

# Combating COVID-19 with International Trade: Insights from Key Medical Goods in Japan\*

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## Abstract

The COVID-19 pandemic has reminded us of the importance of accurately quantifying the gains from international specialization in global value chains (GVCs) and whether they outweigh the associated risks of transmission of shocks caused by a crisis. Import patterns of four medical goods in Japan during the COVID-19 outbreak reveal that international trade has played an important role to help meet various supply shortages in the face of surging demand. Moreover, there was an emergence of new suppliers, indicating that Japan diversified its import sources over the course of the pandemic.

JEL: F14, F15, F60

Keywords: COVID-19, medical goods, international trade, global value chains (GVCs)

## 1. Introduction

As production processes became more and more fragmented and international, trade in intermediate goods and services have accelerated. During the past three decades, global value chains (GVCs) have driven substantial expansions in international trade, boosting economic development by raising productivity and incomes. GVCs account for almost 50% of global trade today (World Bank, 2020). These GVCs proliferated mainly because of their efficiency, in that GVCs enable their participants to specialize in the activity in which they have comparative advantage. In addition, participation in GVCs can lead to increased job creation, increase in the economy's income and helps further economic growth.<sup>1)</sup> According to Brenton et al. (2022), between 1990 and 2017, the growth of GVCs contributed to an increase in the share of low- and middle-income countries in global exports, from 16% to 30%, and a fall in the proportion of the world's population living in extreme poverty, from 36% to 9%.<sup>2)</sup>

GVCs encompass international division of labor where activities that used to be

undertaken in a single location are dispersed among many countries, with gains in efficiency and economies of scale in the execution of each task. Firms in low- and middle-income countries can supply intermediate inputs of goods and services abroad as they no longer need to wait for the domestic industrial base to emerge. This fragmentation of production processes allows firms to export at a lower cost, benefiting from specialization and gaining access to larger markets for their output. Moreover, through imports, firms are also able to access better intermediate inputs at a lower cost, along with productivity-enhancing technologies developed elsewhere. This ability facilitates them to grow faster, contributing to the creation of higher-paying jobs (World Bank, 2020).

Research on GVCs faces new challenges in light of the COVID-19 pandemic and the state of the world in its wake. It is said that the pandemic caused three types of shocks: negative supply shock, positive demand shock and negative demand shock. Overall, the pandemic caused the volume of trade in the world to plummet. In 2020, global trade fell by 8%. Furthermore, it revealed the vulnerability of GVCs by showing the world that one small disruption in the value chain can cause great disruption in the supply due to the lack of access to intermediate goods and services. The COVID-19 pandemic has highlighted the urgent need to understand the (inter) dependencies of many countries on suppliers across the world.

During the pandemic, concerns were raised about the propensity for GVCs to transmit shocks from one country to another. For example, the global semiconductor chip shortage has caused major price increases, shortages queues and scalping among consumers for products that require semiconductors, such as automobiles, graphics cards, video game consoles, computers and household appliance. For example, in Japan, although it has been over two years since its release in November 2020, PlayStation 5 is still not available for sale without having to register for an invitation and win this 'lottery' in order to attain the right to purchase.

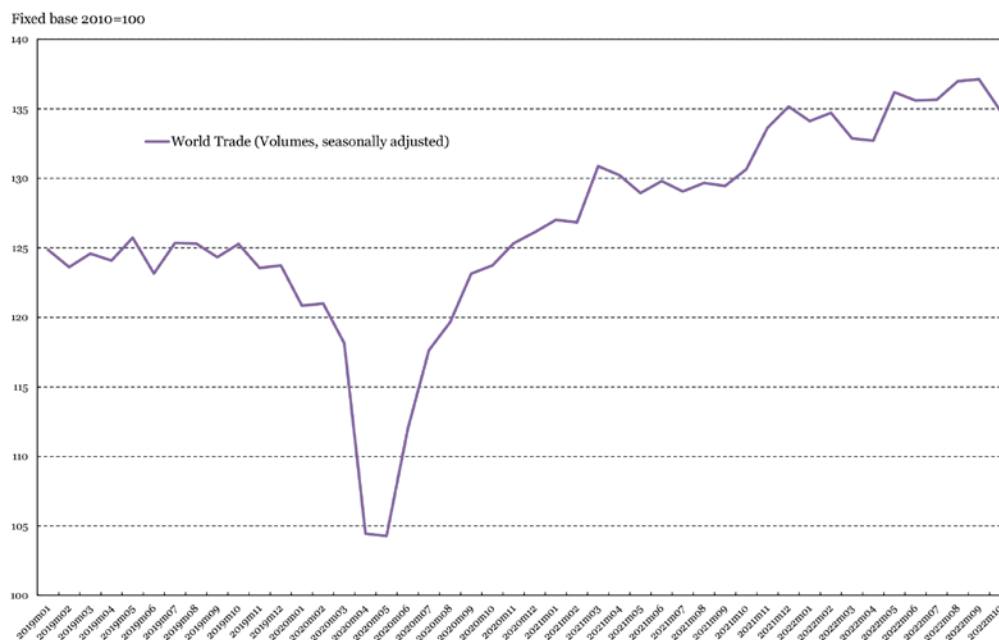
The COVID-19 pandemic highlighted the risks to countries reliant on trade for access to essential items such as medical supplies and food. Opportunistic actions by trade partners, especially the use of export restrictions, exacerbated these risks. According to *Global Trade Alert*, as of January 2021, 140 of 142 export measures worldwide announced to the International Trade Centre were restrictive, whereas 163 of the 264 import measures announced were liberalizing. During the pandemic, access to essential personal protective equipment (PPE), medicine and vaccines exposed the challenges that can arise. That is, in the face of uncertainty, exporting nations tend to resort to restricting exports at the expense of consumers around the world.<sup>3)</sup>

It does not mean, however, that firms should shift their input sourcing from foreign suppliers to domestic suppliers. Studies show that localized sourcing of inputs instead exacerbates the negative impacts of COVID-19 on the domestic economy.<sup>4)</sup> Moreover, Brenton et al. (2022)'s results indicate that countries are better off in a globalized world during and after a crisis. For example, it could lift almost 22 million additional people out of poverty by 2030 and improve the incomes of the bottom 40%. In contrast, attempting to deal with supply chain fragility through measures to reshore production would make all countries worse off. Their results show that steps toward global reshoring and reducing trade could drive an

additional 52 million people into extreme poverty. Studies have also shown that diversification of input sourcing helps prevent the spread of negative shocks through GVCs.<sup>5)</sup>

