Who sends me face masks? Evidence for the impacts of COVID-19 on international trade in medical goods

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February 2021

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Keywords: COVID-19; International trade; Medical goods
JEL Classification: F15; F53

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Who Sends Me Face Masks? Evidence for the Impacts of COVID-19 on International Trade in Medical Goods[§]

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1. Introduction

Many countries have experienced a shortage of medical products during the novel coronavirus 2019 (COVID-19) pandemic, which the World Health Organization (WHO) recognized on 11 March 2020. Since that time, the demand for protective items, such as face masks, has risen dramatically worldwide. However, due to the limited supply, people were not able to obtain a sufficient number of items. Even hospitals were in danger of running out of masks. Furthermore, to ensure an adequate supply for domestic consumption, many countries imposed measures against the outflow of these items, including export bans.

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According to the World Trade Organization[1], China supplied 25% of the face masks exported to the world market in 2019, and together with Germany and the US, provided nearly half of the global supply. These three countries also had a large number of confirmed cases and consequently required a large number of masks. Thus, it proved challenging to import medical products from foreign countries.

This study empirically investigates what kinds of countries imported and exported medical products during the COVID-19 pandemic. As mentioned above, many countries that were in danger of running out of medical products restricted their exports abroad. Nevertheless, many of those countries allowed exports to certain "special" countries. For instance, owing to a longstanding or close relationship, they might help neighboring countries by exporting urgently needed products. In addition, they might export to countries with similar political stances. Medical products might also be imported from countries with large expatriate populations. Old colonial ties or close economic ties, including regional trade agreements (RTAs), might facilitate the trade of medical products. In short, countries may prohibit exports in general but engage in trade with some countries when there are specific reasons to do so.

Herein, we examine the bilateral trade values of medical products among 35 reporting countries and 250 partner countries between January and August in both 2019 and 2020. We follow the World Trade Organization (WTO) classification of medical products, which includes four categories: medicines, medical supplies, medical equipment, and personal protective products. We regress the trade values of each category on the numbers of COVID-19 cases or deaths in exporting and importing countries. The coefficients for these numbers indicate the impacts of COVID-19 on trade in each category of medical products. Then, we introduce interaction terms for these numbers together with various bilateral measures to identify the "special" countries mentioned above. Following the literature on the determinants of foreign aid, we examine four measures: the similarity index in United Nations voting record (i.e., political ties), the RTA dummy (i.e., economic ties), the numbers of immigrants between exporting and importing countries (i.e., demographic ties), and geographical distance (geographic ties). By exploring the estimates in these interaction terms, we investigate what kinds of bilateral relationships increase trade in medical products.

Indeed, investigating health diplomacy in the COVID-19 era provides a rare opportunity for evaluating the roles of bilateral relations.[2] Fazal (2020) examines SARS 2003,

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[1] https://www.wto.org/english/news_e/news20_e/rese_03apr20_e.pdf

[2] The definition of health diplomacy is a topic of debate (Feldbaum and Michaud, 2010). Health diplomacy is different from global health diplomacy. The main aim of global health diplomacy is to contribute to the improvement of global health, whereas that of health diplomacy is to increase or strengthen national interests by solving the health problems of other countries (Bliss, 2011). According to Bliss, China and Russia are pioneers of health diplomacy based on their humanitarian, strategic, and ideological purposes.

HINI 2009, MERS 2012, and Ebola 2014 and 2018 as health diplomacy cases during a pandemic period. Yet, these cases were not global crises and thus did not have enough variations to examine the role of country-pair characteristics in health diplomacy. Furthermore, during such a crisis, multilateral approaches such as using international organizations tend not to work well because there is less coordination. Indeed, health diplomacy around COVID-19 has shown fragmentation (Fazal, 2020). Great powers like the US and China and emerging countries like Turkey and Taiwan have played the role of donor countries of medical products. Furthermore, competition between the US and China and the weak leadership of the WHO provided the conditions for bilateral health diplomacy. As a result, bilateral linkages are expected to play a more critical role in the international trade of medical products during the COVID-19 pandemic.

The findings of the regression analyses can be summarized as follows. An increase in the number of COVID-19 cases or deaths in a country significantly decreases the exports of medical products and increases their imports. However, such a decrease in exports becomes smaller when exporting to countries with political, economic, or geographical ties, whereas the increase of imports does not become larger when importing from such countries. In contrast, demographic ties play a role in the importation of medical products, especially personal protective products. Immigrants receive face masks from relatives in their home country when the immigrant's country of residence is strongly impacted by COVID-19. In sum, our analyses suggest that medical products tend to be exported based on political or economic incentives, even when a country experiences increased impacts from COVID-19. In contrast, people-to-people networks play a key role in importing medical products.

Our study is related to various strands of the literature, including a large number of studies on how and why countries grant foreign aid. Recent examples include Bermeo (2017) and Dreher et al. (2018). Although health diplomacy appears similar to foreign aid, in-kind aid may differ from monetary aid. Second, we contribute to the literature on the international trade–COVID-19 nexus. Some studies have empirically investigated the effects of COVID-19 on global value chains (Hayakawa and Mukunoki, 2020b; Friedt and Zhang, 2020; Kejzar and Velic, 2020; Meier and Pinto, 2020). These studies show that the negative effects of COVID-19 on trade propagate across countries through supply chains. Some studies also discuss this trade–COVID-19 nexus in the context of medical products (Evenett, 2020; Gereffi, 2020). There are also several policy reports on China's "mask diplomacy." Examples include ADB (2020), Baldwin and Freeman (2020), Kahn and Prin (2020), Verma (2020), White (2020), and Wong (2020). However, these studies do not statistically investigate the effects of COVID-19 on the trade of medical products and how those effects differ according to bilateral linkages.

The studies closest to this paper are Fuchs et al. (2020) and Telias and Urdinez (2020). Both studies investigate exports of medical products from China and shed light on the roles of political and economic ties with foreign countries. We extend their analyses in terms of the following three points. First, we cover worldwide trade, including exports from China. As mentioned above, our study potentially includes 250 exporter countries, and thus our analysis provides more general results. Indeed, due to the focus on China's exports, the above studies examine factors specific to China, such as the One China Policy, which are not necessarily useful for deriving policy implications that are applicable to the rest of the world. Second, we examine not only economic and political linkages but also demographic linkages (i.e., migration). Third, we investigate the role of these linkages in both exporting and importing. The separation of these investigations is important because, as introduced above, each kind of linkage has different effects between exporting and importing. In short, our analysis presents richer results.

