ISSN 2413-3175
2020/09

The Commonwealth

INTERNATIONAL TRADE WORKING PAPER

Analysing the Effects of the COVID-19 Pandemic on Medical Supply Chains in Commonwealth Countries

Badri Narayanan Gopalakrishnan, Brendan Vickers and Salamat Ali

International Trade Working Paper 2020/09

ISSN 2413-3175

By Badri Narayanan Gopalakrishnan, Brendan Vickers and Salamat Ali, with inputs and assistance from Sindhu Bharathi Mandharachalam and Sumathi Lalapet Chakravarthy, Infinite Sum Modelling.

Please cite this paper as: Gopalakrishnan, B N, B Vickers and S Ali (2020), 'Analysing the Effects of the COVID-19 Pandemic on Medical Supply Chains in Commonwealth Countries', *International Trade Working Paper* 2020/09, Commonwealth Secretariat, London.

Abstract

This study analyses the supply chains for medical goods across the Commonwealth countries. It assesses trade flows related to the health sector and, more specifically, import and export data for essential COVID-19 medical supplies. It also explores supply chain disruptions (trade interruptions, changes in consumption and tariffs related to imports) caused in the wake of COVID-19. Based on the analysis and key findings, it proposes policy changes and recommendations to increase the resilience of these supply chains, to protect them from such disruptions.

The analysis finds that the global production and trade in COVID-19-related medical goods is highly concentrated. The European Union and the United States monopolise the production of high-tech equipment such as ventilators and oxygen therapy equipment, while China is a leading supplier of personal protective equipment (PPE). Intra-Commonwealth trade in medical supplies is relatively small, with exports mainly dominated by the developed countries and imports by large developing countries. The analysis also finds that export restrictions and high tariffs in many member countries are hampering the trade in medical supplies, and hence reducing its resilience to major shocks such as COVID-19.

JEL Classifications: F10, I11, I15
Keywords: supply chains, medical goods, Commonwealth, health, COVID-19

Contents

Abbreviations and Acronyms

EU	European Union
LDC	least developed country
MFN	most favoured nation (tariffs)
PPE	personal protective equipment
WCO	World Customs Organization
WITS	World Integrated Trade Solution (World Bank)
WHO	World Health Organization

1. Introduction

The massive pandemic, COVID-19, continues to rage at an unprecedented speed covering all continents, although its epicentre has moved to developing countries in southern continents. So far, the disease has affected more than 10 million people in 209 countries, including several countries that are part of the Commonwealth network. In an endeavour to curb the spread of the virus, and contain the infection, governments across the world have imposed lockdown actions, issued precautionary health directives, and have announced economic measures.

More than a third of the world's population remained under some form of restrictions at the time of writing, specifically with respect to access to medical supplies. New Zealand, Singapore, South Africa, India, Australia, the UK, Singapore, Malaysia, Kenya, etc. are some of the notable Commonwealth countries that have imposed either partial or complete lockdowns – with varying degree of severity. Although most of these restrictions have been eased out, the chances of a resurgence or second waves (of the virus) and localised infections loom large.

Industrial companies have in the long run pursued offshoring and outsourcing strategies, motivated by the interest to reduce labour, production and supply chain costs. This has resulted in an increasingly complex supply chain for medical products, which has become global and diversified across various geographical locations. Production stoppages in the primary sources of the supply chain, shortages of raw materials, sub-assemblies and paralysed transport networks have all disrupted the production and supply of essential commodities and medicines. This has led to a future that is uncertain and disorganisation in the execution of activities, ensuing the wild spread of COVID-19.

The World Trade Organization (2020) in a report reveals that in 2019, imports and exports of medical products totalled about US$2 trillion. Trade in products that are described as being critical to manage the pandemic outbreak – disinfectants/sterilisation products; face masks; gloves; hand soap and sanitiser; patient monitors and pulse oximeters; protective spectacles and visors; sterilisers; syringes; thermometers; ultrasonic scanning apparatus; ventilators, oxygen masks; X-ray equipment; and other medical devices – totalled about US$597 billion in 2019, amounting to 1.7 per cent of total merchandise trade in the world. The UK is the only Commonwealth country among the top ten importers and exporters of COVID-19 medical supplies in the world, contributing to 4 per cent of the global trade in these essential goods.

As the world struggles to cope up with COVID-19's unprecedented health, social and economic impact, this report throws light on existing COVID-19-related medical supply chains, with a deeper focus on Commonwealth countries. It unearths their vulnerabilities to pandemics and disaster and proposes policy measures and recommendations to ensure the resilience of the supply chain as they endure this and potential future waves of the pandemic.

This study is organised as follows: section 2 reviews the literature; section 3 lays out the methodology and data sources; section 4 presents the broad summary of findings; section 5 provides greater details of the results; section 6 reviews the policy aspects involving trade restrictions and tariffs; and section 7 concludes with policy recommendations.

2. Literature review

Vidrova (2020) lists the enormous benefits that businesses can gain from participating in the global supply chain. These include the possibility to source high-quality products, push their costs down, increased competitiveness, market stability, being able to gain access to new production and new distribution methods, and continuous performance improvement. Though there exist uncertainties and disruptions owing to geographical distance, the positive benefits

far outweigh the challenges. Christopher and Holweg (2011) reveal that the interdependence of supply chain parties has increased and failure, disruption and turbulence in one part of the world puts the whole supply chain at risk. Such turbulences and disruption in the supply chain are predicted to increase in future.

Harrington and Smith (2013) describe how the healthcare supply chain comprises three important components: 1) the pharmaceutical supply chain; 2) medical device supply chain; and 3) the medical service supply chain. The healthcare supply chain is defined as: 'the information, supplies, and finances involved with the acquisition and movement of goods and services from the supplier to the end user in order to enhance clinical outcomes while controlling costs'. This definition identifies three critical aspects of the supply chain as being finances, supplies and information. These aspects are embodied by the three healthcare supply chain constructs of affordability, access and awareness.

According to Whewell (2009), the pharmaceutical industry supply chain covers the entire spectrum of drug research, development and manufacture; distribution and application through a range of healthcare services; along with all the businesses that help these processes deliver efficiency. As the pharmaceutical industry is fundamentally a business dealing with the life and health of people, it is hugely complex – involving huge markets, products, processes and intermediaries. A typical medical device supply chain includes manufacturers, parts suppliers, raw material suppliers and distribution channels, as per Liao et al. (2019).

Vries and Huijsman (2011), in their comprehensive study on supply chain management in health services, reveal that the last four decades have witnessed a gradual shift and upheaval in the focus of industrial companies from individual processes to chain orientation. Although many healthcare organisations, including pharmaceutical manufacturers, hospitals and medical device manufacturers, have recognised the importance of adopting supply chain management practices, the application of techniques, methods and best practices originally developed in an industrial setting is clearly complex. This is because of the technologies being used, the existence of multiple stakeholders, a dynamic internal and external environment, and distinctive characteristics of health service operations that often impede a straightforward application.

Ebel et al. (2013) quotes, supply chains now account for nearly 25 per cent of pharmaceutical costs and more than 40 per cent of medical device costs. The annual spending is huge, amounting to US$230 billion on pharmaceuticals and US$122 billion on devices, such that even small efficiency gains could free up billions of dollars for investments elsewhere.

Mathew et al. (2013) show that service providers within the healthcare industry are under enormous pressure owing to increasing competition, strict government regulations, rising costs, and the mandated demand to always deliver a high-quality service. This is being compounded by the fact that the various operations within the industry are highly interdependent, and also highly vulnerable to disruptions. Overall efficiency can only be improved by improving the efficiency of every link in the supply chain.

Bhakoo and Chan (2011) reveal the complexity of a pharmaceutical supply chain because it involves different stakeholders, including pharmaceutical manufacturers, wholesalers, distributors, customers, information service providers and regulatory agencies. As a result, the pharmaceutical sector of most developing countries except a few is unable to make significant contributions to the global market. For instance, Mahajan et al. (2015) demonstrate that the Indian pharmaceutical industry has largely capitalised on its low-cost production of generic drugs. EEPC India (2013) shows that India's pharmaceutical exports were around US$8 billion in 2009, and reached US$19.13 billion in 2019 and then US$20 billion in 2020 – demonstrating a growth rate of over 30 per cent. That the cost of manufacturing pharmaceutical machinery in India is the lowest in the world, gives the country a leading edge in world's markets (Deloitte 2019). India accounts for approximately 20 per cent of global generics output, while generic drugs account for three-quarters of the Indian market by volume. Local production of generic drugs and vaccines keeps prices low, while local companies are taking advantage of low labour and research costs to export generics.

Around two-thirds of all disposable gloves are manufactured in Malaysia, which exports 16. 2 billion ringgit's (RM) worth of gloves.

Malaysia mainly imports synthetic rubber from South Korea, Japan and Thailand. When it comes to latex gloves, the raw material is extracted from the rubber tree, which mostly grows in Southeast Asia, Western Africa and South America (Bhutta et al. 2016).

Hamrick and Bamber (2019) reveal that Pakistan leads production in the world of surgical instruments such as scissors, forceps, scalpels and suture needles. Sialkot, a city in Pakistan, produces around 80 per cent of the world's supplies. The raw material needed to produce stainless steel instruments is iron ore and iron scrap, which is imported from China, the world's largest iron producer. Pakistan's involvement is mostly in components manufacturing (from die casting to final components) and assembly segments (assembly, packing and sterilisation), while most instruments are finally packed and branded in other countries including the US, the UK and Germany. Pakistan exports medical goods to 107 countries.