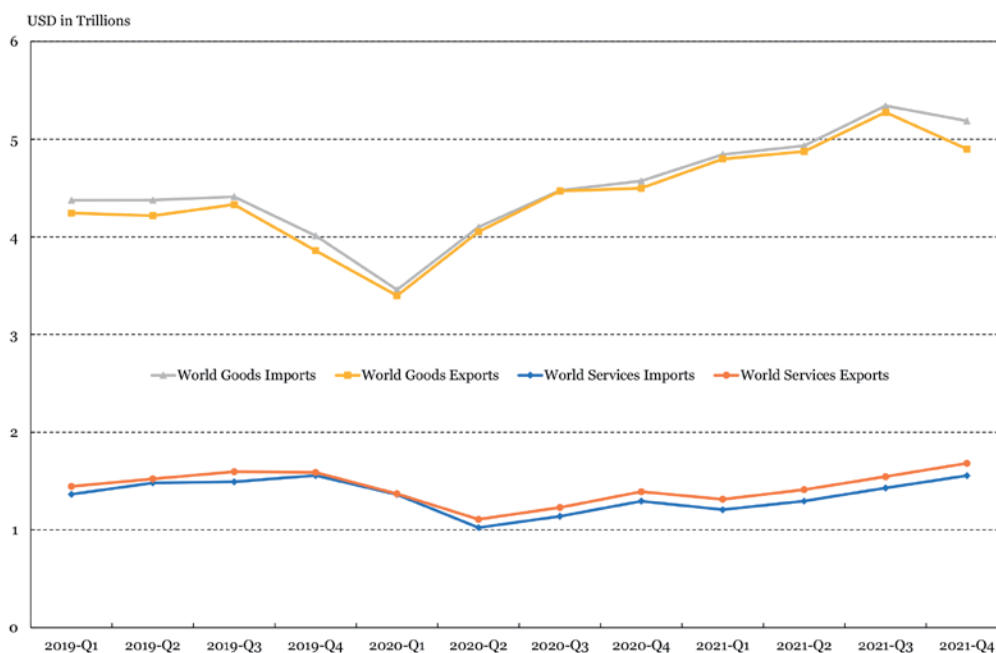
The pandemic also demonstrated that GVCs can maintain trade relationships during a crisis, paving the way for a strong trade-led recovery. GVCs ensure that, in a global recession, recovery in any part of the world is transmitted through the value chain. Indeed, trade has been the engine driving global growth as the world recovers from the pandemic, rebounding faster and stronger than any other component of global output. Figure 1 shows the monthly fluctuations in world trade from January 2019 to October 2022. It can be seen that global trade has been making recovery after a large drop in April and May 2020. Figure 2 depicts the quarterly change in world trade from 2019 to 2021. World goods trade and world services trade declined sharply in the first and second quarters of 2020, respectively, during the early phase of the COVID-19 outbreak. However, world trade has been increasing overall since these drops.

Figure 1: World Trade



Source: CPB World Trade Monitor October 2022.

Figure 2: World Imports and Exports in Goods and Services



Source: Calculations based on ITC statistics.

This paper will focus on the positive demand shock that occurred during the pandemic. This positive demand shock consists of the increase in demand that arose for essential goods and medical supplies for infection prevention as well as for treatment of the disease. In addition, demand increased for products accompanying the surge of telecommuting, quarantines and isolation measures and lockdowns. Workers adjusted their homes to incorporate a functioning working environment. For instance, demand rose for computers, monitors as well as dishwashers due to the increase in the number of people staying at home over a long span of time.

By focusing on key medical goods, this study aims to unveil how Japan accommodated for this positive demand shock in the wake of the pandemic. Namely, four key medical goods will be examined: face masks, disinfectants, vaccines and test kits. Results show that international trade has played an important role to help meet significant supply shortages in the face of surging demand in Japan. Japan has also diversified its import sources over the course of the pandemic.

The rest of this paper is structured as follows. Section 2 introduces existing literature on the effects of the COVID-19 pandemic on international trade. Section 3 investigates the aforementioned key medical goods in Japan. Finally, Section 4 concludes.

## 2. Literature Review

Concerns were raised since the early stages of the COVID-19 pandemic that policies to control the spread of the disease such as a lockdown could spill over into GVCs. Therefore, as early as the first half of 2020, several studies estimating the economy-wide, worldwide impact of the pandemic and lockdown policies had been published. These studies show that the effects of COVID-19 are widely spread through supply chains, and attempt to quantify the actual, significant impact of COVID-19 on supply chains.

For example, McKibbin and Fernando (2021) use a G-Cubed Multi-Country Model, which is a hybrid of a dynamic stochastic general equilibrium (DSGE) model and a computable general equilibrium (CGE) model, to estimate the economic impact of the COVID-19 outbreak. Their model has 6 sectors and 24 countries and regions, and uses the international input-output tables from the Global Trade Analysis Project (GTAP) database (Aguiar et al., 2019). They model different kinds of shocks such as the shock to labor supply in each country through mortality and morbidity due to infection and morbidity arising from family members' caregiving for the infected. Other shocks include an increase in production costs, a reduction in consumption and increases in country risk premium. Seven epidemiological scenarios were developed regarding China. Among them, three scenarios are the pandemic scenarios where the epidemiological shocks occur in all countries to differing degrees, which is what has actually happened. Simulation results show that the decrease in global GDP would range from \$2.3 to \$9.2 trillion, and the GDP loss for China, Japan and the US would be 1.6 to 6.2%, 2.5 to 9.9% and 2 to 8.4%, respectively. This study is notable in that it gave a relatively early warning about the global propagation of shocks via input-output or supply chain linkages.

Next, Inoue and Todo (2020) estimate the possible economic effects from a lockdown (i.e., state of emergency) in Tokyo by applying firm-level data for the actual supply chain linkages of approximately 1.6 million firms in Japan to an agent-based model. They find that a month-long lockdown in Tokyo would result in a reduction of the daily production in Japan by 86%, or 1.25 trillion yen. Moreover, their simulations show that the effect on prefectures other than Tokyo becomes progressively larger as the duration of the lockdown becomes longer, and that in the case of a month-long lockdown, the loss outside Tokyo is twice as large as the loss in Tokyo. The estimated total production loss is 27.6 trillion yen, or 5.22% of Japanese annual GDP. Their results show how the negative effects from lockdowns propagate to other regions through supply chains due to supply and demand shortages.

Hayakawa and Mukunoki (2021a)<sup>6)</sup> found significantly negative effects of COVID-19 on international trade in both exporting and importing countries. Their results indicate that the damage from COVID-19 involves reduction in production and thus export supply, as well as decrease in aggregate demand and hence imports. In addition, Hayakawa and Mukunoki (2021b) analyze the impact of COVID-19 on GVCs by examining bilateral trade in finished machinery product. Their results show that exports in final goods decrease if an exporting country imports inputs from countries more seriously affected by COVID-19. This indicates how the pandemic has disrupted trade in final goods through input-output linkages; namely, the negative effect on trade of downstream products caused by a negative supply

shock in the supplier countries of upstream intermediate inputs.

The general conclusion that can be derived from these empirical studies that have been conducted in the wake of the pandemic is that although COVID-19 has initially caused a significantly negative impact on GVCs and international trade, this effect has been mitigated since the latter half of 2020, proving resilience and robustness against the pandemic. This paper will focus on how international trade has helped tackle countries' medical supply shortages and excess demand by focusing on Japan.

### **3. Trade of Medical Goods in Japan During the COVID-19 Pandemic**

Using data on face masks, disinfectants, vaccines and test kits, which are among the most traded medical products worldwide, descriptive analysis is conducted to unveil the role international trade played during the COVID-19 pandemic. This study will focus on Japan in particular. First, Figures 3-6 show the importing and exporting countries of the aforementioned key medical goods based on their share in world trade in 2021. Panel (a) represents imports and panel (b) represents exports. Trade value is also depicted in bubbles. They show that Japan is a relatively big importer of these products. Therefore, we will now investigate how Japanese imports of these goods have changed throughout the COVID-19 outbreak.