The remainder of this study is organized as follows. Section 2 establishes our conceptual framework on the trade of medical products during the pandemic era by referring to the determinants of foreign aid policy. In Section 3, we present an overview of the global trade of medical products. After explaining our empirical framework in Section 4, we report our estimation results in Section 5. Lastly, Section 6 concludes the paper.

2. Conceptual Framework

Given the global nature of the COVID-19 pandemic, every country needs medical products. During a pandemic, the act of supplying medical products can be considered a form of foreign aid (Hattori, 2011). Indeed, as in the case of foreign aid, the aim of health diplomacy is to strengthen national interests (Vanderwagen, 2006; Feldbaum and Michaud, 2010). Therefore, to elucidate the mechanism and motivation underlying the trade of medical products in the COVID-19 era, this section discusses some possible factors that have an influence on foreign aid from the viewpoint of international relations.

Foreign aid can be characterized by three main pillars: strategic relationships, humanitarian behavior toward recipient countries, and economic assistance to recipient countries. The motivation behind strategic relationships is to obtain material benefits such as political and security gains. Humanitarian behavior is aimed at increasing soft power (i.e., intangible influence) in world politics. Although the motivation behind economic assistance is similar to that of humanitarian behavior, the former also intends to develop recipient states as future trading partners. McKinley and Little (1977) studied US foreign aid programs during the 1960s and concluded that strategic relationships were the central motivation of the programs.[3] They also examined the aid policies of the UK, France, and

[3] More specifically, McKinley and Little (1977) suggested five elements for comparative analysis: development interests, overseas economic interests, security interests, power-political interests, and interest in political stability and democracy. Security interests, power political interests, and interest in political stability and democracy are regarded as the motivation behind strategic relationships. Development interests are based on humanitarian behavior. The aim of overseas economic interests is to

Germany during the 1960s and clarified that the UK and France prioritized strategic relationships (McKinley, 1979; McKinley and Little, 1978). Meanwhile, these studies concluded that economic assistance and humanitarian action are not key drivers of donor countries' motivation.

Schraeder et al. (1998) added three more factors, including cultural/historical similarities, ideological stance, and geographical features. Although these models relate to the three traditional pillars, the motivations behind them are slightly different. For cultural similarities, decision-makers take account of cultural ties based on historical legacies such as colonial traditions, given that former colonies have similar social systems. For ideological ties, decision-makers prioritize ideological similarities when selecting the destination of aid. Geographical features may be linked with strategic relationships because geographical proximity is an element of threat perception for decision-makers, which is directly connected to national security (Walt, 1987). Decision-makers tend to tame neighboring countries through either military power or foreign aid. In some cases (e.g., wars, civil wars, or disasters), the geographic position can be critical. Neighboring states may need an emergent response to such cases for their security. In an analysis of four countries (the US, Japan, France, and Sweden) in the 1980s, Schraeder et al. (1998) found that all the six elements affected the donor's motivation or the target of the aid. Nevertheless, they emphasized that humanitarian concerns are a relatively weak motivation for decision-makers, whereas economic relationships via trade play a vital role in all donor countries' motivation.

Recent studies on foreign aid have introduced the idea of constructivism. One of the core ideas of constructivism is identity. Theories about international relations have included several kinds of identity, such as national identity and state identity (Wendt, 1999). Among them, national identity plays a decisive role in the sending and receiving of foreign aid. Shain and Aharon (2003) emphasize the diaspora (or broadly speaking, kinship) nexus between donor and recipient countries. The activities of Jewish and Armenian lobbies in the US are typical examples of diaspora politics. They have four motivations, namely, influencing (i) the whole kinship community, (ii) the future of their homeland, (iii) people or communities in their host country, and (iv) influential organizations, such as American-Israel Public Affairs Committee (AIPAC) in the case of Jewish Americans (Shain and Aharon 2003). Diaspora politics have worked well in the arena of foreign aid.

Migrant communities also play a role similar to that of the diaspora mentioned above. For example, Bermeo and Leblang (2015) found a positive relationship between aid allocation and the number of migrants from a recipient country to a donor country. One motivation for donor countries to provide aid might be to decrease migration from the recipient country. However, migrants (those with dual-citizenship) living in a host country are interested in developing their home country. To this end, migrants or migrant

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form alliances with trading partners.

organizations may pressure the government of the host country by joining forces with their home government. For example, they lobby the host government to provide aid to their home country (Prather, 2020). In sum, members of diaspora and migrant communities can play a key role in the decision-making of donor countries.

In sum, as a model of foreign aid of donor countries, previous studies supposed seven factors: strategic relationships, humanitarian relations, economic partners, cultural similarities, ideological similarities, geographical features, and identity ties. Those studies concluded that humanitarian action is not a critical factor. Although ideology worked well during the Cold War era, it is no longer relevant. In addition, geographic proximity is critical to avoiding potential conflicts with neighboring countries. Hence, strategic relationships, economic partners, cultural ties (historical legacy), identity network, and geographic features, play critical roles in the allocation of foreign aid.

These five factors may also have significant effects on the international trade of medical products in the COVID-19 pandemic. Health diplomacy during a pandemic can be considered a form of foreign aid. Moreover, many countries introduced export prohibitions and restrictions on the trade of medical products in order to mitigate shortages of those products and keep them for domestic use. For example, according to the WTO[4], 73 countries or territories introduced such restrictions on face and eye protection as of 22 April 2020. Therefore, governments and other decision-makers have exerted some control over the trade of medical products. Therefore, the abovementioned factors in foreign aid are expected to play a critical role in the trade of medical products.

3. Background

This section presents an overview of the international trade of medical products during the COVID-19 pandemic. The rise in the number of confirmed cases led to a dramatic increase in the demand for certain key medical goods, including medical devices, protective equipment, and pharmaceuticals. Because this rise occurred at a similar timing in most countries, supplies of those goods rapidly dwindled in many countries. Indeed, the production of medical goods is concentrated in a limited number of countries, including China, Germany, Switzerland, and the US. Moreover, as mentioned in the previous section, many countries introduced export prohibitions and restrictions on those goods. Although most industries experienced a sharp drop in global trade in April and May 2020 (Hayakawa and Mukunoki, 2020a), the trade of medical products may show a different trend.

