National security, administration, and co-ordination officers
3. Public Health and sanitation officers in the county governments
4. Licensed pharmacies and drug stores
5. Licensed broadcasters and media houses
6. Kenya Power
7. Food dealers, distributors, wholesalers, and transporters of farm produce
8. Licensed supermarkets, mini-markets, and hypermarkets
9. Licensed distributors and retailers of petroleum and oil products and lubricants
10. Licensed telecommunication operators and service providers
11. Licensed banks, financial institutions, and payment financial services
12. Fire brigade and other emergency response services
13. Licensed security firms

Source: authors' calculations based on data from Kenya Gazette (2020).

Table A3: Products that drove export changes in 2020

Product code	Product description	Shares in total trade (2019)
Increased		
07	Coffee, tea, cocoa, spices, and manufactures thereof	26.7%
05	Vegetables and fruits	10.7%
89	Miscellaneous manufactured articles, n.e.s.	3.0%
42	Fixed vegetable oils and fats, crude, refined or fractionated	1.0%
12	Tobacco and tobacco manufactures	2.5%
Declined		
84	Articles of apparel and clothing accessories	6.7%
78	Road vehicles	0.7%
29	Crude animal and vegetable materials, n.e.s.	13.5%
97	Gold, non-monetary (excluding gold ores and concentrates)	0.0%
67	Iron and steel	3.0%

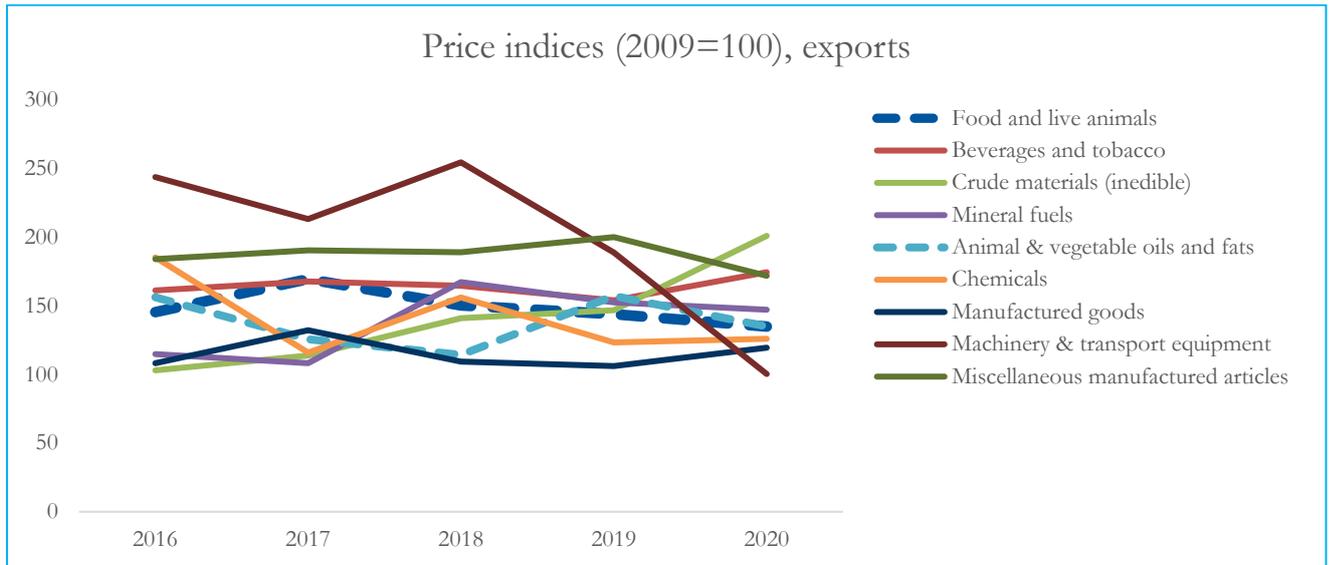
Source: authors' calculations based on data from KNBS (2021).