Figure 3: Trade Map for Face Masks (2021)

(a) Imports



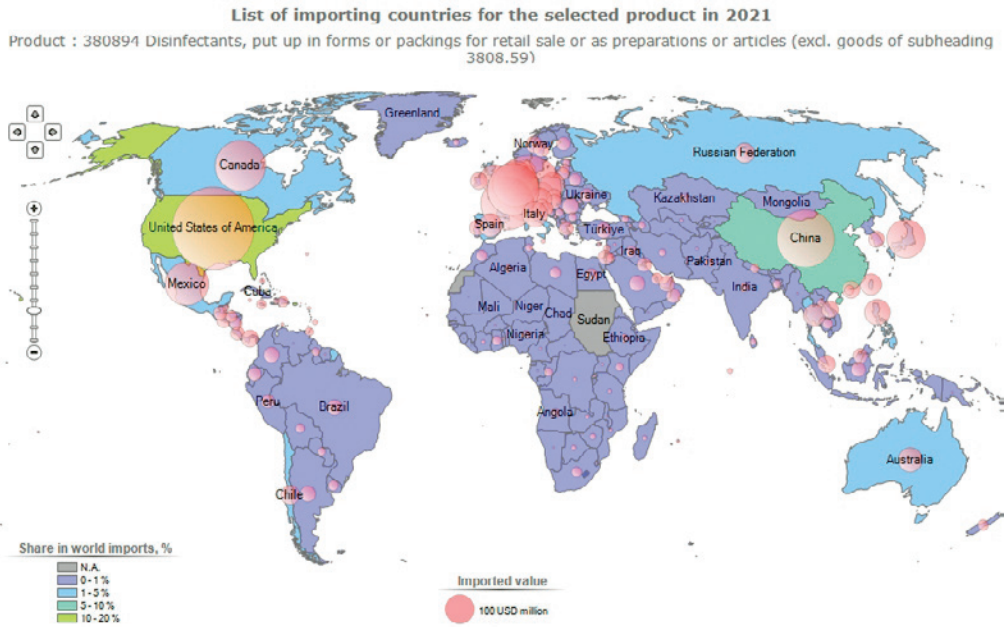
(b) Exports



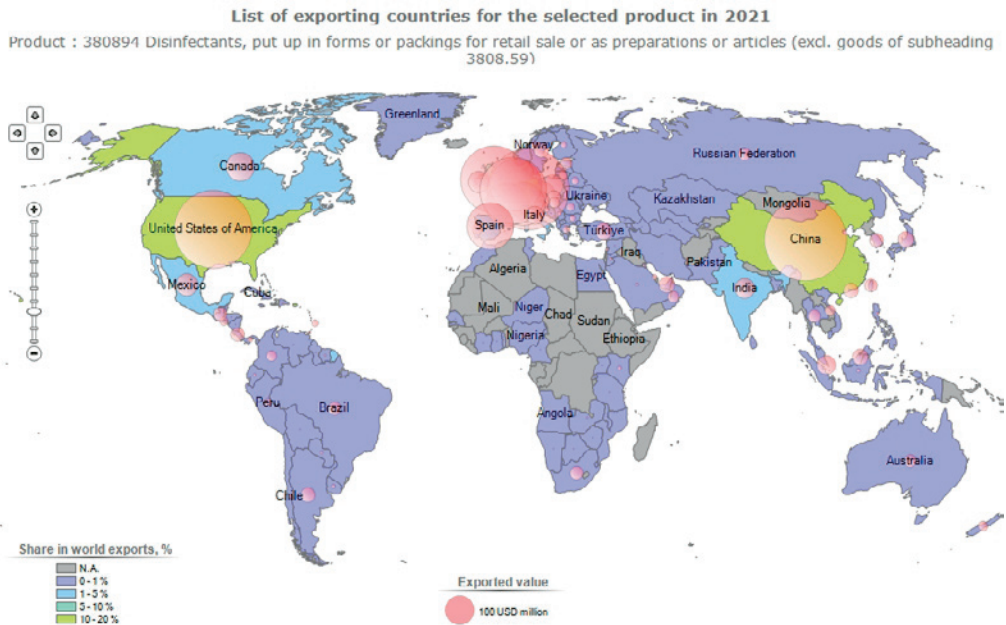
Source: International Trade Centre.

Figure 4: Trade Map for Disinfectants (2021)

(a) Imports



(b) Exports

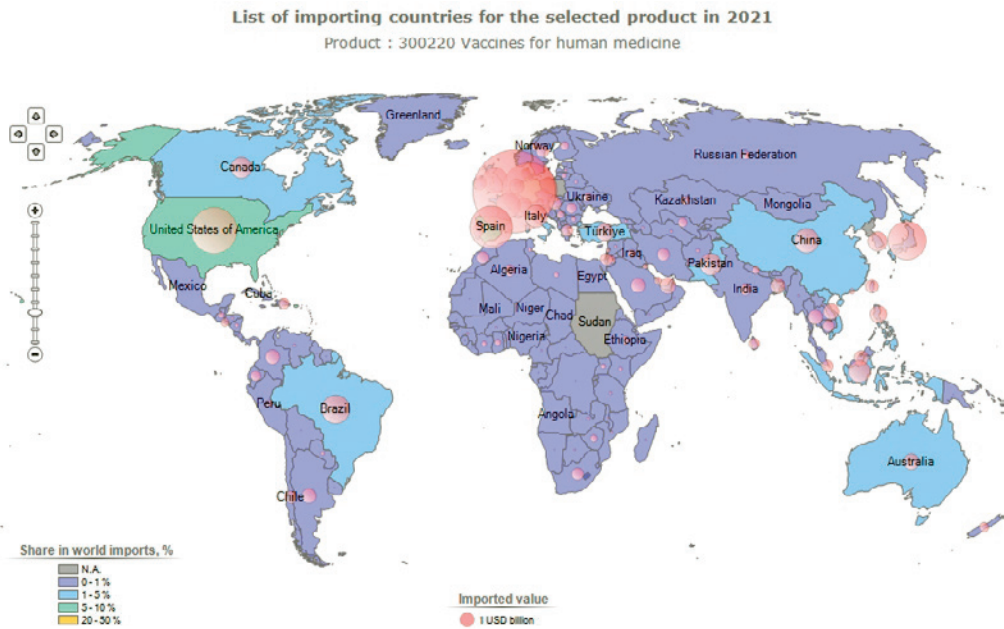


Source: International Trade Centre.

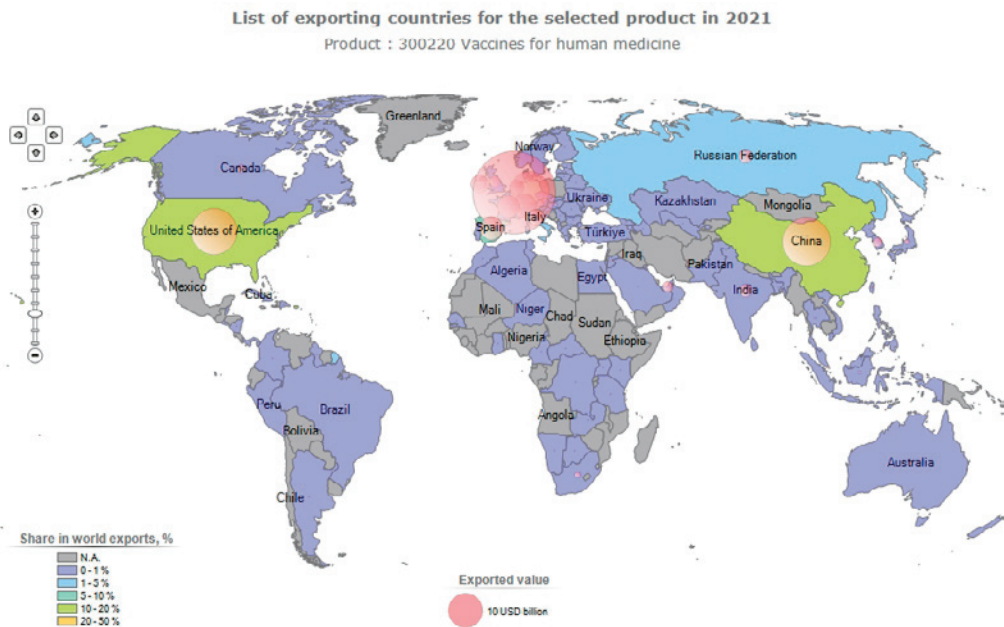


Figure 5: Trade Map for Vaccines (2021)