Here, we examine the monthly trade values of medical products worldwide. We follow the classification of medical goods defined by the WTO. According to its website, there are four categories. The first is medicines (pharmaceuticals), including immunological

[4] https://www.wto.org/english/tratop_e/covid19_e/export_prohibitions_report_e.pdf

products, vaccines for human medicine, and medicaments. The second is medical supplies, which are consumables for hospital and laboratory use (e.g., alcohol, syringes, gauze, reagents). The third is medical equipment, which includes medical, surgical, and laboratory sterilizers as well as medical and surgical instruments and apparatuses. The fourth category is personal protective products (*Personal*), which includes hand soap and sanitizer, face masks, and protective eyewear. A list of six-digit level codes in the Harmonized System (HS) 2017 is available on the WTO website.[5]

We obtained the monthly data on trade values from the Global Trade Atlas maintained by the IHS Markit.[6] In particular, we examine the trade values of the 35 countries listed in the Global Trade Atlas, that is, the 35 reporting countries in the database.[7] The potential number of trading partner countries is 250. We aggregate the trade values at the HS six-digit level according to the four categories described above. We first examine the monthly exports of the 35 countries in 2020 relative to those in 2019. We focus on exports because the data on imports may indicate the figures one or two months after production. This time lag is inevitable because import statistics record the date of arrival at ports in importing countries, and it takes some time to ship goods from the port of an exporting country to the port of an importing country. This time lag may not matter much when using annual data but might affect the results of a month-by-month analysis such as ours (Hayakawa, 2020). Thus, when examining monthly trade values, we use only the trade data from export statistics.

The exports of the 35 countries to the rest of the world for each category of medical products are shown in Figure 1. The increase in exports of personal protective products is of particular note. It rose dramatically in April, peaked in May, and then gradually decreased. In May, the magnitude of exports was 2.5 times larger than that in 2019. Even in August, it was still more than 50% greater. This dramatic increase is consistent with consumer demand. Face masks were needed for infection control not only at hospitals but also offices. Although the growth of exports in other medical goods is moderate compared with that in personal protective products, it is greater than the value of one, indicating a larger magnitude than the level in 2019. This fact is surprising because other products (e.g., apparel, electronic machinery products, and transport equipment) experienced a sharp drop in trade, particularly in April and May (Hayakawa and Mukunoki, 2020a). Thus, based on the rise in demand, the trade in medical goods increased despite the export restrictions imposed by many countries.

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[5] http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/nomenclature/covid_19/hs-classification-reference_2_1-24_4_20_en.pdf?la=en. It should be noted that this list does not include intermediate products needed to produce these medical products because it is difficult to identify whether intermediate products are used for medical or non-medical products.

[6] https://connect.ihsmarkit.com/gta/home

[7] AR, AT, AU, BE, BR, CA, CH, CI, CN, DE, DK, ES, FR, GB, GR, HK, ID, IE, IL, JP, KE, KR, LU, MX, MY, NL, PH, PT, RU, SE, SG, TH, TW, US, ZA

=== Figure 1 ===

Next, we examine who exports or imports medical products by exploring the sum of exports to or imports from other countries from January to August in 2020. To this end, we mix the trade values of export and import statistics because this is not a month-by-month analysis. We create a more comprehensive dataset on global trade by using mirror trade data. We use imports when both exports and imports are available, that is, if both exporting and importing countries are "reporting countries" in the database. The top five exporters and importers are listed in Table 1. In terms of exports, Germany and the US are key players in most medical product categories. However, China is a major exporter of personal protective products, accounting for 45% of the world's exports. Thus, the surge in exports of personal protective products shown in Figure 1 was realized mostly by China's exports. However, in terms of imports, Germany and the US are again key players in most medical products. The US in particular ranked first in all four categories.

=== Table 1 ===

4. Empirical Framework

This section presents our empirical framework for investigating the impacts of COVID-19 on the international trade of medical products. We examine these impacts by exploring the sum of bilateral trade values from January to August for both 2019 and 2020. Our dataset contains two time points. As shown in Table 1, we use both import and export statistics to maximize the number of country pairs included in the dataset. As in the previous section, we use the data on trade values from the Global Trade Atlas. Thus, our dataset covers the trade between 35 reporting countries and 250 trading partners. We again aggregate trade values at the HS six-digit level according to the four categories of medical products.

Our baseline model is as follows.

$$Trade_{ijy} = \exp\{\alpha_1 COVID_{iy} + \beta_1 COVID_{jy} + \delta_{ij} + \delta_{yf}\} \cdot \epsilon_{ijy} \quad (1)$$

$Trade_{ijy}$ is the sum of export values from countries i to j during January-August in year y. $COVID_{jy}$ and $COVID_{iy}$ are the COVID-19 burdens in exporting countries and importing countries, respectively. We control for two kinds of fixed effects (δ_{ij} and δ_{yf}). The subscript "f" indicates the trade flow included in the data (i.e., export statistics or import statistics). Given that our study time includes two points, δ_{yf} has four combinations. ϵ_{ijy} is a disturbance term. We estimate this equation for each category of medical products by the Poisson pseudo-maximum likelihood (PPML) method.

We measure COVID-19 burden as the sum of the number of confirmed cases or deaths from January to August. These data are obtained from the European Centre for Disease Prevention and Control[8] and have been collected on a daily basis from reports issued by health authorities worldwide. The numbers are set to zero for 2019. We add a value of one to these numbers and then take their logs. Although these numbers represent those who contracted the virus, large numbers are also expected to have a substantial psychological impact on the uninfected, discouraging them from working or going out. Thus, we expect that this measure reflects the economic impacts of COVID-19. As a result, the coefficients for these numbers indicate the effects of COVID-19 on trade.

We introduce two kinds of fixed effects. δ_{ij} represents country-pair fixed effects, which control for the standard gravity variables such as geographical distance. Furthermore, due to the short time period (two years), this type of fixed effect may control for country characteristics that do not change much in such a short time (e.g., the total population of importing and exporting countries). δ_{yf} represents year-flow fixed effects. The year component of this indicator controls for changes in the world income, whereas the trade flow component (*f*) controls for the difference in the trade value between the import and export statistics, that is, the difference between FOB base values and CIF base values.

Next, we extend our model by introducing the interaction terms of COVID-19 variables with variables on various bilateral linkages.

$$Trade_{ijy} = \exp\{\alpha_1 COVID_{iy} + \alpha_2 COVID_{iy} \cdot Linkage_{ij} + \beta_1 COVID_{jy} + \beta_2 COVID_{jy} \cdot Linkage_{ij} + \delta_{ij} + \delta_{yf}\} \cdot \epsilon_{ijy} \quad (2)$$

In Section 2, we have discussed the roles of political linkages (strategic relationships), economic linkages, demographic linkages (i.e., identity networks of migrants and diaspora), and geographical linkages in the relationships between donor and recipient countries in foreign aid. $Linkange_{ij}$ captures these four kinds of bilateral relationships between countries i and j.[9] Furthermore, we examine the role of these linkages in exporting and importing separately by interacting these linkage variables with the COVID variables of importers and exporters. Some types of linkages may be effective only in the context of exporting and *vice versa*.