Linton and Vakil (2020) reveal that the world's largest 1,000 companies or their suppliers own more than 12,000 facilities (factories, warehouses and other operations) in COVID-19 quarantine areas. A total of 1,796 life sciences, healthcare and medical device manufacturers have been put in jeopardy due to their location in the worst-hit areas. Of these, 1,562 are in China, 230 in Italy and 4 in South Korea. The World Health Organization Fortune (2020) reveals that 94 per cent of Fortune 1000 companies are enduring supply chain disruptions from COVID-19.

Historical evidence suggests that among various disasters that have hit humankind, the outbreak of epidemics and pandemics has distorted human and material capital, killed a large number of people, and has disrupted value chains at the global level. The explosion of the Plague epidemic in late Medieval Europe (from 1347 to 1352) caused severe fatalities notably in Tuscany and France where the average morbidity rates were 44% and 55% respectively. The Spanish Influenza pandemic killed between approximately 20 and 50 million people during the 1918–19 (Benedictow 1987). The last 20 years of this century have witnessed several epidemics including SARS, H7N9, Zika and Ebola, and this year it is the COVID-19 pandemic.

Given the context set by the literature, our study aims to assess the trade flows related to the health sector in Commonwealth member countries and, more specifically, evaluate import and export data for the essential COVID-19 medical supplies of each Commonwealth member across the globe. It also aims to analyse and model the supply chain disruptions (trade interruptions, changes in consumption and tariffs related to imports), caused in the wake of COVID-19, within Commonwealth countries. Based on the analysis and key findings, policy changes and recommendations are proposed to increase the resilience of the supply chains to protect them from such disruptions.

3. Methodology and data sources

As identified by the World Customs Organization (WCO)[1], there are about 60 specific pharmaceutical or medical products that play an essential role in controlling, identifying and treating the COVID-19 pandemic. These 60 pharmaceutical products and medical equipment are grouped under 8 categories: i) COVID-19 test kits/ instruments and apparatus used in diagnostic tests; ii) protective garments and the like; iii) disinfectants/sterilisation products; iv) medical devices; v) oxygen therapy and pulse oximeters; vi) soaps; vii) medical consumables; and viii) vehicles, based on their role/relevance in the COVID-19 supply chain.

In order to explore the global supply chain of the above-mentioned products both specific to Commonwealth countries and to the rest of the world, an analysis of the trade flow data for these product categories between 2017 and 2019 was carried out using data from World Integrated Trade Solution (WITS). To obtain the average trade flow values, this report looks at trade flow value for every Commonwealth country across every partner

and then averages the same across the three years, ignoring any missing observations. In other words, if 2019 data are missing, we take the total of 2017 and 2018 and then divide it by two. Furthermore, trade data are also mirrored at a partner–product combination level. If an import observation is missing for a country as a reporter from partner X, then the value from the exports observation that may be available for the same country as a partner for the reporter X is taken. In this way, many missing observations were filled out using the mirrored data.

Another alternative method to treat missing data is to assume that they are zeros. We do not pursue this alternative method, because, particularly in 2019, there are many missing values – probably because of the lack of timely reporting of trade data by many countries – and they are most likely not zeros. The same could be true even for a few previous years for some categories. The World Trade Organization (WTO) handbook for trade analysis[1] suggests the following:

> … Sometimes the nature of the data suggests entry errors rather than zero trade; for instance, when a regular trade flow is observed over several years with a zero in between. In that case 'interpolation' (taking the average of the previous and next entries) is valid. However, trade data at high degrees of disaggregation is typically volatile, making interpolation risky ….

The quote above from the handbook clearly discusses 'zeros' and not 'missing values'. We do recognise that entries that are zeros must be respected, owing to the HS-6 disaggregated data being perhaps volatile over time. Therefore, we do not ignore zeros at all. We only treat missing data as exactly what it is – an observation that is missing (and not necessarily zero) and hence, it needs to be ignored.

4. Main findings

Our analysis reveals that the aggregate import of COVID-19 medical supplies to the Commonwealth countries is US$196 billion and the aggregate export of the same from Commonwealth nations is US$180 billion. Figures 1(a) and (b) present an overview of the aggregate trade flows of COVID-19-related medical supplies over the past three years among the Commonwealth and non-Commonwealth countries.

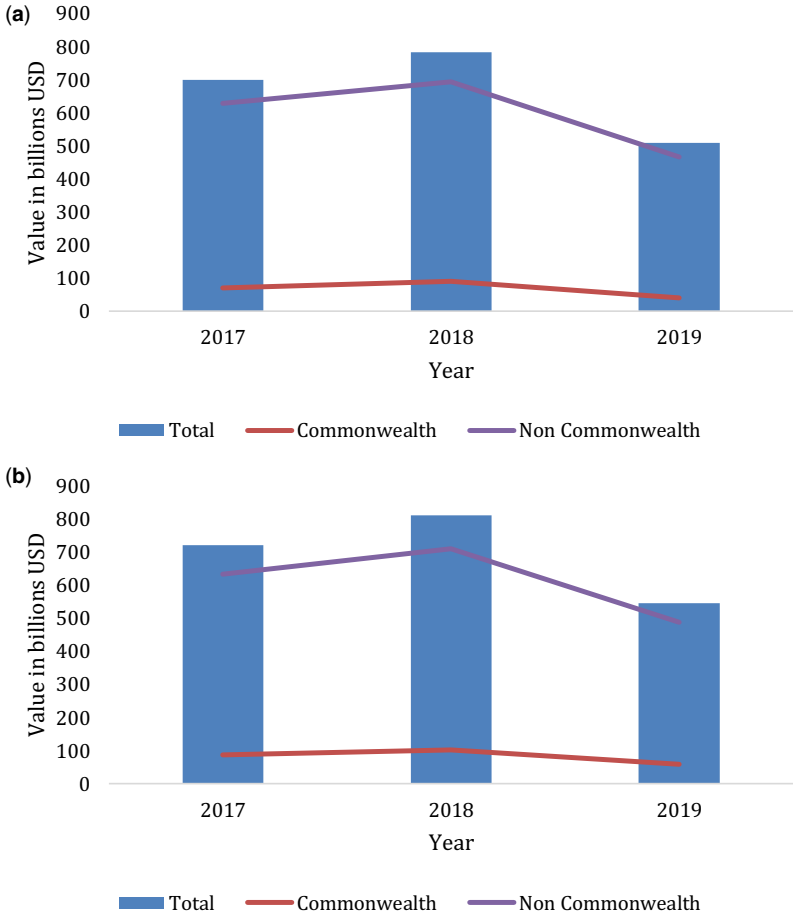
The analysis also reveals that of the total Commonwealth trade in COVID-19 medical supplies, 13 per cent of the trade is within the Commonwealth member nations; in other words, it contributes to intra-Commonwealth trade. The US is the leading supplier of all COVID-19-related products to Commonwealth countries and supplies around 21 per cent of the total demand.

Table 1 presents a more detailed picture of the magnitude and intensity of the spread of COVID-19, by presenting the number of infected people and the death rate in the countries that are part of the Commonwealth network, as well as the trade flow value in these countries (figures as at 12 July 2020).

While the total number of people infected by the COVID-19 virus around the world is about 12.7 million (as on 12 July 2020), there are about 2 million (16.5%) infected people in the Commonwealth countries. Within the Commonwealth network, India is the most affected, and there is a notable spread in countries like the UK and Pakistan. Of the total 89,846 deaths in the Commonwealth network, the UK has recorded the highest number with about 44,883 deaths. Across the entire globe, developed countries have been the worst affected.

The outbreak of the novel coronavirus and its aftermath has had dire, immediate and pronounced consequences on medical supplies – spiking a demand for diagnostic kits, critical medicines, artificial respiratory equipment and services. This is given that there are no standard medicines or treatment procedures for the virus. The increase in demand to manage the deluge of victims caused by the pandemic has gained the spotlight, as it is unable to be met by disrupted production and supply in the already-fragile medical supply chains emanating from countries across the globe.

Figure 1. Exports of COVID-19-related medical supplies. (b) Imports of COVID-19-related medical supplies



The ten largest supplying countries made up around three-quarters of total world exports in medical supplies, while the ten largest importers accounted for two-thirds of world imports (see Table 2).

The UK is the only Commonwealth country in the list in Table 2, exporting and importing US$38.2 billion and US$41.1 billion respectively and making up to 4 per cent of total COVID-19-related imports and exports in the world.