(a) Imports



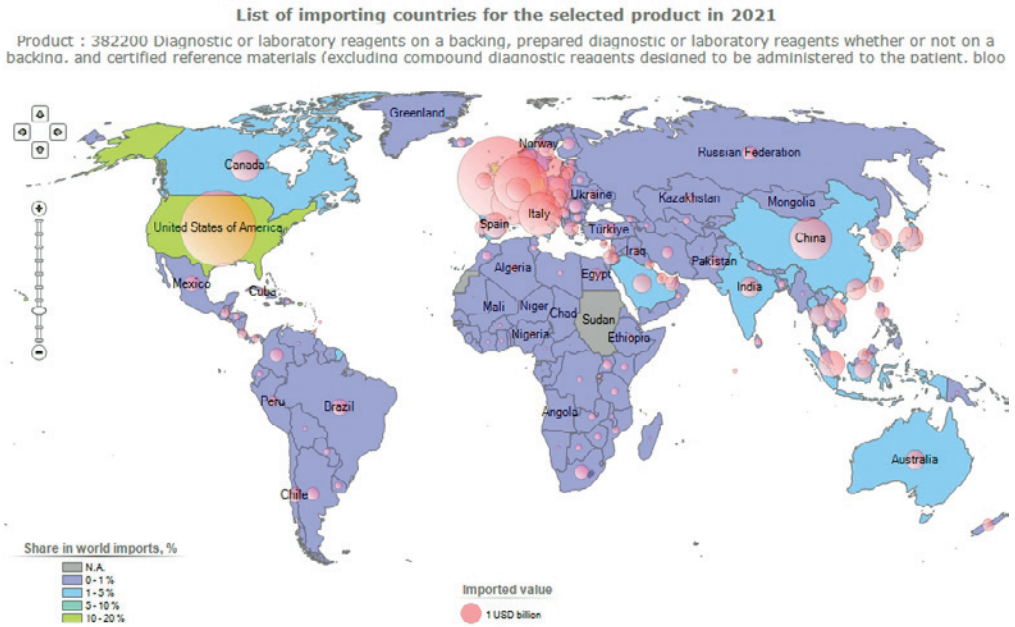
(b) Exports



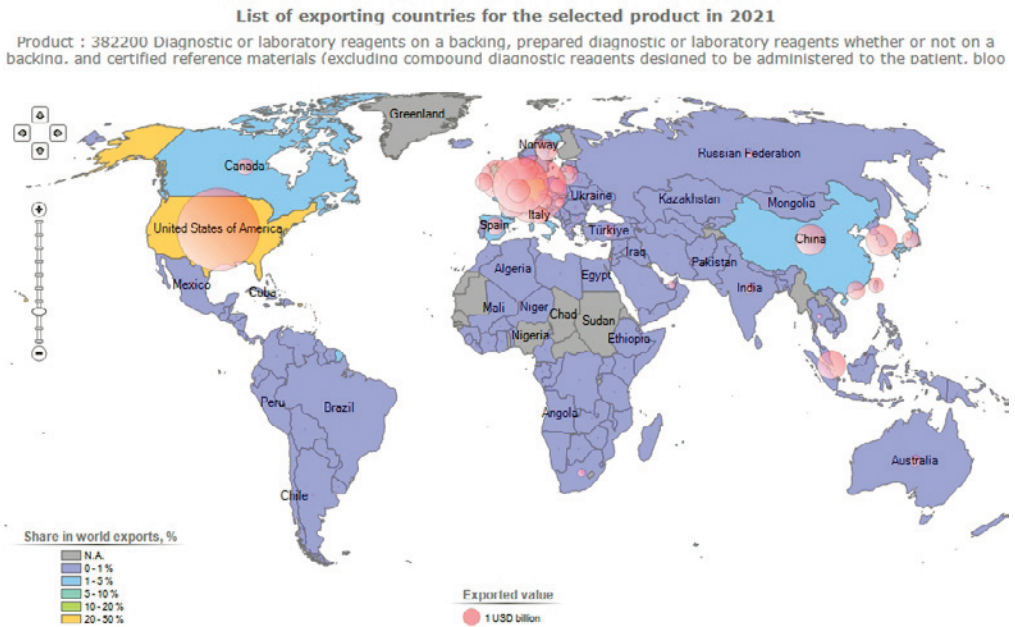
Source: International Trade Centre.

Figure 6: Trade Map for Test Kits (2021)

(a) Imports



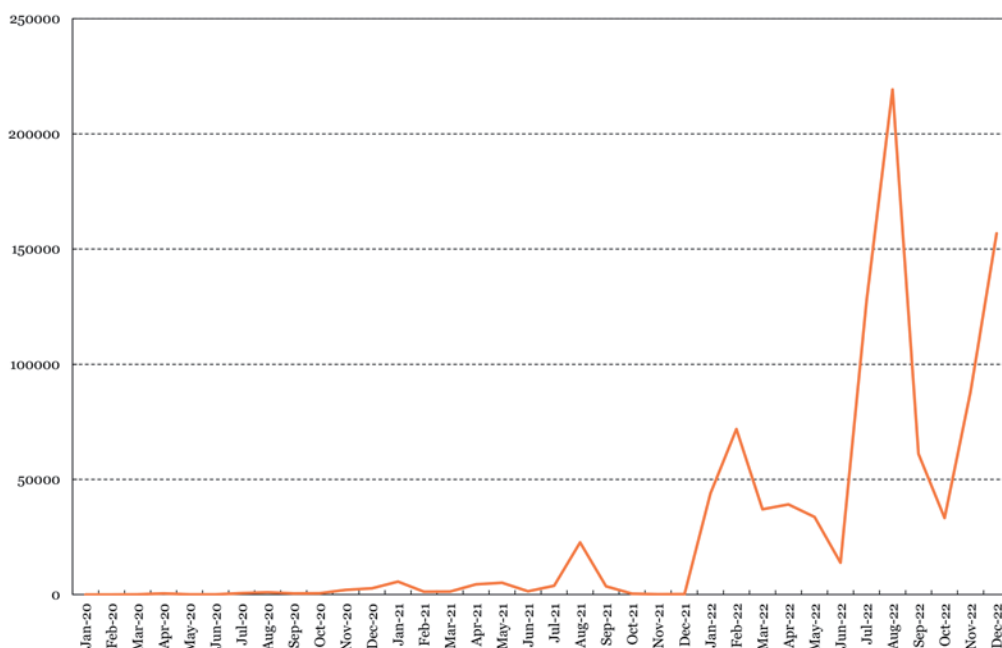
(b) Exports



Source: International Trade Centre.

Before we dive in, Figure 7 shows the trend in the number of newly confirmed cases daily. It is of importance to note that from July 23<sup>rd</sup> until August 8<sup>th</sup>, 2021, Tokyo 2020 Summer Olympics took place. During this time, Japan saw a record-breaking number of new COVID-19 cases each day. This trend of rising cases can be seen in Figure 7 from July 2021 to August 2021, where cases continued to increase until they reached their peak on August 26<sup>th</sup>, 2021. These events inevitably affect the supply and demand of medical goods.