Table A4: Products that drove import changes in 2020

Product code	Product description	Shares in total trade (2019)
Increased		
42	Fixed vegetable oils and fats, crude, refined or fractionated	3.2%
59	Chemical materials and products, n.e.s.	1.8%
54	Medicinal and pharmaceutical products	3.7%
74	Other industrial machinery and parts	3.2%
24	Cork and wood	0.2%
Declined		
77	Electrical machinery, apparatus and appliances, n.e.s.	4.4%
78	Road vehicles	6.8%
72	Specialized machinery	4.1%
79	Other transport equipment	3.2%
33	Petroleum, petroleum products, and related materials	17.5%

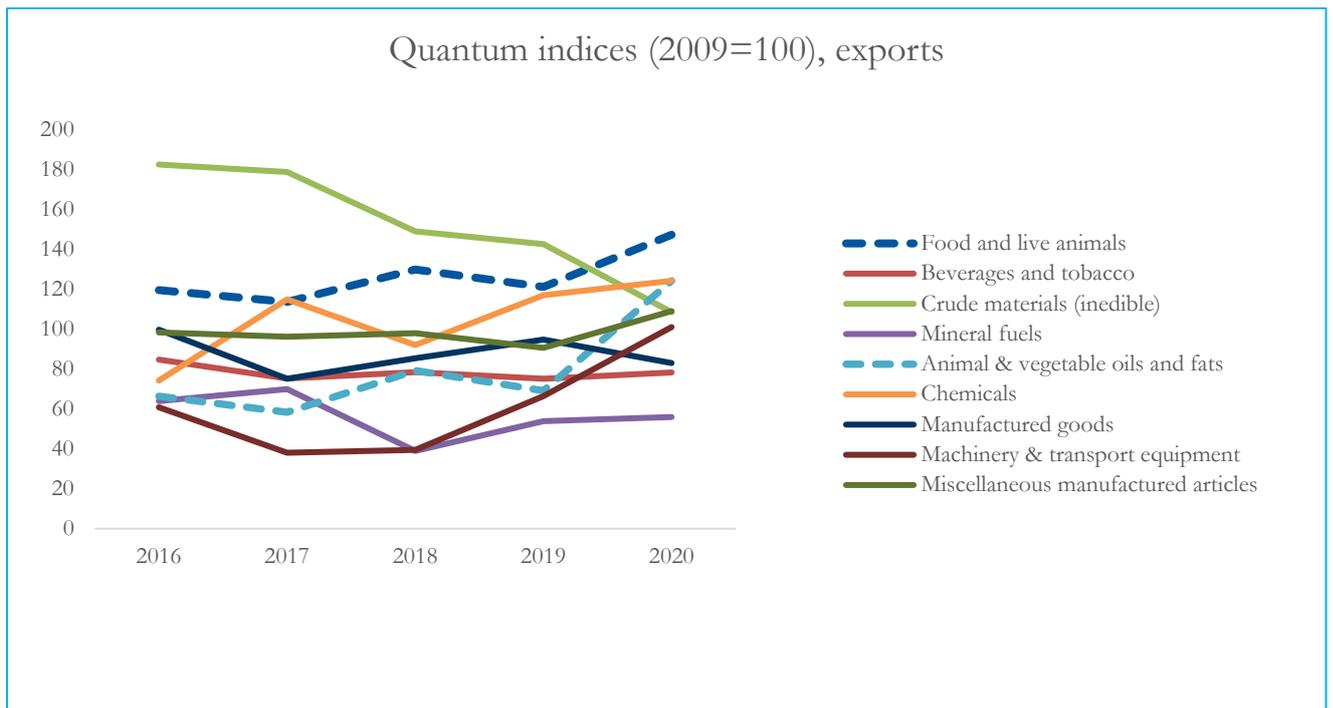
Source: authors' calculations based on data from KNBS (2021).

Figure A1: Export price indices



Source: authors' illustration based on data from KNBS (2021).

Figure A2: Export quantum indices



Source: authors' illustration based on data from KNBS (2021).