Here, we use the following variables to measure the strength of each linkage. In the literature, strategic relationships have been measured by several indicators, including treaties between donor and recipient countries, friend or foe status with respect to applicable states or alliances, and United Nations General Assembly (UNGA) voting similarity (Alesina and Dollar, 2000). In the present study, as a political linkage measure, we use the voting similarity index in 2019, the data of which are obtained from Bailey et al. (2017). The index indicates the similarity of state preferences inferred from voting behavior in the UNGA. For the economic linkage, some studies examined the role of trade volumes

[8] https://data.europa.eu/euodp/en/data/dataset/covid-19-coronavirus-data

[9] Later, we also examine the role of cultural or historical linkages.

in foreign aid (Lundsgaarde et al., 2010). Instead of direct trade indicators, we use the dummy variable that indicates the existence of RTAs between the two countries. We obtain the RTA dummy variable from Egger and Larch (2008) and update it for 2020 by using the information on RTAs available on the WTO website. As an indicator of the demographic linkage, we use the number of migrants. Stock data on bilateral migrants as of 2019 are obtained from the report *International Migrant Stock 2019* issued by the United Nations. We measure the geographical linkage by geographical distance, the data of which are drawn from the CEPII website.

5. Empirical Results

This section reports our estimation results.[10] In all estimations, we cluster the standard errors by country pairs. The estimation results of equation (1) are shown in Table 2. We report those by medical product categories and COVID-19 measures (i.e., cases and deaths). In all columns, the coefficient for the exporter's COVID-19 is estimated to be negative, although the number of deaths is insignificant in terms of equipment trade. Thus, countries more severely impacted by COVID-19 decreased their exports of all medical products. The difference in magnitude across categories indicates that such a decrease in exports is relatively large for personal protection products and small for medical equipment. In contrast, the coefficient for the importer's COVID-19 is significant only in terms of trade in personal protection products. Furthermore, the coefficient for the importer's COVID-19 is estimated to be positive, indicating that countries with a larger number of cases or deaths increase their imports of personal protection products. This result is natural given that such countries need those products to prevent the further spread of infection.

=== Table 2 ===

Before estimating equation (2), we estimate our model for monthly trade to examine whether the effects of COVID-19 differ by month. To this end, we estimate the following equation:

$$Trade_{ijym} = \exp\{COVID_{iym}\mathbf{D}'\boldsymbol{\alpha} + COVID_{jym}\mathbf{D}'\boldsymbol{\beta} + \delta_{ijy} + \delta_{ijm} + \delta_{ym}\} \cdot \epsilon_{ijym} \qquad (3)$$

$Trade_{ijym}$ is the export value from countries i to j in month m in year y. To minimize the time lag between the production and the arrival of goods at ports, we only use the export statistics from reporting countries. For COVID variables, we use the sum of new cases and new deaths for each month.[11] **D** includes dummy variables that indicate the month. We

[10] The basic statistics are presented in Table A1 in the Appendix.

[11] One notice is that the database reports 27 cases for China in December 31, 2019, which are added to

control for three kinds of fixed effects. δ_{ijy} controls for not only the standard gravity variables but also the effects of trade agreements as well as the annual average of multilateral resistance terms in each country, the annual average of the exporter's factor prices (e.g., wages), and the annual average of the importer's income. δ_{ijm} is country-pair month fixed effects. This type of fixed effect controls for the seasonality of trade between the two countries (e.g., flu season). δ_{ym} is the year-month fixed effects, which control for time-series changes in world income.

The results are reported in Table 3. Compared with the results in Table 2, we can see many significant coefficients, implying that the significance of COVID-19 differs greatly by month. On the import side, a significant increase in personal protective products starts in April, perhaps because most countries recognized the threat posed by COVID-19 in March. On the export side, except for medicines, we can see negatively significant coefficients for most months. However, the absolute magnitude seems smaller in the third quarter (i.e., July and August), indicating that the shortage of those medical products started to be less severe because of the gradual decrease in confirmed COVID-19 cases and deaths in Asia. In contrast, we do not find significant coefficients for exports of medicines in most months.

=== Table 3 ===

Next, we start the estimation of equation (2). In Table 4, we interact with the similarity index in voting in the UNGA. The interaction terms for importers have significantly negative coefficients, except for trade in medicines. This result implies that countries tend to import those medical goods from countries with less similar state preferences. Thus, political linkages are not helpful when requesting medical aid. In contrast, the coefficient for the interaction term for exporters is significantly positive, especially for trade in personal protective products. Even if countries experience an increase in cases or deaths, they export personal protective products to countries with similar state preferences. Similar results can be found when introducing the interaction terms with the RTA dummy variable, as shown in Table 5. Countries are less likely to import medical products from RTA partners but more likely to export them to RTA partners. In sum, these results indicate that the decrease in exports of medical products caused by COVID-19 is smaller for exports to countries with political or economic ties. In other words, strategic and economic relationships play significant roles in the export of medical products but not in requesting medical aid.

=== Tables 4 & 5 ===

Next, we interact with the numbers of migrant stocks. The model becomes somewhat complicated because of the use of two unidirectional variables (i.e., trade and migration).

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the cases for China in January 2020.

With COVID variables, we interact two migration variables, namely, the log of the number of migrants from an exporting country to an importing country (*Emigration*) and the log of the number of migrants from an importing country to an exporting country (*Immigration*). We name the migration variables based on the flow of trade and use the numbers as of 2019. We take their logs after adding the value of one because many country pairs have a zero-valued stock of bilateral migrants.

The estimation results are presented in Table 6. We can find significant results in interaction terms, especially for imports of personal protective products. In particular, the interaction term between the importer's COVID and *Emigration* has significantly positive coefficients when using both the cases and deaths of COVID-19. This result implies that a country tends to import personal protective products from countries with large numbers of people immigrating to that country. In short, immigrants' home countries send face masks. However, the negative result in the interaction term between the exporter's deaths and *Immigration* is inconsistent with this result because both interaction terms capture the same flows in trade and migration. Nevertheless, in contrast to the results of political or economic ties, identity and demographic ties affect the import of essential goods.