Figure 7: Daily New Confirmed COVID-19 Cases (7-day rolling average)

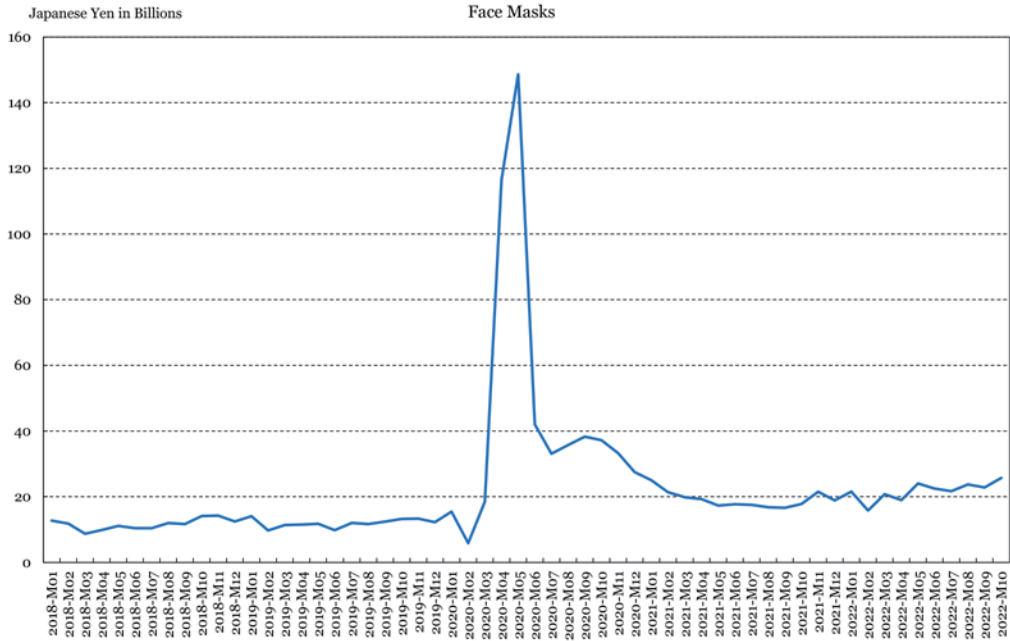


Source: Author's calculations based on data from *Ministry of Health, Labour and Welfare* (<https://covid19.mhlw.go.jp/extensions/public/en/index.html>).

First, let us look at face masks. According to Japan Hygiene Products Industry Association, Japan imported 12.6 billion face masks whereas it domestically produced 3.7 billion face masks in fiscal year 2021 (April 2021-March 2022).<sup>7)</sup> With the spread of COVID-19, the demand for face masks increased, which led to a mask shortage. Japan experienced an increase in cases of face masks being resold at markup prices. This prompted the Japanese government to take on a mask policy, and 120 million cloth masks, dubbed “Abenomasks,” were delivered to every household between April and June 2020.

Figure 8 shows face mask imports to Japan from January 2018 to October 2022. Imports peaked in May 2020, when Japan was suffering from a major mask shortage. In other words, international trade helped meet significant supply shortages in the face of surging demand. Figure 9 depicts Japanese import shares of face mask exporters. The major exporter for face masks to Japan is China. It can be seen that Chinese exports dropped in January 2020, and Japan resorted to sourcing its face mask imports from other countries.

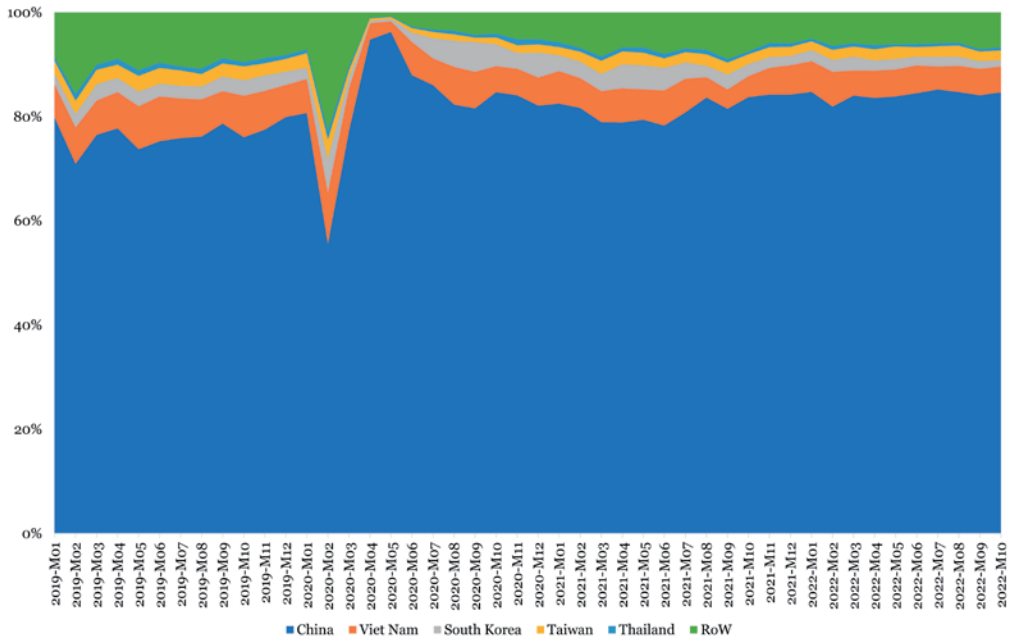
Figure 8: Japanese Imports of Face Masks



Notes: Face masks refer to the aggregate 6-digit HS code 6307.90.

Source: ITC calculations based on Japanese Ministry of Finance statistics.

Figure 9: Japanese Import Shares of Face Mask Exporters

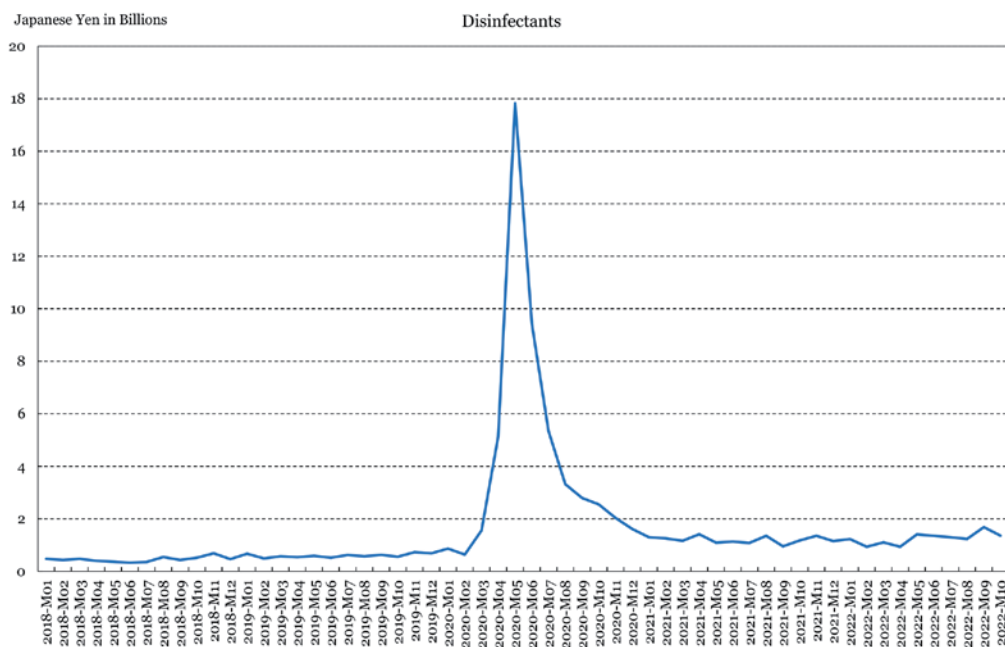


Notes: Face masks refer to the aggregate 6-digit HS code 6307.90.