Table 1. Aggregate trade flows and case counts related to COVID-19 medical products (all categories) (as of 12 July 2020)

Regions	Population, total (2018)	Health expenditure (% of GDP) (2017)	WHO Index (5 = best, 1 = worst)	Medium age	No. of cases	No of Deaths	Total imports (value in millions US$)	Total exports (value in millions US$)
All Commonwealth	2,494,247,972	7	4	32	2,111,218	89,846	179,735	196,066
of which								
Developed	135,015,692	9	4	38	412,439	53,858	89,239	138,010
Australia	24,982,688	9	3	37	9,553	107	6,088	25,520
Canada	37,057,765	11	5	40	109,150	8,818	20,359	37,849
Cyprus	1,189,265	7	4	35	1,014	19	568	892
Malta	484,630	9	–	41	674	9	1,016	748
New Zealand	4,841,000	9	5	37	1,544	22	1,509	3,856
United Kingdom	66,460,344	10	5	40	290,504	44,883	59,700	69,146
Developing	2,359,232,280	6	3	25	1,698,779	35,988	90,496	58,056
Africa	555,604,267	6	3	20	357,774	5,579	5,441	14,922
Botswana	2,254,126	6	2	22	314	1	4	211
Cameroon	25,216,237	5	3	18	14,916	359	3	239
eSwatini	1,136,191	7	3	20	1,311	18	0	35
Gambia, The	2,280,102	3	2	17	64	3	26	898
Ghana	29,767,108	3	3	20	24,248	135	89	659
Kenya	51,393,010	5	3	19	9,726	184	4	117
Lesotho	2,108,132	9	2	21	184	1	1	143
Malawi	18,143,315	10	3	17	2,261	33	194	389
Mauritius	1,265,303	6	–	34	342	10	4	547
Mozambique	29,495,962	5	3	17	1,135	9	8	498
Namibia	2,448,255	9	2	21	668	1	18	1,413
Nigeria	195,874,740	4	3	18	31,987	724	1	102
Rwanda	12,301,939	7	3	18	1,299	4	19	56
Seychelles	96,762	5	3	32	100	0	5	52

(*Continued*)

Table 1. Aggregate trade flows and case counts related to COVID-19 medical products (all categories) (as of 12 July 2020) (*Continued*)

Regions	Population, total (2018)	Health expenditure (% of GDP) (2017)	WHO Index (5 = best, 1 = worst)	Medium age	No. of cases	No of Deaths	Total imports (value in millions US$)	Total exports (value in millions US$)
Sierra Leone	7,650,154	13	3	19	1,618	63	4,878	7,151
South Africa	57,779,622	8	3	26	264,184	3,971	91	166
Tanzania	56,318,348	4	3	17	509	21	31	943
Uganda	42,723,139	6	3	16	1,013	0	49	705
Zambia	17,351,822	4	2	17	1,895	42	16	600
Asia	1,785,970,316	4	4	28	1,339,357	30,351	84,958	42,337
Bangladesh	161,356,039	2	3	25	181,129	2305	959	753
Brunei Darussalam	428,962	2	4	30	141	3	5	306
India	1,352,617,328	4	3	26	849,553	22,674	27,794	13,772
Malaysia	31,528,585	4	5	27	8,704	122	19,387	7,446
Maldives	515,696	9	3	25	2,664	13	1	192
Pakistan	212,215,030	3	2	22	248,872	5,197	2,765	2,813
Singapore	5,638,676	4	5	38	45,783	26	32,822	15,757
Sri Lanka	21,670,000	4	3	31	2,511	11	1,225	1,298
Caribbean	6,782,974	5	3	30	1,616	58	70	540
Antigua and Barbuda	96,286	5	5	30	74	3	0	11
Bahamas, The	385,640	6	3	32	111	11	2	96
Barbados	286,641	7	3	37	103	7	8	41
Belize	383,071	6	3	23	37	2	1	57
Dominica	71,625	6	3	34	18	–	5	8
Grenada	111,454	5	3	26	23	–	0	6
Guyana	779,004	5	3	22	291	17	11	33
Jamaica	2,934,855	6	3	28	758	10	29	152
Saint Kitts and Nevis	52,441	5	3	36	17	–	2	6

(*Continued*)

Table 1. Aggregate trade flows and case counts related to COVID-19 medical products (all categories) (as of 12 July 2020) (*Continued*)

Regions	Population, total (2018)	Health expenditure (% of GDP) (2017)	WHO Index (5 = best, 1 = worst)	Medium age	No. of cases	No of Deaths	Total imports (value in millions US$)	Total exports (value in millions US$)
Saint Lucia	181,889	5	3	30	22	–	1	7
Saint Vincent and The Grenadines	110,210	4	3	29	29	–	4	6
Trinidad and Tobago	1,389,858	7	3	33	133	8	7	116
Pacific	10,874,723	7	2	22	32	–	26	257
Fiji	883,483	4	2	27	21	–	19	127
Kiribati	115,847	11	2	23	–	–	0	3
Nauru	12,704	11	1	22	–	–	1	3
Papua New Guinea	8,606,316	2	2	21	11	–	4	88
Samoa	196,130	5	2	21	–	–	0	10
Solomon Islands	652,858	5	2	20	–	–	1	8
Tonga	103,197	5	2	21	–	–	0	6
Tuvalu	11,508	17	2	26	–	–	0	0
Vanuatu	292,680	3	2	22	–	–	0	10

Source: a. World Integrated Trade Solutions.
b. World Health Organization.

Table 2. Ten largest exporters and importers of medical supplies across the globe

	Country	Export value (in billion US$)	% of world exports		Country	Import value (in billion US$)	% of world imports
Exports	Germany	136.2	14	Imports	USA	193.1	19
	USA	116.6	12		Germany	86.7	9
	Switzerland	89.9	9		China	65	6
	Netherlands	73.1	7		Belgium	56.6	6
	Belgium	65.8	7		Netherlands	52.7	5
	Ireland	65.3	7		Japan	44.8	4
	China	51.6	5		UK	41.1	4
	France	49.9	5		France	40.5	4
	Italy	42.9	4		Italy	37.1	4
	UK	38.2	4		Switzerland	36.9	4

Source: World Trade Organization 2020a.

5. Detailed results and findings

Table 3 and Figure 2 provide a more detailed view about the supply chain players to the Commonwealth countries and their share in the trade. An analysis of the trade flows reveals the clear leadership of the United States, Germany and China in the export of COVID-19 medical supplies to Commonwealth countries. The US, Germany, China, Switzerland and Netherlands are the top suppliers of COVID-19-related products to Commonwealth countries. They make up to 56 per cent of the total supplies, with the US and Germany the top suppliers of test kits/instruments, disinfectants and sterilisation products, medical equipment, soaps, medical consumables, and oxygen therapy and pulse oximeters, to Commonwealth countries. China is the leading supplier of protective garments (about 35% of total supplies) and second largest supplier of transport vehicles (about 16%).

Further, looking at exports and imports among the four different Commonwealth regions, developed Commonwealth countries (including Australia, Canada, United Kingdom) show clear leadership in the COVID-19 medical supply trade among Commonwealth countries. From a deeper look at both the imports and exports, it can be clearly seen that these medical supplies go through several iterations from raw materials to manufacturing before they reach the final product phase. They therefore possess a bigger challenge during this pandemic in terms of quickly ramping up production.

Forty-four per cent (44%) of total exports of all COVID-19-related medical supplies are disinfectants and sterilisation products. Of the remaining 56 per cent, 13 per cent of the total export of COVID-19-related medical supplies are protective garments, 12 per cent of them are vehicles, 11 per cent are oxygen therapy equipment and pulse oximeters, 9 per cent medical devices and equipment, while medical consumables make up to 8 per cent of total exports.

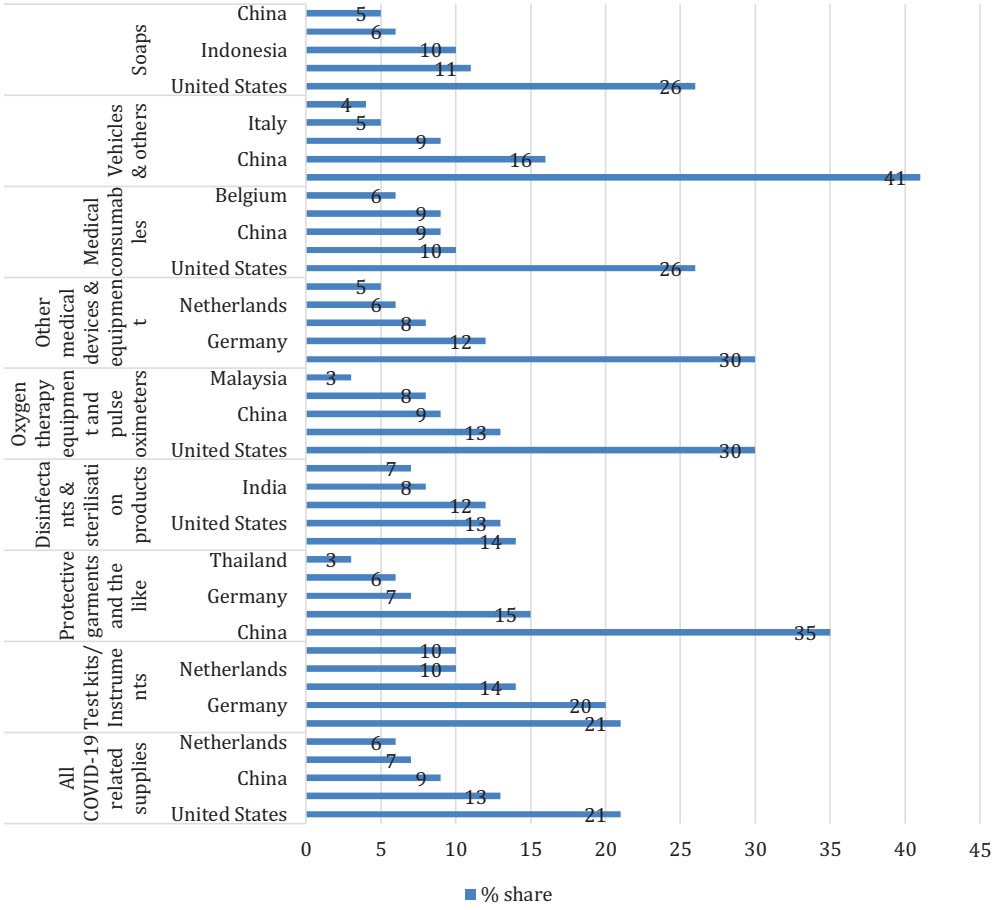
Thirty-three per cent (33%) of the total imports of the COVID-19-related medical supplies are disinfectants and sterilisation products, 16 per cent are test kits and instruments, 14 per cent of the imports are protective garments, and 12 per cent are medical consumables and medical equipment.