=== Table 6 ===

Table 7 shows the results when introducing the interaction terms with the log of geographical distance between two countries. The results are reported in Table 7 and show significant coefficients for the interaction terms for trade in most products. Those results indicate that when COVID-19 hits a country hard, that country does not necessarily import medical products from neighboring countries. This result might be because neighboring countries also want medical products when they experience a substantial increase in COVID-19 infections. However, the decrease of exports is smaller when exporting to neighbors. This result is similar to the cases of political and economic linkages presented in Tables 4 and 5. However, it is not limited to personal protective products but is found in most categories of products. Thus, geographical proximity plays a greater role in the export of medical products than other types of linkages, including political and economic relations. This result might also indicate that geographical connections are related to various linkages because it is natural that close political and economic ties would be established between neighboring countries.

=== Table 7 ===

Lastly, we conduct two more analyses. First, to investigate the role of cultural or historical linkages, we introduce the interaction terms with the dummy for the past colonial ties, the data of which are obtained from the CEPII website, as in the case of geographical distance. The estimation results are presented in Table A2 in the Appendix. Most coefficients were estimated to be non-significant. We can see significant results mainly for trade in medical supplies in the case of deaths, which indicates that countries import those products from countries with past colonial ties but are less likely to export to such countries. Second, as found in Table 1, China is a key player in the trade of medical products. Thus, in Tables A3 to A6, we estimate our models by excluding China. Although the significance becomes weaker in the interaction term with RTAs, the other results do not change much.

6. Concluding Remarks

This study empirically investigated what kinds of countries imported and exported medical products during the COVID-19 pandemic. To that end, we examined the bilateral trade values of medical products among 35 reporting countries and 250 partner countries between January and August in both 2019 and 2020. Our findings can be summarized as follows. An increase in COVID-19 burden led to decreases in exports of medical products. However, such a decrease is smaller when exporting to countries with political ties or economic ties or to neighboring countries. In contrast, demographic ties are critical in the import of medical products, especially personal protective products such as face masks. In sum, our analyses may indicate that medical products are likely to be exported based on political or economic incentives during the pandemic, whereas identity or demographic ties play a key role in the import of such products.

These findings also contribute to the debate on foreign aid, including health diplomacy in international relations. Traditionally, strategic relationships and economic relations have been the most influential factors in foreign aid. However, our findings indicate that the decision-makers of donor states and migrants' homelands also influence the demographic ties based on identity and geographic proximity during crises. During a global pandemic, it is crucial for decision-makers to explain to their people the need to prioritize domestic politics and national security because the public will demand that the crisis be addressed in their own country first. Clarifying their policy stance legitimizes sending essential goods such as medical products to other countries that are home to diaspora and migrant populations. Also, given that COVID-19 is a life-threatening disease, emigrants may engage more actively in demanding that medical products be sent to their home country. In addition, caring for neighboring countries is the first step toward preventing possible external threats, such as the entry of infected people. COVID-19 may accelerate foreign policy's subordination to domestic politics.

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Table 1. Top 5 Exporters and Importers Between January and August in 2020 (%)

	Equipment		Supplies		Medicines		Personal	
Export								
1st	US	18	US	19	Germany	15	China	45
2nd	Germany	15	Germany	12	Switzerland	12	Germany	9
3rd	China	14	China	11	Ireland	12	US	7
4th	Mexico	7	Ireland	5	US	9	Japan	4
5th	Japan	6	Netherlands	5	Belgium	6	France	3
Import								
1st	US	21	US	16	US	21	US	12
2nd	China	10	Germany	10	Germany	9	Germany	11
3rd	Germany	7	Netherlands	6	Belgium	8	France	8
4th	Netherlands	6	China	5	Switzerland	6	China	7
5th	Japan	4	France	5	China	5	UK	5

Source: Authors' computation using the Global Trade Atlas.

Table 2. Baseline Results

	Equipment	Supplies	Medicines	Personal
(i) Cases				
Importer COVID	0.016	-0.011	-0.008	0.053**
	[0.011]	[0.010]	[0.007]	[0.023]
Exporter COVID	-0.015**	-0.031***	-0.024***	-0.052***
	[0.007]	[0.005]	[0.008]	[0.012]
Log pseudolikelihood	-2.5.E+09	-3.5.E+09	-8.5.E+09	-1.0.E+10
Pseudo R-squared	0.9953	0.9945	0.9962	0.9836
Number of obs	14,800	15,580	12,564	17,764
(ii) Deaths				
Importer COVID	0.016	-0.01	-0.009	0.056**
	[0.010]	[0.008]	[0.006]	[0.024]
Exporter COVID	-0.005	-0.027***	-0.018**	-0.035***
	[0.008]	[0.005]	[0.009]	[0.011]
Log pseudolikelihood	-2.5.E+09	-3.5.E+09	-8.5.E+09	-1.0.E+10
Pseudo R-squared	0.9953	0.9944	0.9962	0.9835
Number of obs	14,800	15,580	12,564	17,764

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. “COVID” indicates the number of confirmed cases (Cases) or deaths (Deaths).

Table 3. Monthly-level Estimation

	Cases				Deaths			
	Equipment	Supplies	Medicines	Personal	Equipment	Supplies	Medicines	Personal
Importer COVID								
* 1 for January	-0.007	-0.007	-0.033**	0.019	-0.031***	-0.017	-0.061**	0.021
* 1 for February	0.012**	0.003	0.028**	0.024	0.000	0.016**	0.059***	0.052*
* 1 for March	0.009	0.012	0.042**	-0.007	0.005	0.000	0.017	-0.017
* 1 for April	-0.019**	-0.023	-0.007	0.051***	-0.016**	-0.026**	-0.011	0.024*
* 1 for May	-0.022	-0.001	0.017	0.066***	-0.017	-0.005	0.014	0.055***
* 1 for June	0.012	0.012	-0.013	0.058***	0.014**	0.012	-0.014	0.044***
* 1 for July	0.011	-0.003	0.003	0.046***	0.014	0.000	0.003	0.038***
* 1 for August	0.001	0.005	0.005	0.057***	0.002	0.005	0.004	0.050***
Exporter COVID								
* 1 for January	-0.079***	-0.097***	-0.029*	-0.171***	-0.135***	-0.153***	-0.095***	-0.276***
* 1 for February	-0.037***	-0.046***	0.01	-0.092***	-0.047***	-0.057***	-0.024	-0.118***
* 1 for March	-0.004	0.001	-0.01	-0.018	-0.013	-0.003	-0.036	-0.063***
* 1 for April	-0.035***	-0.011	0.007	-0.087***	-0.021**	-0.009	0.015	-0.042***
* 1 for May	-0.063***	-0.033***	-0.003	-0.122***	-0.053***	-0.026***	-0.009	-0.095***
* 1 for June	-0.037***	-0.050***	0.017	-0.058***	-0.027***	-0.044***	0.024*	-0.043***
* 1 for July	-0.021*	-0.038***	0.013	-0.048***	-0.006	-0.033***	0.01	-0.032**
* 1 for August	-0.023**	-0.039***	0.007	-0.033**	-0.017*	-0.029***	0.005	-0.025
Log pseudolikelihood	-2.6.E+09	-3.5.E+09	-1.4.E+10	-3.3.E+09	-2.6.E+09	-3.5.E+09	-1.4.E+10	-3.2.E+09
Pseudo R-squared	0.9939	0.9938	0.9915	0.9943	0.9939	0.9938	0.9915	0.9945
Number of obs	59,352	65,560	52,226	70,884	59,318	65,522	52,206	70,856