Source: Author's calculations based on ITC Trade Map.

Figure 10 shows a similar trend of disinfectant imports to face mask imports, where disinfectant imports also peaked in May 2020. Even after the surge in demand for disinfectants calmed down, it has stabilized at a rate higher than before the COVID-19 outbreak. Figure 11 shows the Japanese import shares of disinfectant exporters. South Korea and Switzerland joined the exporting business of disinfectants when demand peaked in Japan, while exporters such as Thailand and UK decreased their shares. This can also be seen in Figure 12, which shows the changes in growth of disinfectant imports to Japan. It suggests the emergence of new suppliers during the pandemic, led by South Korea. Other Asian trading partners such as Taiwan, Vietnam and China also increased their disinfectant exports to Japan. Since late 2020, imports of disinfectants from Switzerland have risen greatly as well.

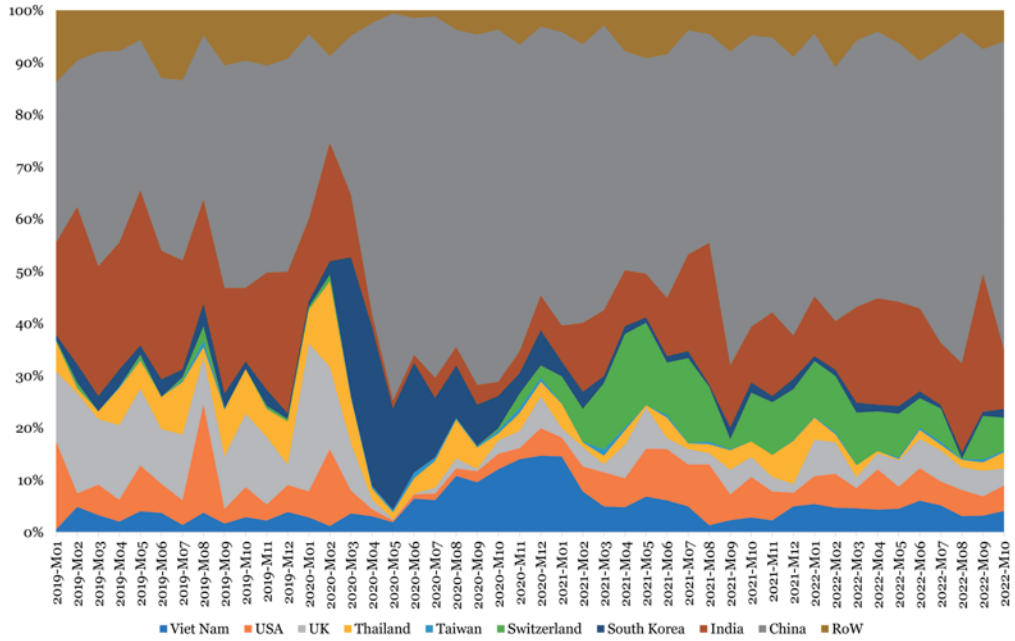
Figure 10: Japanese Imports of Disinfectants



Notes: Disinfectants refer to the aggregate 6-digit HS code 3808.94.

Source: ITC calculations based on Japanese Ministry of Finance statistics.

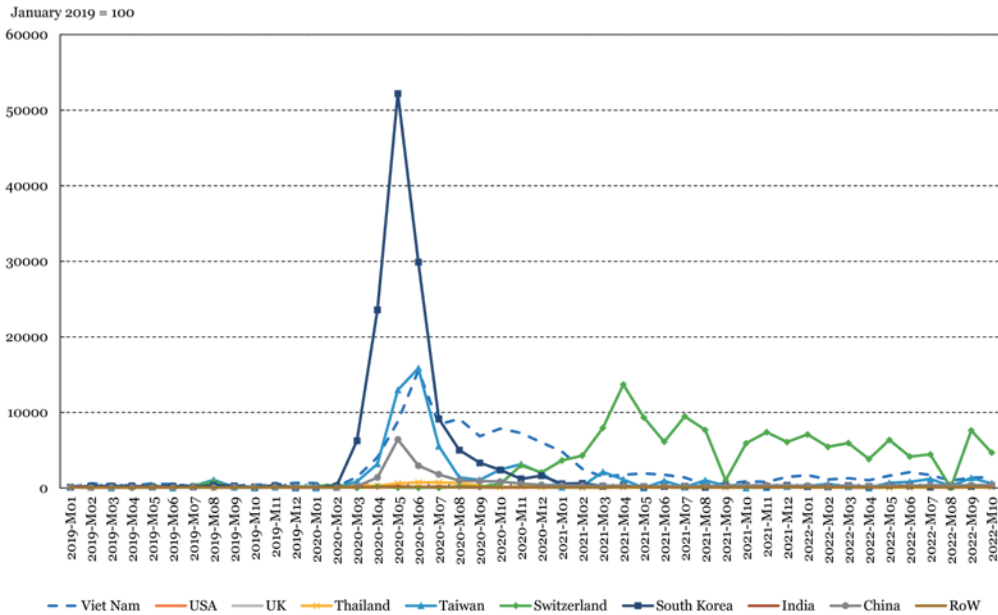
Figure 11: Japanese Import Shares of Disinfectant Exporters



Notes: Disinfectants refer to the aggregate 6-digit HS code 3808.94.

Source: Author's calculations based on ITC Trade Map.

Figure 12: Changes in Growth of Disinfectant Imports



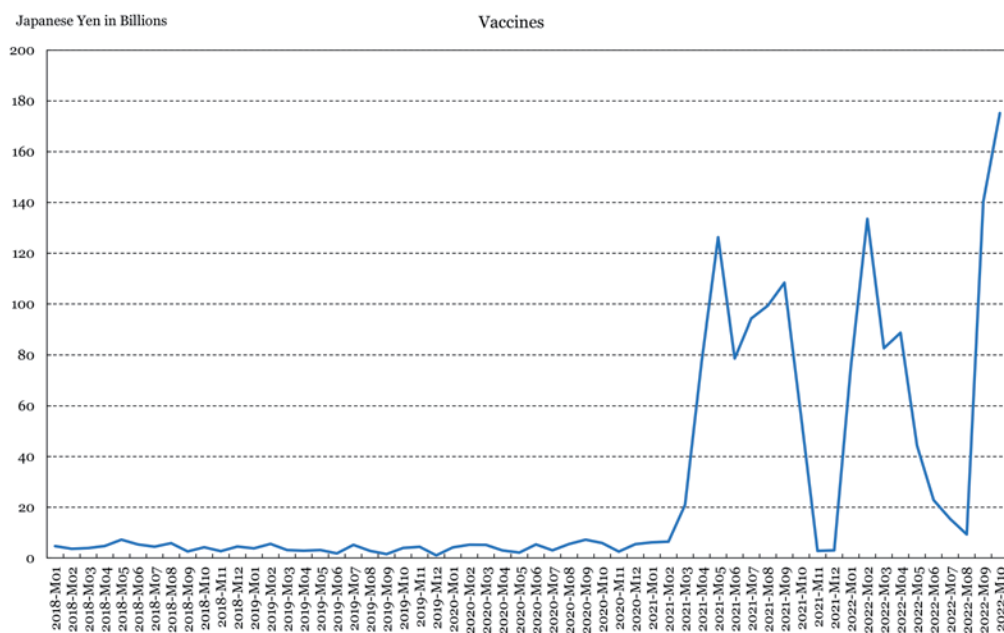
Notes: Disinfectants refer to the aggregate 6-digit HS code 3808.94.

Source: Author's calculations based on ITC Trade Map.