Fifty-five per cent (55%) of total exports by Africa are oxygen therapy equipment and pulse oximeters, while 20 per cent are disinfectants and sterilisation products. Forty-six per cent (46%) of the total imports in Africa are disinfectants and sterilisation produces, while 11 per cent are protective garments.

Table 3. Leading suppliers of COVID-related health products to Commonwealth countries

Category	Top sources	% share	Value in millions USD
All COVID-19 related supplies	United States	21	40,458.6
	Germany	13	25,341.8
	China	9	17,372.0
	Switzerland	7	13,195.9
	Netherlands	6	12,741.7
Test kits/ Instruments	United States	21	6,356.2
	Germany	20	6,325.0
	Switzerland	14	4,171.7
	Netherlands	10	3,237.0
	Belgium	10	2,981.7
Protective garments and the like	China	35	9,264.1
	United States	15	4,073.3
	Germany	7	1,753.3
	Malaysia	6	1,609.8
	Thailand	3	746.7
Disinfectants & sterilisation products	Germany	14	8,974.0
	United States	13	8,738.3
	Switzerland	12	7,910.3
	India	8	5,292.5
	Belgium	7	4,836.8
Oxygen therapy equipment and pulse oximeters	United States	30	5,403.7
	Germany	13	2,336.7
	China	9	1,623.9
	Netherlands	8	1,428.0
	Malaysia	3	626.8
Other medical devices & equipment	United States	30	7,027.0
	Germany	12	2,738.4
	China	8	1,854.6
	Netherlands	6	1,385.5
	Japan	5	1,220.9
Medical consumables	United States	26	6,361.6
	Germany	10	2,443.4
	China	9	2,094.8
	Netherlands	9	2,091.4
	Belgium	6	1,516.9
Vehicles & others	United States	41	1,585.4
	China	16	605.3
	Germany	9	368.9
	Italy	5	181.5
	France	4	160.9
Soaps	United States	26	913.1
	Germany	11	402.0
	Indonesia	10	341.8
	Malaysia	6	222.1
	China	5	184.3

Figure 2. Leading suppliers of COVID-related health products to Commonwealth countries



Source: World Integrated Trade Solutions.

Forty-one per cent (41%) of the total exports in Asia are disinfectants and sterilisation products and 19 per cent are protective garments. Imports are diversified: 19 per cent are disinfectants and sterilisation products, 19 per cent are medical devices and equipment, 17 per cent are medical consumables, and 16 per cent of are protective garments.

Seventy-four per cent (74%) of the exports from the Caribbean are disinfectants and sterilisation products. Meanwhile, 29 per cent of the imports from the Caribbean are disinfectants and sterilisation products, 15 per cent are medical consumables, 14 per cent are of medical devices and equipment, and also of protective garments.

Forty-nine per cent (49%) of the exports from developed countries are disinfectants and sterilisation products, while 14 per cent are COVID-19 test kits and instruments. In terms of imports, 37 per cent are disinfectants and sterilisation products, and 17 per cent are COVID-19 test kits and instruments.

Fifty-nine per cent (59%) of the exports from the Pacific are protective garments and 15 per cent of them are disinfectants and sterilisation products. In terms of imports, 25 per cent are disinfectants and sterilisation products, 19 per cent are protective garments, and 14 per cent are other medical devices and equipment.

Of the total trade of US$179.735 billion worth of COVID-19-related medical supplies, US$24.239 billion is within the Commonwealth member countries while 13 per cent of total trade is between the Commonwealth countries. Australia is the largest importer from Commonwealth countries and India is the largest supplier to Commonwealth countries. Australia is the largest importer of COVID-19 test kits and the UK is the largest supplier; Canada is the largest importer of disinfectants and sterilisation products and India is the leading supplier. Australia is the largest importer of medical consumables and medical devices, and Singapore is the major supplier of the same

Table 4. Distribution of trade in COVID-19 medical products (all categories)

	Exports (value in millions USD)						Imports (value in millions USD)					
Medical product category	All	Africa	Asia	Carribean	Developed	Pacific	All	Africa	Asia	Carribean	Developed	Pacific
Test kits/instruments	20,694.2	190.3	7,451.9	2.8	13,047.5	1.6	30,877.5	1,514.8	5,506.5	44.0	23,792.5	19.6
Protective garments and the like	24,067.1	298.9	16,055.5	1.6	7,695.9	15.2	26,681.4	1,630.9	6,724.7	75.4	18,200.4	49.9
Disinfectants & sterilisation products	79,477.9	1,101.3	34,609.0	51.7	43,712.1	3.7	65,803.9	6,801.1	8,262.6	158.4	50,518.3	63.5
Oxygen therapy equipment and pulse oximent	20,225.9	2,991.2	7,754.6	1.2	9,478.0	0.9	18,066.4	1,024.0	5,528.6	58.2	11,434.0	21.7
Other medical devices & equipment	15,456.9	256.2	8,920.7	6.0	6,272.1	2.0	23,224.9	1,511.6	7,854.2	74.3	13,749.5	35.3
Medical consumables	15,133.6	305.6	8,697.2	6.1	6,123.4	1.4	24,018.1	1,553.4	7,159.4	78.1	15,194.5	32.7
Vehicles & others	1,507.5	59.4	181.4	0.6	1,266.0	0.2	3,895.9	372.9	502.0	22.4	2,983.6	15.0
Soaps	3,171.9	238.1	1,288.2	0.3	1,644.5	0.8	3,498.2	513.5	799.3	28.7	2,137.5	19.2

Source: World Integrated Trade Solutions.

to Commonwealth countries. Singapore is the leading importer of oxygen therapy equipment and pulse oximeters, while Malaysia is the major exporter of the same to Commonwealth nations. The United Kingdom is the largest importer of protective garments and Malaysia is the leading supplier. Within Commonwealth nations, disinfectants and sterilisation products make up to 43.5 per cent of total trade of all COVID-19-related medical supplies. Asian

Figure 3. Exports and imports of COVID-19 medical supplies

Commonwealth members are the leading suppliers and make up about 59.6 per cent; developed Commonwealth countries make up to 32.7 per cent, with Africa at about 7.36 per cent. While the leading importers of COVID-related supplies from Commonwealth countries are the developed member countries (45.35%), Asia makes up about 31.18 per cent and Africa about 22.47 per cent. Commonwealth countries from the Caribbean and Pacific regions comprise a tiny portion of intra-Commonwealth trade.

The following graphs give a detailed description of all exports and imports of the eight COVID-19 categories by the four Commonwealth regions, further illustrating the above observations.

6. Analysis of tariffs and trade restrictions

6.1 Tariff restrictions

The WTO report (2020b) also reveals that the average tariff for COVID-19 medical products stood at 4.8 per cent and 134 WTO members imposed a tariff of 5 per cent or lower on medical products, albeit tariffs on masks can be as high as 55 per cent in some countries. Tariffs imposed on some products are very high. The average tariff imposed for hand soap is 17 per cent, while in some countries it is as high as 65 per cent. For protective supplies used in the fight against COVID-19, the average tariff is about 11.5 per cent, while in some countries it is as high as 27 per cent. Table 5 provides a brief overview based on our analysis, outlining the import tariffs for all major COVID-19 medical supply categories.

Even after the rapid surge in the spread of the pandemic, 110 nations continue to levy taxes on the import of COVID-19 test kits and related apparatus. Such imports are heavily taxed in Latin America, and East and South Asia. 56 countries around the globe impose tariffs on the import of disinfectant and sterilisation equipment; 118 countries on medical consumables; 77 nations on the import of medical devices and equipment; India and Latin American nations all charged 5 per cent or even more on the import of such devices. Some 160 nations on protective garments; 118 nations on import of thermometers (as at 23 March 2020).

Under the non-discrimination principle of most-favoured nation (MFN) clause in WTO's General Agreement on Tariffs and Trade, it requires a country to provide any concessions, privileges or immunities granted to one nation in a trade agreement to all other member countries of the WTO, to ensure equal treatment of all countries.

6.2 Non-tariff import restrictions

Evenett (2020) in his *Global Trade Alert* report on 'Tackling COVID-19 Together, The Trade Policy Dimension' reveals that the total value of global trade during the year 2018 in the first six groups of medical supplies was just under US$715 billion, mostly consisting of trade in disinfectants, sterilisation products and test kit. As of 21 March 2020, 46 export curbs on medical supplies had been introduced by 54 governments since the beginning of the year. Thirty-three of those export curbs had been announced since the beginning of April, an indication of just how quickly new trade limits are spreading across the globe. Bulgaria, France, India, Indonesia, Saudi Arabia, the Republic of Korea, Taiwan, Thailand, Turkey and the United Kingdom have implemented multiple export curbs. This has denied the countries on the other end of the chain access to much-needed medicines.

As the novel virus affects the lungs of a person, ventilators are key to offer them artificial respiratory support. An analysis presented by Evenett using the UN COMTRADE trade data for 2018 that there were 25 nations that each exported more than US$10 million worth of medical ventilators. The report also reveals that no nation in Africa, the Commonwealth of Independent States (CIS) region, the Middle East, or South Asia exported medical ventilators. Because its production involves advanced technologies, the ability of the domestic producers in the above countries to immediately manufacture cutting-edge ventilators is low. This puts the life of the infected patients in those countries under huge risk.