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. "COVID" indicates the number of confirmed cases (Cases) or deaths (Deaths).

Table 4. Heterogenous Impacts: Political Linkages

	Equipment	Supplies	Medicines	Personal
(i) Cases				
Importer COVID	0.028*	-0.011	-0.004	0.071**
	[0.016]	[0.010]	[0.009]	[0.032]
* Agreement	-0.017	-0.015*	-0.013	-0.098***
	[0.016]	[0.009]	[0.015]	[0.029]
Exporter COVID	-0.017**	-0.034***	-0.028***	-0.124***
	[0.009]	[0.006]	[0.009]	[0.022]
* Agreement	0.01	0.008	0.017	0.050*
	[0.015]	[0.009]	[0.014]	[0.025]
Log pseudolikelihood	-2.3.E+09	-3.1.E+09	-8.1.E+09	-8.0.E+09
Pseudo R-squared	0.9955	0.9948	0.9963	0.9864
Number of obs	12,914	13,702	11,414	15,376
(ii) Deaths				
Importer COVID	0.026**	-0.005	-0.005	0.089***
	[0.012]	[0.009]	[0.008]	[0.029]
* Agreement	-0.027***	-0.017*	-0.009	-0.120***
	[0.010]	[0.008]	[0.012]	[0.028]
Exporter COVID	-0.008	-0.027***	-0.023**	-0.084***
	[0.008]	[0.005]	[0.009]	[0.021]
* Agreement	0.018**	0.01	0.016	0.056**
	[0.009]	[0.007]	[0.011]	[0.023]
Log pseudolikelihood	-2.3.E+09	-3.1.E+09	-8.1.E+09	-8.1.E+09
Pseudo R-squared	0.9955	0.9948	0.9963	0.9861
Number of obs	12,914	13,702	11,414	15,376

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. “COVID” indicates the number of confirmed cases (Cases) or deaths (Deaths).

Table 5. Heterogenous Impacts: Economic Linkages

	Equipment	Supplies	Medicines	Personal
(i) Cases				
Importer COVID	0.018*	-0.006	-0.002	0.075***
	[0.010]	[0.008]	[0.007]	[0.019]
* RTA	-0.008	-0.029**	-0.020*	-0.082***
	[0.015]	[0.012]	[0.011]	[0.019]
Exporter COVID	-0.017*	-0.041***	-0.030***	-0.055***
	[0.010]	[0.007]	[0.008]	[0.017]
* RTA	0.004	0.020*	0.022**	0.030*
	[0.012]	[0.011]	[0.011]	[0.016]
Log pseudolikelihood	-2.5.E+09	-3.3.E+09	-8.4.E+09	-8.0.E+09
Pseudo R-squared	0.9954	0.9947	0.9963	0.9872
Number of obs	14,800	15,580	12,564	17,764
(ii) Deaths				
Importer COVID	0.022**	-0.003	-0.004	0.094***
	[0.010]	[0.008]	[0.007]	[0.020]
* RTA	-0.016	-0.025**	-0.011	-0.109***
	[0.010]	[0.010]	[0.010]	[0.021]
Exporter COVID	-0.008	-0.033***	-0.022***	-0.038**
	[0.009]	[0.006]	[0.008]	[0.018]
* RTA	0.011	0.015*	0.014	0.034*
	[0.008]	[0.009]	[0.009]	[0.018]
Log pseudolikelihood	-2.5.E+09	-3.4.E+09	-8.5.E+09	-7.8.E+09
Pseudo R-squared	0.9953	0.9946	0.9962	0.9876
Number of obs	14,800	15,580	12,564	17,764

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. “COVID” indicates the number of confirmed cases (Cases) or deaths (Deaths).

Table 6. Heterogenous Impacts: Demographic Linkages

	Cases				Deaths			
	Equipment	Supplies	Medicines	Personal	Equipment	Supplies	Medicines	Personal
Importer COVID	0.002	0.007	0.017	0.025	0.003	-0.006	0.009	0.019
	[0.009]	[0.011]	[0.011]	[0.017]	[0.009]	[0.010]	[0.014]	[0.019]
* ln (1 + Immigration)	0.000	-0.002	-0.003*	-0.008***	0.001	-0.001	-0.001	-0.007***
	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.001]	[0.002]	[0.002]
* ln (1 + Emigration)	0.001	0.000	0.000	0.008***	0.000	0.000	-0.001	0.008***
	[0.001]	[0.002]	[0.001]	[0.003]	[0.001]	[0.001]	[0.001]	[0.003]
Exporter COVID	-0.002	-0.041***	-0.040***	0.015	0.012	-0.023*	-0.017	0.048***
	[0.012]	[0.014]	[0.014]	[0.016]	[0.010]	[0.012]	[0.015]	[0.017]
* ln (1 + Immigration)	-0.001	0.000	0.002	-0.001	-0.003***	-0.002*	-0.001	-0.005***
	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.001]	[0.002]	[0.002]
* ln (1 + Emigration)	0.001	0.002	0.000	-0.002	0.002**	0.003**	0.001	0.000
	[0.001]	[0.002]	[0.001]	[0.003]	[0.001]	[0.001]	[0.001]	[0.002]
Log pseudolikelihood	-2.3.E+09	-3.2.E+09	-8.4.E+09	-5.5.E+09	-2.3.E+09	-3.2.E+09	-8.5.E+09	-5.4.E+09
Pseudo R-squared	0.9957	0.9949	0.9963	0.9912	0.9957	0.9949	0.9962	0.9915
Number of obs	14,800	15,580	12,564	17,764	14,800	15,580	12,564	17,764