Vaccines are another key medical good whose demand has been supported by sourcing supplies from trading partners abroad. The COVID-19 vaccination program in Japan began its first stage in February 2021, with health care professionals. The second stage started in April 2021, targeting senior citizens aged 65 and older. Having been criticized for its slow rollout of COVID-19 vaccines, which started months behind the US and many other countries, Japan opened large-scale vaccination centers in May 2021 in Tokyo and Osaka, operated by the Self-Defense Forces. The third stage started in June 2021 for those aged 20-64 with underlying health conditions that put them at risk of severe symptoms should they contract COVID-19. At around the same time, in an effort to speed up vaccinations in Japan, the government announced that workplaces and universities will be involved in the rollout and began to target younger people.

Figure 13 depicts vaccine imports in Japan from 2018. Imports increased and peaked out in May 2021, continued to rise again in July 2021 until they started decreasing after September 2021. Vaccine imports reached another peak in February 2022. Figure 14 shows the import shares of vaccine exporters. Around April 2021, import shares from the US, Ireland and France seemingly are replaced by those from Belgium, Spain and Germany.

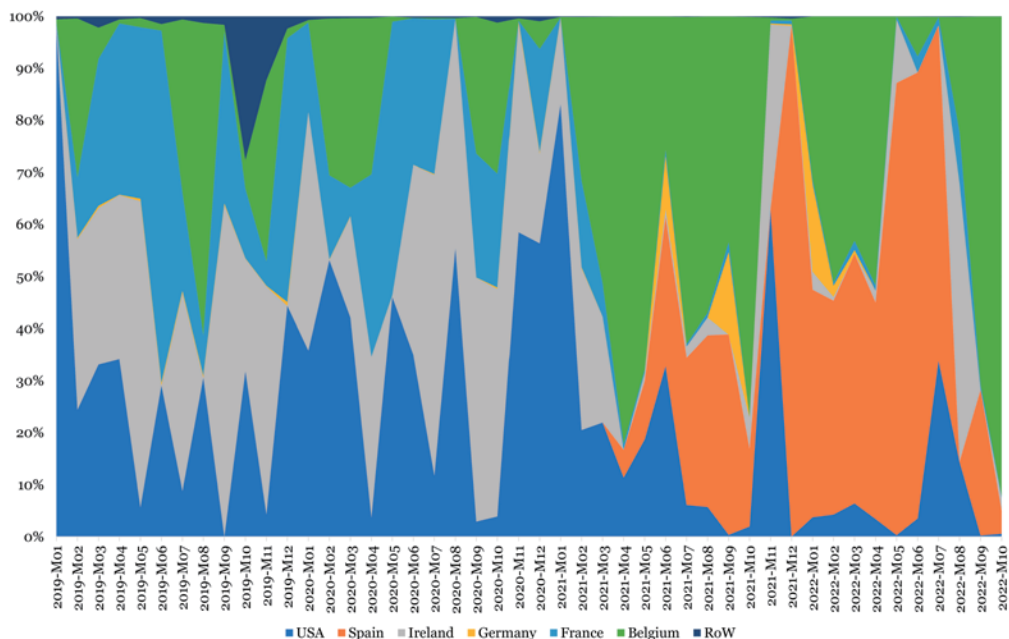
Figure 13: Japanese Imports of Vaccines



Notes: Vaccines refer to the aggregate 6-digit HS code 3002.20 until 2021, and HS code 3002.41 for 2022.

Source: ITC calculations based on Japanese Ministry of Finance statistics.

Figure 14: Japanese Import Shares of Vaccine Exporters



Notes: Vaccines refer to the aggregate 6-digit HS code 3002.20 until 2021, and HS code 3002.41 for 2022.

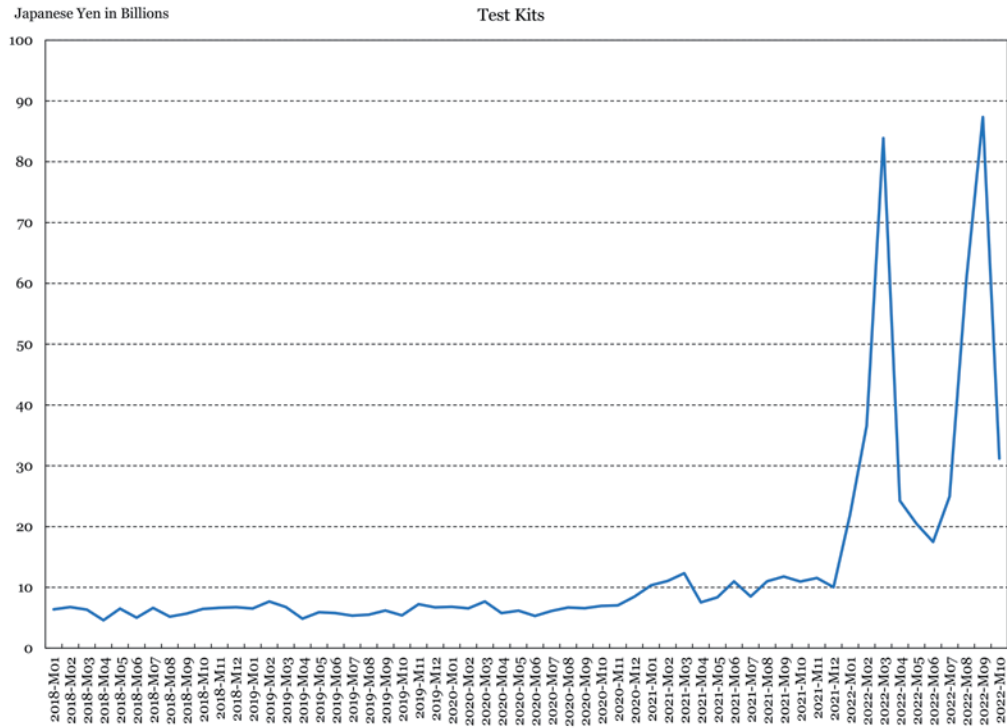
Source: Author's calculations based on ITC Trade Map.

Test kits are also a key medical good for which demand rose with the outbreak. Figure 15 shows the imports of test kits in Japan. Imports peaked twice: first in March 2022 and then in September 2022. This is consistent with the policy changes of the Japanese government; in that they have started to put a greater focus on increasing the availability of test kits. For instance, Ministry of Health, Labour and Welfare approved the online sale of self-test coronavirus antigen kits via pharmacy shopping sites in August 2022.

Figure 16 shows the changes in test kit import shares in Japan by country. Prominently, South Korea, but also China have increased their test kit import shares in Japan, indicating that new suppliers emerged during the COVID-19 crisis. This is confirmed in Figure 17, which depicts the changes in growth of test kit imports in Japan. The increase in test kits imported from South Korea led the two peaks in overall Japanese imports seen in Figure 16.