WHO(2020).The WHO has called on industry and governments to take necessary

Table 5. Average import tariffs for COVID-19-related medical supplies among all of the Commonwealth countries (2016–19)

Region	Average tariffs on all COVID-related health supplies	Tariffs on key product categories (simple average)							
		COVID-19 test kits	Disinfectants and sterilisation products	Other medical consumables	Other medical devices	Oxygen therapy	Protective garments and the like	Soap	Vehicles
MFN applied tariffs, simple average									
Commonwealth	7.3	2.6	5.4	7.2	4.1	4.3	12.2	18.4	4.7
of which									
LDCs	8.2	1.6	4.5	6.8	4.2	4.0	16.4	22.8	5.7
Africa	6.9	0.6	2.9	6.0	3.3	3.7	14.0	21.9	2.8
Botswana	4.7	–	0.2	4.0	0.7	2.6	10.1	20.0	–
Gambia, The	9.8	1.3	4.6	7.9	7.3	7.2	16.3	30.8	3.1
Ghana	10.4	2.4	6.7	9.6	7.2	7.5	15.7	31.5	2.6
Kenya	8.5	–	5.0	6.0	2.2	4.3	18.5	25.0	7.2
Lesotho	4.9	–	0.5	6.0	0.5	2.0	10.2	20.0	–
Malawi	7.4	–	2.9	3.8	2.6	1.8	20.9	22.6	4.5
Mauritius	2.6	–	1.7	3.3	–	–	2.2	13.8	–
Mozambique	7.9	1.7	2.9	9.0	5.2	5.2	11.8	17.8	9.8
Namibia	5.1	–	0.4	5.1	0.6	3.4	11.4	20.0	–
Nigeria	10.0	1.4	5.6	7.0	6.7	8.0	13.0	33.6	4.6
Rwanda	8.9	–	3.9	10.2	5.9	1.4	18.7	25.0	5.9
Seychelles	0.8	–	3.7	0.3	–	–	2.4	–	–
South Africa	5.5	–	0.7	5.1	1.3	2.2	14.8	20.0	–
Swaziland	5.1	–	0.3	4.3	0.5	2.6	12.9	20.0	–
Tanzania	8.4	–	4.9	6.9	3.4	1.9	19.6	25.0	5.6
Uganda	7.3	–	2.6	4.2	3.3	2.7	19.3	22.9	3.6
Zambia	10.1	4.0	3.0	9.5	8.9	10.2	19.9	25.0	–
Asia	7.2	4.2	9.1	9.2	3.8	3.7	8.9	12.3	6.0
Bangladesh	9.8	4.8	9.0	7.9	2.8	3.9	19.6	25.0	5.2

(*Continued*)

Table 5. Average import tariffs for COVID-19-related medical supplies among all of the Commonwealth countries (2016–19) (*Continued*)

Region	Average tariffs on all COVID-related health supplies	Tariffs on key product categories (simple average)							
		COVID-19 test kits	Disinfectants and sterilisation products	Other medical consumables	Other medical devices	Oxygen therapy	Protective garments and the like	Soap	Vehicles
Brunei	1.3	0.3	0.2	0.1	1.0	0.7	0.2	4.5	3.0
India	10.3	6.4	24.2	8.3	6.6	7.0	10.0	10.0	10.0
Malaysia	2.4	–	–	3.7	1.3	1.6	4.3	3.7	4.3
Maldives	15.4	9.6	27.1	36.6	10.7	9.4	14.6	5.0	10.2
Pakistan	11.9	12.7	12.7	9.1	4.9	6.9	14.1	20.0	15.0
Singapore	–	–	–	–	–	–	–	–	–
Sri Lanka	6.2	–	–	8.0	3.4	–	8.4	30.0	–
Caribbean	11.3	4.2	10.4	11.9	7.7	7.7	14.7	27.0	6.9
Antigua and Barbuda	9.7	5.0	12.2	12.3	6.7	6.5	12.5	16.9	5.4
Bahamas, The	15.9	9.3	7.4	12.6	19.1	22.6	26.3	2.9	27.3
Belize	9.4	4.5	10.1	11.3	7.3	6.7	13.3	17.8	4.3
Dominica	14.4	4.2	5.1	11.5	5.8	5.9	13.0	65.0	4.6
Grenada	12.1	5.0	12.9	10.0	6.9	8.2	13.9	35.8	3.8
Guyana	10.3	5.0	15.1	12.4	7.2	6.3	12.4	18.0	5.6
Jamaica	10.6	–	12.8	12.6	5.4	4.6	13.0	32.2	4.0
Saint Kitts and Nevis	9.9	–	8.7	12.2	7.8	6.4	16.6	23.1	4.8
Saint Lucia	10.1	3.8	9.4	12.6	3.5	2.9	12.7	30.6	5.4
Saint Vincent and the Grenadines	10.6	5.0	9.8	11.4	7.5	6.7	13.1	27.6	3.6

(*Continued*)

Table 5. Average import tariffs for COVID-19-related medical supplies among all of the Commonwealth countries (2016–19) (*Continued*)

Region	Average tariffs on all COVID-related health supplies	Tariffs on key product categories (simple average)							
		COVID-19 test kits	Disinfectants and sterilisation products	Other medical consumables	Other medical devices	Oxygen therapy	Protective garments and the like	Soap	Vehicles
Developed	1.8	0.6	0.8	1.2	0.6	1.1	5.8	3.0	1.1
Australia	2.6	1.2	2.5	1.9	0.6	2.2	4.0	5.0	3.1
Canada	1.6	–	0.2	0.7	0.6	–	7.3	3.8	0.2
Cyprus	1.3	0.2	0.6	1.7	0.3	0.5	5.3	1.6	0.2
Malta	1.5	0.2	0.4	1.1	0.3	0.6	7.3	1.5	0.6
New Zealand	2.3	1.5	0.5	0.7	1.6	2.3	4.2	5.0	2.3
United Kingdom	1.4	0.4	0.4	1.1	0.3	1.0	6.4	1.2	0.0
Pacific	7.7	4.5	4.0	6.3	4.0	4.4	13.2	17.6	7.3
Fiji	9.0	1.1	1.2	5.7	1.8	3.7	23.0	32.0	3.8
Nauru	10.0	10.0	3.2	9.2	10.0	10.0	10.0	10.0	17.3
Papua New Guinea	3.9	–	1.7	5.1	–	–	4.7	20.0	–
Samoa	7.7	8.0	2.5	7.4	8.0	8.0	13.9	8.0	6.2
Solomon Islands	8.2	4.3	5.1	8.7	9.0	10.0	9.7	10.0	8.6
Tonga	6.0	9.8	2.2	7.3	1.8	1.2	13.2	11.1	1.3
Tuvalu	9.0	–	11.5	4.9	–	–	17.3	19.4	19.0
Vanuatu	7.5	3.2	4.6	2.4	1.4	2.3	13.4	30.0	2.4

Source: World Integrated Trade Solutions.
Note: LDCs = least developed countries; MFN = most favoured nation.

action to increase the manufacture of personal protective equipment (PPE) by 40 per cent to cater for the sudden spike in demand. This highlights the plight of frontline workers, who are in need of personal protective equipment including gloves, medical masks, respirators, goggles, face shields, gowns and aprons to ensure their health, because they are increasingly exposed to the risk of infection. Since the outbreak of the pandemic, demand for surgical masks has seen a six-fold increase; demand for respirators has trebled and for gowns has doubled. WHO has estimated that around 89 million medical masks, 76 million examination gloves and 1.6 million goggles are required per month to respond to the surge in demand.

Eleven nations' non-tariff policies discourage the import of COVID-19 test kits, while 23 nations have imposed non-tariff barriers in an endeavour to limit the import of disinfectants. Thirteen nations have imposed non-tariff restrictions on medical consumables, while non-tariff restrictions hinder the import of medical devices in eight nations. The non-tariff policies pursued by 15 nations restrict the import of protective garments. Two countries, Kazakhstan and Russia, have imposed non-tariff restrictions on the import of thermometers.

The following tables present an overview of the non-tariff policies pursued by Commonwealth countries to limit the import of COVID-19-related supplies and medical products.

Many organisations, including the International Monetary Fund (IMF 2020) have warned that restrictions in the trade of these medical goods may severely affect the ability to contain COVID-19. Some Commonwealth countries have restricted exports of medical

Table 6. Non-tariff policies that limit the import of COVID-19 medical supplies

Importing country	Number of non-tariff policies that limit import of test kits	Percentage of COVID-19 medical supplies produced abroad that currently face import restrictions other than tariffs (in %)
Test kits		
India	2	65.6
Nigeria	2	66.99
South Africa	1	35.28
Disinfectants		
India	4	86.11
Malaysia	1	0.94
Nigeria	2	78.12
Pakistan	2	0.5
South Africa	1	97.39
United Kingdom	1	0.02
Medical consumables		
India	1	1.4
Malaysia	1	63.32
Nigeria	2	98.44
South Africa	1	4.13
Medical devices		
Malaysia	1	94.69
Nigeria	2	97.48
Protective garments		
India	1	79.26
Malaysia	1	1.94
Nigeria	2	100
South Africa	1	23.26

Source: https://www.globaltradealert.org/reports.

supplies and eased import tariffs on such essentials in anticipation of shortages of vital medicines and equipment essential for the treatment of patients infected by the virus. Table 7 presents an overview of the export bans and tariff concessions introduced by the governments of Commonwealth countries in light of the rapid spread of COVID-19.