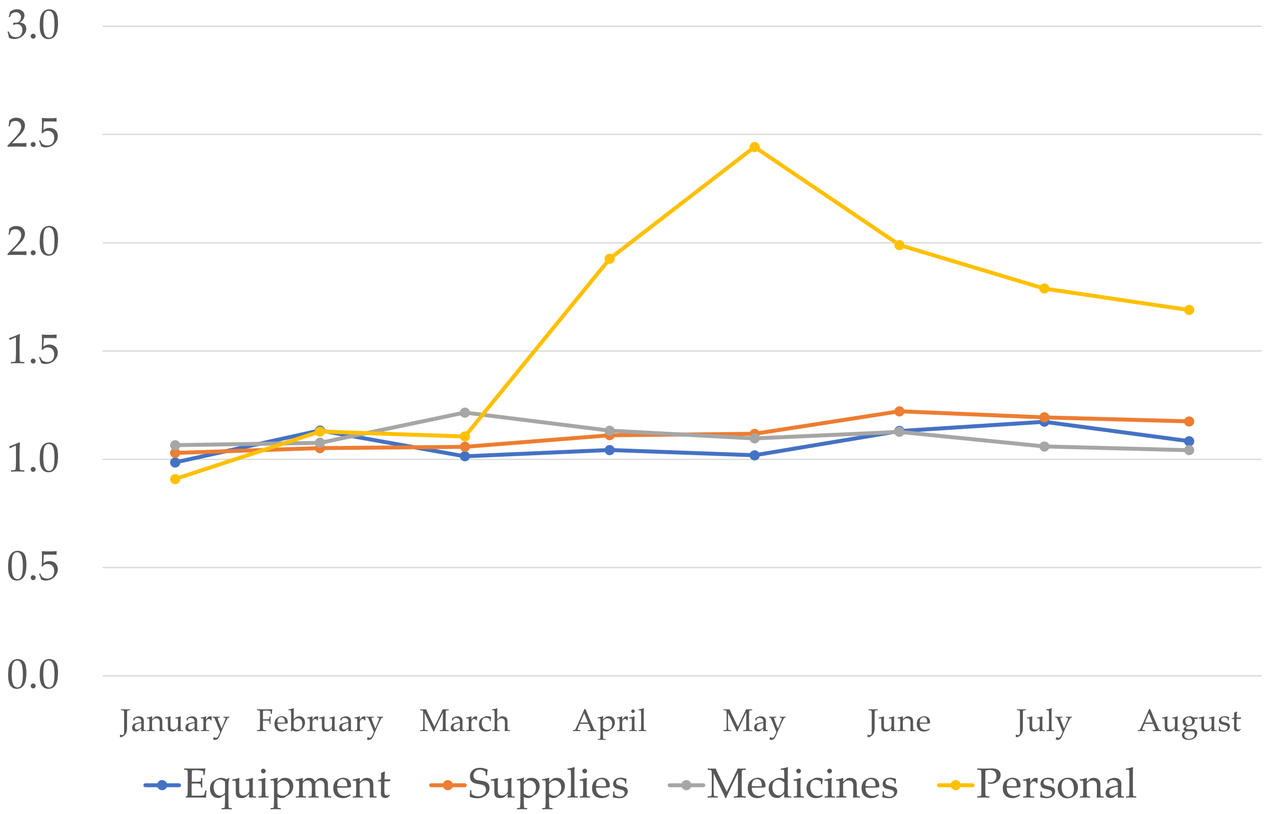
Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. “COVID” indicates the number of confirmed cases (Cases) or deaths (Deaths).

Table 7. Heterogenous Impacts: Geographical Linkages

	Equipment	Supplies	Medicines	Personal
(i) Cases				
Importer COVID	-0.052	-0.140***	-0.114**	-0.299***
	[0.056]	[0.051]	[0.048]	[0.071]
* ln Distance	0.008	0.015***	0.012**	0.040***
	[0.006]	[0.005]	[0.006]	[0.009]
Exporter COVID	0.034	0.065	0.079	0.1
	[0.046]	[0.041]	[0.049]	[0.066]
* ln Distance	-0.006	-0.011**	-0.012**	-0.018**
	[0.005]	[0.005]	[0.006]	[0.008]
Log pseudolikelihood	-2.5.E+09	-3.3.E+09	-8.4.E+09	-7.8.E+09
Pseudo R-squared	0.9954	0.9946	0.9963	0.9876
Number of obs	14,800	15,580	12,564	17,764
(ii) Deaths				
Importer COVID	-0.058	-0.107***	-0.082*	-0.283***
	[0.042]	[0.039]	[0.046]	[0.063]
* ln Distance	0.009*	0.011***	0.009	0.039***
	[0.005]	[0.004]	[0.005]	[0.008]
Exporter COVID	0.046	0.046	0.062	0.055
	[0.038]	[0.032]	[0.045]	[0.054]
* ln Distance	-0.006	-0.008**	-0.009*	-0.009
	[0.004]	[0.004]	[0.005]	[0.007]
Log pseudolikelihood	-2.5.E+09	-3.4.E+09	-8.4.E+09	-7.9.E+09
Pseudo R-squared	0.9953	0.9945	0.9962	0.9875
Number of obs	14,800	15,580	12,564	17,764

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. "COVID" indicates the number of confirmed cases (Cases) or deaths (Deaths).

Figure 1. Monthly Exports of Medical Goods in 2020 Relative to Those in 2019



Source: Authors' computation using the Global Trade Atlas.

Appendix. Other Tables

Table A1. Basic Statistics

	Obs	Mean	Std. Dev.	Min	Max
Importer COVID	17,764	4.831	5.354	0	15.607
* Agreement	15,376	1.538	3.718	0	15.607
* RTA	17,764	1.821	4.025	0	15.607
* ln (1 + Immigration)	17,764	20.851	40.611	0	253.719
* ln (1 + Emigration)	17,764	21.020	39.033	0	223.430
* ln Distance	17,764	41.926	46.864	0	151.808
* Colony	17,764	0.125	1.037	0	12.118
Exporter COVID	17,764	5.047	5.498	0	15.607
* Agreement	15,376	1.576	3.786	0	15.607
* RTA	17,764	1.901	4.149	0	15.607
* ln (1 + Immigration)	17,764	20.434	39.060	0	223.430
* ln (1 + Emigration)	17,764	22.452	41.564	0	253.719
* ln Distance	17,764	43.813	48.152	0	151.708
* Colony	17,764	0.142	1.129	0	12.118

Note: In this table, we compute the basic statistics for explanatory variables by using the observations for personal protective products.