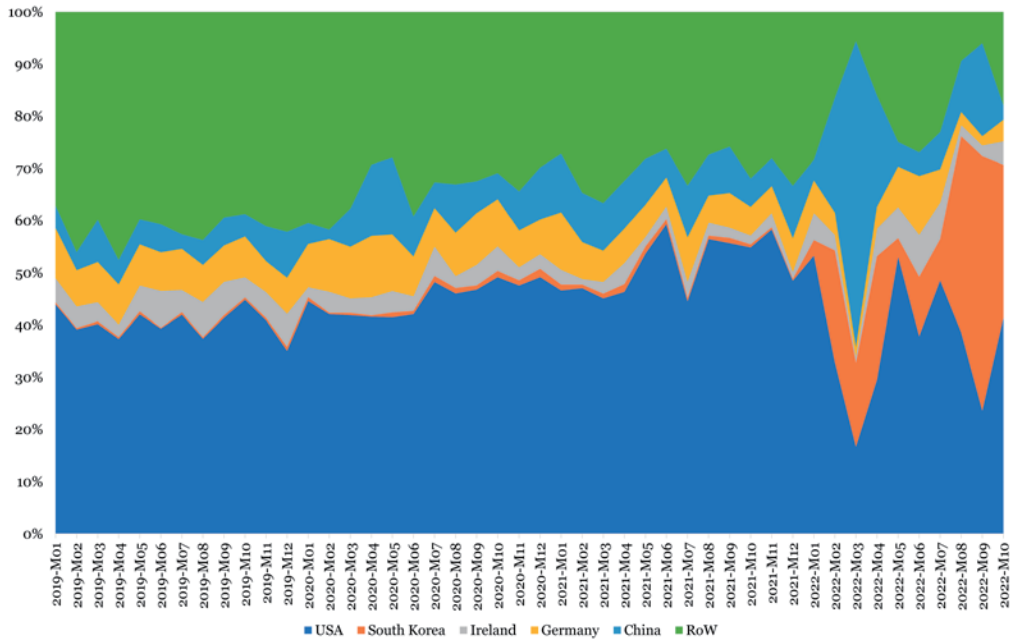
Figure 15: Japanese Imports of Test Kits



Notes: Test kits refer to the aggregate 6-digit HS code 3822.00.

Source: ITC calculations based on Japanese Ministry of Finance statistics.

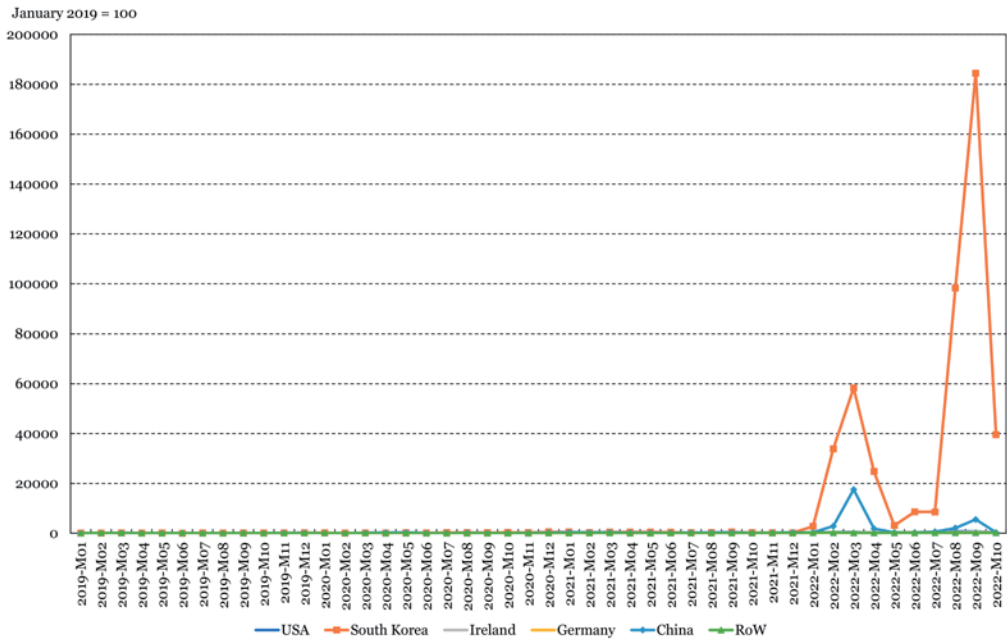
Figure 16: Japanese Import Shares of Test Kit Exporters



Notes: Test kits refer to the aggregate 6-digit HS code 3822.00.

Source: Author's calculations based on ITC Trade Map.

Figure 17: Changes in Growth of Test Kit Imports



Notes: Test kits refer to the aggregate 6-digit HS code 3822.00.

Source: Author's calculations based on ITC Trade Map.

Focusing on imports of four medical goods in Japan, results show that international trade helped meet significant supply shortages in the face of surging demand amid the pandemic. In addition, there was an emergence of new suppliers during the pandemic, indicating that Japan resorted to sourcing its imports of key medical goods from different countries during the COVID-19 crisis. This diversification of import sources is an important strategy according to Todo et al. (2021). They find that the geographic diversity of customers and suppliers strengthens resilience of supply chains. When the demand or supply from a trading partner is disrupted due to COVID-19, firms can mitigate the damage from this disruption by substituting partners if their supply chains are well diversified across countries.

#### 4. Conclusion

This study investigates Japan's importing patterns and reveals the trade interdependencies in key medical goods during the COVID-19 pandemic. International trade has played an important role to help meet significant supply shortages in the face of surging demand in Japan. Japan has also diversified its import sources over the course of the pandemic.

These findings suggest that measures to maintain and enhance trade ultimately contribute to managing a crisis, namely the COVID-19 pandemic. This is consistent with Brenton et al. (2022), who empirically show that by supporting international trade we can strengthen the recovery from the pandemic, whereas measures to restrict trade and promote reshoring will weaken it. Firms' decisions to shifting input sourcing from foreign suppliers to domestic suppliers exacerbate the negative impacts of COVID-19 on the domestic economy. Therefore, firms should focus on diversification of input sourcing including dual sourcing of the same inputs from suppliers in different countries. These measures should help prevent the spread of negative shocks through GVCs.

Japan has been tackling the unprecedented demand shock by utilizing international trade and GVCs. Trade interdependencies in COVID-19 goods help each economy's recovery. Consequently, measures to reduce trade barriers, streamline trade procedures and facilitate trade at borders contribute to a better response to the pandemic, and also pave the way for greater resilience to future shocks. Increasing supply chain resilience is important for dealing with not only health emergency crises like COVID-19, but also other types of shocks such as war, cyberattacks and extreme weather events related to climate change.

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#### Notes

- 1) For a recent discussion, see The World Bank (2020).
- 2) According to the World Bank, low-income economies are those in which 2021 GNI per capita was \$1,085 or less, and middle-income economies are those in which 2021 GNI per capita was between \$1,086 and \$13,205.
- 3) See *Global Trade Alert* (<https://www.globaltradealert.org/>) for details.
- 4) See OECD (2021).
- 5) For example, see Todo et al. (2021).

- 6) Hayakawa and Mukunoki (2021a)'s results also show that the overall negative impact of COVID-19 tends to become insignificant after July 2020, which is consistent with the trend seen in Figure 1.
- 7) Data can be accessed at: [https://www.jhpie.or.jp/data/data7.html?\\_fsi=ln1TOzKc](https://www.jhpie.or.jp/data/data7.html?_fsi=ln1TOzKc).

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## 新型コロナウイルス感染症と国際貿易 —日本における医療用品に関する考察—\*

新型コロナウイルス感染症（COVID-19）の大流行は、グローバル・バリューチェーン（GVC）における国際分業・特化から得られる便益をいかに正確に定量化し、それに伴う、あらゆる危機により引き起こされるショックが伝播するというリスクと比較し、その関係を明らかにすることの重要性を我々に喚起した。COVID-19 発生時の日本における4つの医療用品の輸入パターンから、需要の急増に伴う様々な供給不足に対応するために、国際貿易が重要な役割を果たしたことが明らかになった。さらに、新しい供給者の参入も見られ、コロナ禍のもとで日本が輸入先を多様化させていることも示された。

JEL: F14, F15, F60

キーワード: COVID-19, 医療用品, 国際貿易, グローバル・バリューチェーン (GVC)

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