Table 7. COVID-19 Trade regulatory measures undertaken by Commonwealth countries

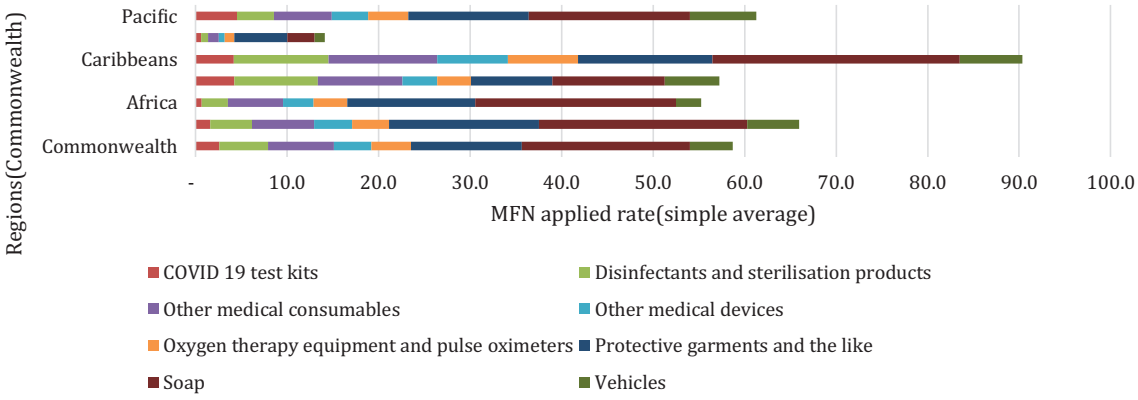
Country	Measure	Affected products	Date
DEVELOPED COUNTRIES			
Australia	Export restrictions	PPE in the form of disposable face masks, disposable gloves, disposable gowns, protective eye wear in the form of goggles, glasses or visors, alcohol wipes and hand sanitiser.	30.03.2020
The UK	Export ban	162 medicines and drugs have been banned from export.	03.04.2020
	Permit requirements to export	Mandated a temporary license to export PPE, including protective spectacles, gloves and garments, face shields, mouth–nose protection equipment to countries outside the EU, European Free Trade Area (EFTA), etc.	02.04.2020
Canada	Import tariff elimination	Temporary elimination of import tariffs on certain products (e.g. face masks, surgical gloves and disinfectants) imported by public health agencies, hospitals and testing sites.	16.03.2020
New Zealand	Import tariff elimination	Temporary removal of tariffs on the import of medical and hygiene products needed for coronavirus treatment and response.	28.03.2020
ASIA			
Pakistan	Export ban	Tyvek suits, disposable gowns, disposable gloves, face shields, surgical masks, N 95 masks, biohazard bags, goggles, shoe covers and hand sanitisers.	24.03.2020
Malaysia	Export Ban	Face masks.	18.03.2020
India	Export prohibition	Medical supply products, masks, ventilators, textile raw materials for mask production.	19.03.2020
	Import tariff reduction	Decrease of import tariffs (from 10% to 5%) and an exemption from health cess, for the medical or surgical instruments and apparatus.	01.04.2020
	Export permit requirements	Restricted the export of 26 pharmaceutical ingredients and the medicines made from them, including paracetamol. Limited exports to some countries are allowed.	03.04.2020
	Export permit requirements	Export of diagnostic kits.	04.04.2020
AFRICA			
Kenya	Export ban	Face masks.	03.03.2020
	Import tariff reduction	Reduced VAT from 16% to 14% on all goods.	01.04.2020
South Africa	Import tariff reduction	Imported goods defined as 'essential goods' as detailed in Gazette No. 43148 will be exempt from VAT [value-added tax].	27.03.2020
	Permit requirements for export	The Department of Trade Industry and Competition will need to be consulted prior to the export of certain selected goods including face masks and hand sanitiser.	28.03.2020

Source: https://macmap.org/covid19.

Table 8. Tariffs on the imports of COVID-related health supplies, by regions (average 2016–19)

Regions	Tariffs on key product categories (MFN applied rates – simple average)								
	All COVID-19-related medical supplies	COVID 19 test kits	Disinfectants and sterilisation products	Other medical consumables	Other medical devices	Oxygen therapy	Protective garments and the like	Soap	Vehicles
Commonwealth	7.3	2.6	5.4	7.2	4.1	4.3	12.2	18.4	4.7
LDCs	8.2	1.6	4.5	6.8	4.2	4.0	16.4	22.8	5.7
Africa	6.9	0.6	2.9	6.0	3.3	3.7	14.0	21.9	2.8
Asia	7.2	4.2	9.1	9.2	3.8	3.7	8.9	12.3	6.0
Caribbean	11.3	4.2	10.4	11.9	7.7	7.7	14.7	27.0	6.9
Developed	1.8	0.6	0.8	1.2	0.6	1.1	5.8	3.0	1.1
Pacific	7.7	4.5	4.0	6.3	4.0	4.4	13.2	17.6	7.3

Figure 4. Tariffs on the imports of COVID-related health supplies, by regions (average 2016–19)

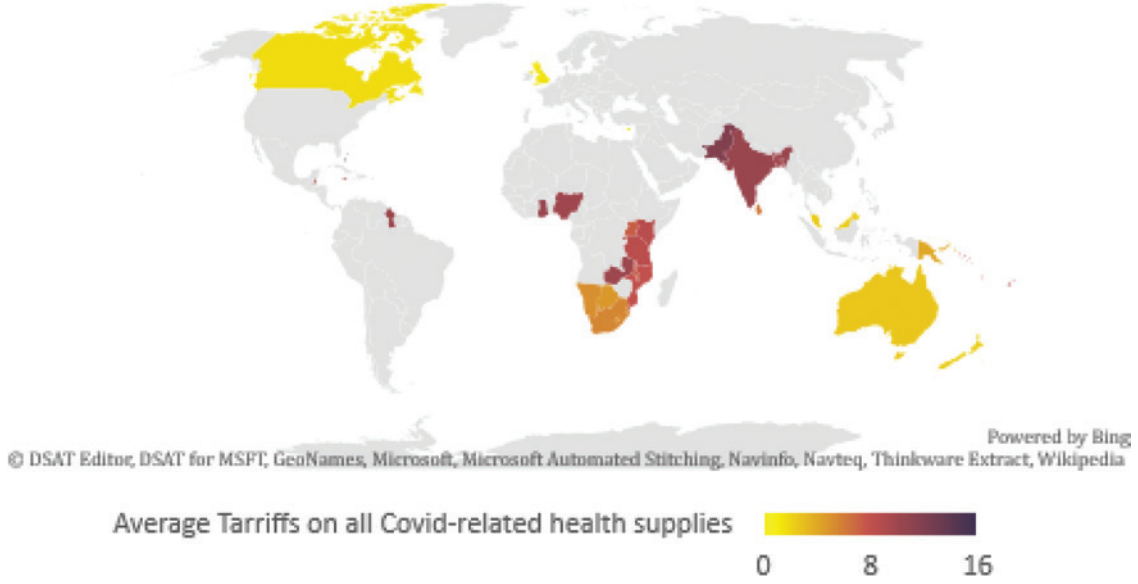


Evenett (2020) demonstrates that the import barriers (in the form of import tariffs and non-tariff barriers) that were imposed on medical supplies, disinfectants and other equipment, before the declaration of the pandemic, reveal the coherence of trade policy of those countries.

The average tariff of COVID-19-related medical supplies imposed by countries in the Commonwealth bloc is 7.3 per cent. Among least developed countries (LDCs), the average tariff is about 8.2 per cent. Regional analysis reveals that import tariffs are high, about 11.3 per cent in the Carribean countries, and an approximate 7 per cent among the countries in Africa, Asia and the Pacific. Tariffs are significantly lower, about 1.8 per cent, in developed member countries.

Product-wise analysis reveals that soaps face the highest tariff rates, up to about 18.4 per cent, while protective garments are up to about 12.2 per cent. In order to cope with the high demand for health supplies, easing tariff rates can help nations quickly source required supplies from where they are available.

Figure 5. Tariffs on the imports of COVID-related health supplies (average 2016–19)



7. Conclusions and policy recommendations

An analysis of the effects of the COVID-19 epidemic on medical supply chains in Commonwealth countries captures the disruptions in essential medical supplies owing to the lockdown measures, stay-at-home orders, export bans and other cautionary directives put in place by governments across the globe. A study of the literature reveals the vulnerability in supply chains and the importance of building them with resilience to pandemics and natural disasters, as well as economic shocks. In other words, the COVID-19 pandemic has itself disrupted these supply chains so much that fighting the virus has become difficult due to the lack of availability of medical supplies.

The trade policy measures – for example, export bans, import concessions and quota easing – put forth by various Commonwealth countries have analysed. The import tariffs and non-import policies that exist in various countries on the eight essential categories of COVID-19 products (as categorised by the WCO) and remain in place, even after the rapid surge of the pandemic, are presented here for a better understanding. Though accessibility and affordability to such essential medical products are a major determinant of 'life or death' to people around the globe, particularly when the world is fighting a medical emergency, some countries have remarkably high tariffs in place.

The export and import analysis of the essential products needed to tackle COVID-19 reveals that, although the developed countries of the block hold a significant share of global trade, their trade within the Commonwealth is relatively low (only 13%). The average tariff rate is around 7.3%, which is significantly higher than the global average of 4.8%. Global tariffs are expected to fall even further because recent and ongoing free trade agreements such as Comprehensive and Progressive Agreement for Trans-Pacific Partnership and Regional Comprehensive Economic Partnership have explicit clauses mandating reduction – if not elimination – of tariffs on medical supplies and also because many countries are taking action to cut tariffs and also other trade costs to fight COVID-19.

Therefore, Commonwealth countries may benefit from following a two-pronged strategy of reducing tariffs and other trade costs on the medical supplies, as we have found in this study, while also building the capacity of domestic supply chains for some of these medical supplies. Such capacity development may be possible via greater emphasis on soliciting technological aid from the developed countries in the block, easing restrictions on foreign direct investment in these sectors, improving the environment to do business in general, and advancements in education and research in these areas. In other words, greater integration with global trade and global supply chains may actually facilitate development of domestic supply chains for these products as well.