Table A2. Heterogenous Impacts: Colonial Linkages

	Equipment	Supplies	Medicines	Personal
(i) Cases				
Importer COVID	0.016	-0.012	-0.007	0.053**
	[0.012]	[0.010]	[0.007]	[0.023]
* Colony	-0.020*	0.015	-0.017	-0.028
	[0.010]	[0.011]	[0.029]	[0.028]
Exporter COVID	-0.015**	-0.031***	-0.025***	-0.051***
	[0.007]	[0.005]	[0.009]	[0.013]
* Colony	0.015	-0.013	0.017	-0.001
	[0.009]	[0.009]	[0.023]	[0.023]
Log pseudolikelihood	-2.5.E+09	-3.4.E+09	-8.5.E+09	-1.0.E+10
Pseudo R-squared	0.9953	0.9945	0.9962	0.9838
Number of obs	14,800	15,580	12,564	17,764
(ii) Deaths				
Importer COVID	0.016	-0.011	-0.009	0.055**
	[0.010]	[0.009]	[0.006]	[0.024]
* Colony	-0.01	0.025**	-0.014	-0.024
	[0.015]	[0.011]	[0.029]	[0.028]
Exporter COVID	-0.004	-0.026***	-0.018**	-0.034***
	[0.008]	[0.005]	[0.009]	[0.012]
* Colony	0.002	-0.022**	0.013	-0.016
	[0.012]	[0.009]	[0.021]	[0.022]
Log pseudolikelihood	-2.5.E+09	-3.5.E+09	-8.5.E+09	-1.0.E+10
Pseudo R-squared	0.9953	0.9944	0.9962	0.9837
Number of obs	14,800	15,580	12,564	17,764

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. "COVID" indicates the number of confirmed cases (Cases) or deaths (Deaths).

Table A3. Heterogenous Impacts by Political Linkages: Excluding China

	Equipment	Supplies	Medicines	Personal
Importer COVID	0.028*	-0.011	-0.004	0.017*
	[0.016]	[0.008]	[0.010]	[0.010]
* Agreement	-0.028**	-0.011	-0.015	-0.037***
	[0.012]	[0.008]	[0.015]	[0.011]
Exporter COVID	-0.004	-0.023***	-0.030***	-0.045***
	[0.009]	[0.005]	[0.009]	[0.012]
* Agreement	0.023**	0.008	0.019	0.033***
	[0.011]	[0.008]	[0.015]	[0.010]
Log pseudolikelihood	-1.3.E+09	-2.1.E+09	-7.6.E+09	-1.3.E+09
Pseudo R-squared	0.9966	0.996	0.9963	0.9954
Number of obs	12,332	13,102	10,930	14,684

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. "COVID" indicates the number of confirmed cases (Cases) or deaths (Deaths).

Table A4. Heterogenous Impacts by Economic Linkages: Excluding China

	Equipment	Supplies	Medicines	Personal
Importer COVID	0.016*	-0.006	-0.004	0.003
	[0.009]	[0.006]	[0.007]	[0.007]
* RTA	0.01	-0.012	-0.019*	-0.015
	[0.015]	[0.010]	[0.011]	[0.011]
Exporter COVID	-0.002	-0.029***	-0.033***	-0.039***
	[0.010]	[0.006]	[0.008]	[0.007]
* RTA	-0.008	0.007	0.020*	0.012
	[0.011]	[0.009]	[0.011]	[0.010]
Log pseudolikelihood	-1.5.E+09	-2.3.E+09	-7.9.E+09	-1.5.E+09
Pseudo R-squared	0.9964	0.9958	0.9963	0.9951
Number of obs	14,160	14,930	12,042	17,002

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. "COVID" indicates the number of confirmed cases (Cases) or deaths (Deaths).

Table A5. Heterogenous Impacts by Demographic Linkages: Excluding China

	Equipment	Supplies	Medicines	Personal
Importer COVID	-0.006	0.018*	0.015	-0.018**
	[0.010]	[0.010]	[0.012]	[0.007]
* ln (1 + Immigration)	0.000	-0.002***	-0.002	-0.001
	[0.001]	[0.001]	[0.002]	[0.001]
* ln (1 + Emigration)	0.001	-0.001	-0.001	0.003*
	[0.001]	[0.001]	[0.001]	[0.001]
Exporter COVID	-0.008	-0.048***	-0.042***	-0.033***
	[0.009]	[0.012]	[0.015]	[0.008]
* ln (1 + Immigration)	0.000	0.002**	0.001	0.000
	[0.001]	[0.001]	[0.001]	[0.001]
* ln (1 + Emigration)	0.000	0.001	0.001	-0.001
	[0.001]	[0.001]	[0.001]	[0.001]
Log pseudolikelihood	-1.4.E+09	-2.3.E+09	-7.9.E+09	-1.5.E+09
Pseudo R-squared	0.9966	0.9958	0.9963	0.9952
Number of obs	14,160	14,930	12,042	17,002

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. "COVID" indicates the number of confirmed cases (Cases) or deaths (Deaths).

Table A6. Heterogenous Impacts by Geographical Linkages: Excluding China

	Equipment	Supplies	Medicines	Personal
Importer COVID	0.032	-0.075**	-0.112**	-0.130***
	[0.049]	[0.038]	[0.049]	[0.042]
* ln Distance	-0.001	0.008*	0.012**	0.015***
	[0.005]	[0.004]	[0.006]	[0.005]
Exporter COVID	-0.011	0.03	0.073	0.084**
	[0.035]	[0.031]	[0.051]	[0.037]
* ln Distance	0.001	-0.006*	-0.012**	-0.014***
	[0.004]	[0.004]	[0.006]	[0.005]
Log pseudolikelihood	-1.5.E+09	-2.3.E+09	-7.9.E+09	-1.5.E+09
Pseudo R-squared	0.9964	0.9958	0.9963	0.9952
Number of obs	14,160	14,930	12,042	17,002

Notes: This table reports the estimation results by the PPML method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country pairs. In all specifications, we control for country-pair fixed effects and trade flow-year fixed effects. "COVID" indicates the number of confirmed cases (Cases) or deaths (Deaths).