Note

1 See World Trade Organization, available at: https://www.wto.org/english/res_e/publications_e/practical_guide12_e.htm

References

Australian Border Force (2020) 'Exportation of goods during COVID-19 human biosecurity period', 30 March, available at: https://www.abf.gov.au/importing-exporting-and-manufacturing/prohibited-goods/categories/covid-exports (accessed 13 April 2020).

Benedictow, O. J. (1987) 'Morbidity in historical plague epidemics (Tuscany and France)', *Population Studies* **41**, 401–431.

Bhakoo, V. and C. Chan (2011), 'Collaborative implementation of e-business processes within the health-care supply chain: the Monash Pharmacy Project', *Supply Chain Management: An International Journal*, **16**(3): 184–193.

Bhutta, M. and A. SanthaKumar (2016), In good hands – Tackling labour rights concerns in the manufacture of medical gloves, A BMA Report, British Medical Association Medical Fair and Ethical Trade Group, and in collaboration with the European Working Group on Ethical Public Procurement, available at https://www.bma.org.uk/media/1093/in-good-hands-medical-gloves-report-web-23-03-2.pdf.

Christopher, M. and M. Holweg (2011), ""Supply Chain 2.0": managing supply chains in the era of turbulence", *International Journal of Physical Distribution & Logistics Management*, Vol. **41** No. 1, pp. 63–82. https://doi.org/10.1108/09600031111101439

Deloitte (2019) *Global life sciences outlook. Focus and Transform | Accelerating change in life sciences*, available at: https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-ls-outlook-2019.pdf

Ebel, T., E. Larsen and K. Shah (2013) 'Strengthening health care's supply chain: A five-step plan', Mckinsey, available at: https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/strengthening-health-cares-supply-chain-a-five-step-plan

EEPC India (2013) 'India's Medical Device and Pharma Machinery Sector – Strategy Paper to boost exports', available at: https://www.eepcindia.org/download/MedicalDeviceStrategyPaper-170614122943.pdf

Evenett, J. (2020) 'Tackling COVID-19 Together – The Trade Policy Dimension', *Global Trade Alert*, 23 March, available at: https://www.globaltradealert.org/reports

Fortune (2020) '94% of the Fortune 1000 are seeing coronavirus supply chain disruptions: Report', 21 February, available at: https://fortune.com/2020/02/21/fortune-1000-coronavirus-china-supply-chain-impact/

Hamrick, D. and P. Bamber (2019) 'Pakistan in the Medical Device Global Value Chain', Duke Global Value Chains Center', available at: https://gvcc.duke.edu/wp-content/uploads/PakistanMedicalDeviceGVC.pdf.

Harrington, L. and R. H. Smith (2013) The resilience imperative: reinventing healthcare supply chains. DHL: Bonn, Germany, 2014.

IMF (2020), 'A Crisis Like No Other, An Uncertain Recovery', June 2020, available at https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020

Liao, K., X. Deng, Y. Wang and O. Bayazit (2019) 'Proposing a framework for developing supply chains of medical devices', *OSCM Publications*, Volume **12**, Issue 3, 2019, available at https://journal.oscm-forum.org/publication/article/proposing-a-framework-for-developing-supply-chains-of-medical-devices

Linton, T. and B. Vakil (2020) 'Coronavirus Is Proving We Need More Resilient Supply Chains', *Harvard Business Review*, 5 March, available at: https://hbr.org/2020/03/coronavirus-is-proving-that-we-need-more-resilient-supply-chains

Mahajan, V., D. K. Nauriyal and S. P. Singh (2015), 'Trade performance and revealed comparative advantage of Indian pharmaceutical industry in new IPR regime', *International Journal of Pharmaceutical and Healthcare Marketing*, **9**(1): 56–73.

Mathew, J., J. John and S. Kumar (2013) 'Supply chain management in Healthcare', at POM 2013, 24th Annual conference of the Production and Operations Management Society.

Vidrova, Z. (2020) 'Supply chain management in the aspect of globalization', SHS Web of Conferences 74, **04031** (2020) available at https://doi.org/10.1051/shsconf/20207404031.

Vries, J. D. and R. Huijsman (2011), 'Supply chain management in health services: An overview', Supply Chain Management: An International Journal, Vol. **16** Iss 3 pp. 159–165, available at http://dx.doi.org/10.1108/13598541111127146

Whewell, R. (2009) Supply Chain in the Pharmaceutical Industry: Strategic Influences and Supply Chain Responses. Routledge Publishers, UK.

World Health Organization (2020) 'Shortage of personal protective equipment endangering health workers worldwide', 3 March, available at: https://www.who.int/news-room/detail/03-03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide

World Trade Organization (2020a) 'Trade in Medical Goods in the Context of Tackling COVID-19', 3 April, available at: https://www.wto.org/english/news_e/news20_e/rese_03apr20_e.pdf

World Trade Organization (2020b) 'WTO issues new report on worldwide trade in COVID-19 medical products', 3 April, available at: https://www.wto.org/english/news_e/news20_e/rese_03apr20_e.htm#fnt-1

Online databases:

John Hopkins Coronavirus Resource Center, available at: https://covid/ourworldindata.orgg/data/ecdc/full_data.csv

World Customs Organization, available at: http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/nomenclature/covid_19/hs-classification-reference_en.pdf?la=en

World Integrated Trade Solution, available at: https://wits.worldbank.org/default.aspx

Annex 1. Aggregate imports and exports of all Commonwealth countries, detailed table (units and years)

Table A1.1. Aggregate imports of COVID-19 medical product categories (average 2017–19)

Total imports (values in million US$)								
	COVID-19 test kits	Disinfectants	Medical consumables	Other medical devices	Oxygen therapy	Protective garments	Soap	Vehicles
All Commonwealth	30,877.5	65,803.9	24,018.1	23,224.9	18,066.4	26,681.4	3,498.2	3,895.9
All LDCS	491.0	1,680.7	792.7	390.2	250.1	115.0	452.4	1,696.5
Africa	1,514.8	6,801.1	1,553.4	1,511.6	1,024.0	1,630.9	513.5	372.9
Botswana	14.1	98.0	18.6	20.2	9.3	26.2	17.1	7.3
Cameroon	15.6	148.0	12.6	11.8	16.2	19.3	6.1	9.1
Gambia, The	1.7	5.6	1.9	1.6	0.9	17.8	4.5	0.6
Ghana	48.1	468.8	73.0	75.4	51.3	80.0	66.7	34.2
Kenya	67.9	315.7	48.5	66.6	38.0	90.7	6.5	25.7
Lesotho	7.8	53.0	9.3	5.7	4.1	20.1	14.4	2.3
Malawi	20.1	85.0	7.1	8.1	2.3	5.9	11.0	3.3
Mauritius	20.2	205.9	39.7	35.8	16.6	40.9	19.4	10.7
Mozambique	79.5	250.9	42.2	31.6	24.1	57.5	31.6	29.2
Namibia	33.5	189.7	74.2	60.7	20.5	60.6	39.9	19.2
Nigeria	62.4	873.6	64.3	53.1	101.7	152.0	76.6	29.2
Rwanda	13.4	60.7	6.1	7.3	4.3	4.0	2.4	4.3
Seychelles	4.1	14.9	8.4	8.8	2.7	9.7	4.0	3.2
Sierra Leone	2.9	30.0	4.2	2.6	1.3	3.8	5.1	2.1
South Africa	815.2	2,793.2	933.1	900.6	615.1	867.9	130.0	95.4
Swaziland	13.3	71.4	23.7	16.7	6.3	16.8	14.9	2.7
Tanzania	118.4	436.3	91.6	102.9	65.3	78.9	21.6	27.8

(*Continued*)

Table A1.1. Aggregate imports of COVID-19 medical product categories (average 2017–19) (*Continued*)

Total imports (values in million US$)								
	COVID-19 test kits	Disinfectants	Medical consumables	Other medical devices	Oxygen therapy	Protective garments	Soap	Vehicles
Uganda	88.1	408.2	55.5	63.0	21.5	35.0	9.5	24.2
Zambia	88.5	292.3	39.6	39.1	22.5	43.9	31.9	42.5
Asia	5,506.5	8,262.6	7,159.4	7,854.2	5,528.6	6,724.7	799.3	502.0
Bangladesh	66.9	53.3	90.6	124.6	185.2	182.2	26.1	23.8
Brunei	25.2	106.6	31.3	35.5	63.7	29.9	7.1	6.5
India	2,027.2	2,077.5	2,388.7	2,991.9	1,771.1	2,197.4	179.6	138.4
Malaysia	455.7	1,981.5	1,112.8	911.2	1,003.2	1,719.9	201.1	60.9
Maldives	16.4	41.1	41.4	41.7	10.1	26.0	8.2	7.0
Pakistan	283.3	709.2	538.5	423.0	426.2	273.3	62.5	96.9
Singapore	2,553.0	2,676.5	2,816.6	3,182.7	1,964.5	2,128.3	296.2	139.3
Sri Lanka	78.8	616.8	139.4	143.5	104.5	167.7	18.5	29.2
Caribbean	44.0	158.4	78.1	74.3	58.2	75.4	28.7	22.4
Antigua and Barbuda	0.4	2.0	2.0	2.0	2.2	1.3	0.2	1.3
Bahamas, The	10.4	20.4	13.2	18.4	9.1	14.2	3.6	6.3
Barbados	4.2	11.8	6.6	6.1	2.9	4.9	2.2	2.3
Belize	3.0	20.9	11.6	4.3	6.1	8.1	2.3	1.0
Dominica	0.3	1.0	1.7	1.9	0.5	1.4	0.1	1.0
Grenada	0.5	1.5	1.0	1.2	0.4	0.7	0.2	0.7
Guyana	2.2	10.1	3.5	3.2	2.8	6.9	2.7	1.9
Jamaica	8.4	57.2	22.0	19.8	16.3	17.4	7.7	2.9
Saint Kitts and Nevis	0.3	1.3	0.9	1.1	0.5	0.8	0.2	0.8
Saint Lucia	0.5	2.1	0.7	0.7	0.6	1.6	0.4	0.9

(*Continued*)

Table A1.1. Aggregate imports of COVID-19 medical product categories (average 2017–19) (*Continued*)

Total imports (values in million US$)								
	COVID-19 test kits	Disinfectants	Medical consumables	Other medical devices	Oxygen therapy	Protective garments	Soap	Vehicles
Saint Vincent and the Grenadines	0.2	0.7	1.4	1.8	0.4	0.5	0.1	0.5
Trinidad and Tobago	13.4	29.4	13.5	13.7	16.6	17.6	8.9	2.8
Developed	23,792.5	50,518.3	15,194.5	13,749.5	11,434.0	18,200.4	2,137.5	2,983.6
Australia	3,733.2	8,160.9	3,710.2	3,685.8	1,949.3	3,373.2	316.4	591.5
Canada	6,477.5	11,710.4	3,820.5	3,732.0	4,033.3	5,737.4	865.1	1,472.7
Cyprus	110.9	446.0	85.8	75.6	39.5	95.8	24.5	13.8
Malta	73.7	436.1	52.5	43.2	23.4	96.8	13.7	8.2
New Zealand	447.5	971.4	698.7	671.9	254.0	632.9	81.3	97.8
United Kingdom	12,949.7	28,793.6	6,826.8	5,541.0	5,134.5	8,264.3	836.6	799.7
Pacific	19.6	63.5	32.7	35.3	21.7	49.9	19.2	15.0
Fiji	8.5	32.4	15.0	18.9	10.1	26.0	9.1	6.8
Kiribati	0.1	0.7	0.6	0.4	0.2	0.5	0.4	0.2
Nauru	0.1	0.7	0.6	0.8	0.5	0.3	0.1	0.3
Papua New Guinea	9.7	19.9	11.8	11.0	5.6	17.9	6.9	5.1
Samoa	0.6	3.3	1.8	1.1	0.5	1.5	0.8	0.8
Solomon Islands	0.3	1.4	1.3	1.0	0.5	1.8	1.4	0.7
Tonga	0.1	1.9	1.1	1.6	0.3	0.8	0.2	0.3
Tuvalu	0.0	0.2	0.0	0.0	0.1	0.1	0.0	0.0
Vanuatu	0.2	3.0	0.6	0.4	3.8	1.2	0.2	0.9

Table A1.2. Aggregate exports of COVID-19 medical product categories (average 2017–19)

Total exports (values in million US$)								
	COVID-19 test kits	Disinfectants	Medical consumables	Other medical devices	Oxygen therapy	Protective garments	Soap	Vehicles
All Commonwealth	20,694.2	79,477.9	15,133.6	15,456.9	20,225.9	24,067.1	3,171.9	1,507.5
All LDCS	4.1	145.3	60.3	16.5	5.2	1.9	845.2	40.0
Africa	190.3	1,101.3	305.6	256.2	2,991.2	298.9	238.1	59.4
Botswana	0.1	0.8	0.9	0.4	0.4	0.2	0.7	0.3
Cameroon	0.0	0.0	0.1	0.3	0.3	0.5	0.0	1.7
Gambia, The	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Ghana	0.4	8.5	7.3	0.9	0.5	5.2	3.3	0.0
Kenya	0.6	66.3	3.5	1.4	1.3	3.4	12.2	0.2
Lesotho	0.0	0.8	0.1	0.2	0.7	1.4	0.0	0.5
Malawi	0.0	0.2	0.3	0.2	0.1	0.2	0.4	0.1
Mauritius	8.4	67.6	53.5	27.2	26.1	7.4	3.8	0.4
Mozambique	0.1	0.6	0.5	0.5	0.3	0.5	0.0	1.6
Namibia	0.3	0.9	1.4	1.7	1.3	1.3	0.1	0.7
Nigeria	0.7	3.8	2.6	1.2	0.9	0.4	7.7	0.2
Rwanda	0.0	0.3	0.0	0.0	0.0	0.2	0.0	
Seychelles	0.2	0.0	7.6	6.9	3.5	0.6	0.0	
Sierra Leone	0.1	3.7	0.2	0.3	0.2	0.8	0.0	0.0
South Africa	172.7	832.9	219.4	203.7	2,948.9	267.7	182.3	50.0
Swaziland	3.1	68.5	5.4	5.3	2.9	2.5	2.0	1.1
Tanzania	2.4	9.3	1.0	4.3	2.5	2.5	8.6	0.2
Uganda	0.6	36.2	0.8	0.8	0.8	1.7	7.5	0.9
Zambia	0.5	0.6	0.8	0.8	0.6	2.3	9.2	1.7

(*Continued*)

Table A1.2. Aggregate exports of COVID-19 medical product categories (average 2017–19) (*Continued*)

Total exports (values in million US$)								
	COVID-19 test kits	Disinfectants	Medical consumables	Other medical devices	Oxygen therapy	Protective garments	Soap	Vehicles
Asia	7,451.9	34,609.0	8,697.2	8,920.7	7,754.6	16,055.5	1,288.2	181.4
Bangladesh	0.1	92.4	17.2	9.1	1.4	837.2	1.2	0.1
Brunei	0.4	0.2	0.7	1.0	1.2	1.4	0.0	0.4
India	334.4	21,868.3	1,460.4	805.3	1,142.1	1,895.5	178.6	109.8
Malaysia	85.3	369.0	3,130.2	1,946.1	2,706.1	10,168.1	951.1	31.5
Maldives	0.0	0.1	0.1	0.1	0.4	0.1	0.0	
Pakistan	0.8	868.0	673.7	667.2	8.8	527.3	18.9	0.5
Singapore	7,030.1	11,403.2	3,402.0	5,484.9	3,887.4	1,438.6	137.2	38.4
Sri Lanka	0.8	8.0	12.9	6.9	7.3	1,187.3	1.1	0.7
Caribbean	2.8	51.7	6.1	6.0	1.2	1.6	0.3	0.6
Antigua and Barbuda	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0
Bahamas, The	1.0	0.5	0.1	0.2	0.2	0.2	0.0	0.0
Barbados	0.0	7.1	0.2	0.1	0.0	0.1	0.0	0.4
Belize	0.0	0.5	0.1	0.0	0.1	0.1	0.0	0.0
Dominica	0.0	0.1	2.4	1.9	0.2	0.1	0.0	0.0
Grenada	0.1	0.2	0.0	0.1	0.0	0.0	0.0	
Guyana	0.0	10.2	0.3	0.4	0.1	0.0	0.0	0.0
Jamaica	0.0	28.4	0.0	0.1	0.2	0.2	0.2	
Saint Kitts and Nevis	0.0	0.2	0.8	0.8	0.0	0.1		
Saint Lucia	0.0	0.1	0.2	0.2	0.0	0.1	0.0	
Saint Vincent and the Grenadines	0.0	0.2	1.9	1.9	0.0	0.3	0.0	0.1

(*Continued*)

Table A1.2. Aggregate exports of COVID-19 medical product categories (average 2017–19) (*Continued*)

Total exports (values in million US$)								
	COVID-19 test kits	Disinfectants	Medical consumables	Other medical devices	Oxygen therapy	Protective garments	Soap	Vehicles
Trinidad and Tobago	1.6	4.1	0.1	0.2	0.3	0.3	0.1	0.0
Developed	13,047.5	43,712.1	6,123.4	6,272.1	9,478.0	7,695.9	1,644.5	1,266.0
Australia	234.3	2,301.3	617.9	667.9	1,721.5	352.2	131.6	61.3
Canada	1,530.6	9,502.7	1,629.3	1,330.8	2,306.4	2,590.7	631.0	837.8
Cyprus	14.5	503.1	19.6	10.7	9.9	6.9	2.5	0.2
Malta	8.7	640.0	122.5	117.9	18.6	104.6	2.1	1.4
New Zealand	66.5	287.2	127.8	128.7	727.8	129.2	25.9	15.4
United Kingdom	11,192.9	30,477.8	3,606.2	4,016.0	4,693.8	4,512.3	851.4	349.8
Pacific	1.6	3.7	1.4	2.0	0.9	15.2	0.8	0.2
Fiji	0.3	1.9	0.8	0.4	0.3	14.3	0.7	0.1
Kiribati	0.0		0.0	0.0	0.0	0.0		
Nauru	0.1	0.1	0.2	0.2	0.0	0.4	0.0	0.0
Papua New Guinea	1.0	1.3	0.2	1.2	0.2	0.3	0.1	0.1
Samoa	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0
Solomon Islands	0.0	0.4	0.1	0.1	0.0	0.0	0.0	
Tonga		0.0	0.1	0.0	0.2	0.0	0.0	
Tuvalu	0.2	0.0		0.0	0.0	0.0		
Vanuatu	0.0	0.1	0.0	0.0	0.0	0.1	0.0	

Annex 2. Aggregate Trade Flows of all Commonwealth countries split by region

Figure A2.1. Exports and imports of COVID-related health supplies (average 2016–19)