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Keywords: Novel coronavirus disease 2019 (COVID-19); Trade in services; Balance of payments
JEL Classification: F15; F53

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Impact of COVID-19 on Trade in Services[§]

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Abstract: In past shocks (e.g., the 2008–2009 global financial crisis), the services trade was found to be more resilient than the goods trade. However, the ongoing novel coronavirus disease 2019 (COVID-19) pandemic has restricted people's cross-border mobility, which is fatal to the services trade because it often requires physical proximity between suppliers and consumers. We empirically examine the impact of COVID-19 on the services trade using quarterly data from 146 countries in 2019 and 2020. Its severity is measured according to the number of cases, the number of deaths, and an index measuring the severity of lockdown orders. We found that COVID-19 had a significantly negative impact on the services trade. Moreover, the extent of the impact varied among disaggregated services sectors, reflecting the nature of services. Travel services were the most affected, followed by transport services and construction services. The harmful effects on the trade in these services were more serious than those on the goods trade.

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1. Introduction

Services have become one of the most dynamic sectors of the economy as a key driver of global trade. Reflecting the fact that the trade in services has expanded faster than the trade in goods, the services share of global trade in gross terms has grown from just 9% in 1970 to over 20% today—and it is expected to rise to one-third of global trade by 2040 based on a World Trade Organization (WTO) forecast (WTO, 2019). This represents a 50% increase in its share in only two decades. According to the WTO (2019, 2020), services now generate more than two-thirds of all economic output, attract over two-thirds of foreign direct investment (FDI), provide the most jobs globally (almost two-thirds of all jobs in developing countries and four-fifths in developed countries), and account for over 40% of global trade

in value-added terms. These numbers definitely confirm the importance of the services sector.

This study aims to quantitatively examine the impact of the novel coronavirus disease 2019 (COVID-19) pandemic on the trade in services. It is well-known that the services trade is resilient to external shocks, especially compared to the goods trade. The resilient nature of the services trade could be observed during the 2008–2009 global financial crisis (GFC). During the GFC, while the trade in goods experienced a sharp drop, the trade in services hardly changed. Several studies have empirically investigated this resilience in the services trade during the GFC. They have demonstrated that this could be attributed to the low sensitivity of the services trade to demand shocks, a lower cyclical demand for a range of traded services, and less dependence on external financing (Borchert and Mattoo, 2010; Ariu, 2016; Ceglowski, 2017). Based on this experience, we might expect an ongoing shock like the COVID-19 pandemic to have a negligible effect on the trade in services.

However, unlike past shocks, the COVID-19 pandemic is having a serious effect on the services trade. Indeed, as we later show, while the global trade in goods returned to a normal level by the end of 2020, the trade in services has not yet done so. One of the most distinctive features of this pandemic is how it has forced us to introduce mobility restrictions and social distancing measures for public health reasons. This creates a drastic effect, especially on the trade in services, because unlike the trade in goods, some services trade requires physical proximity between suppliers and consumers and the cross-border mobility of suppliers or consumers. Thus, restrictive orders on cross-border mobility will have a more serious impact on the services trade. Moreover, this impact may vary among service sectors/subsectors, depending on whether or not physical proximity between suppliers and consumers is necessary and whether or not an online supply is available.

To examine the impact of COVID-19 on exports and imports of services, we employ quarterly data for 146 countries from 2019 and 2020. By including trade during the pre-pandemic period (i.e., 2019) in our study sample, we identify the effects of COVID-19 on the trade in services. Due to the current availability of global data, the services data we use are not those on bilateral trade but those on exports to, or imports from, the world. The severity of COVID-19's damages is measured by the number of newly confirmed cases, the number of deaths, or a severity index on the policies that restrict behavior. To control for unobservable factors, we introduce various types of fixed effects. In addition, to capture their features more clearly, we compare them to the impact on the trade in goods. Furthermore, we quantitatively estimate the impact of COVID-19 on the services trade by sector/subsector and explore the possibility of sectoral heterogeneity of the effects, if any. We estimate these models using the Poisson pseudo maximum likelihood (PPML) method.

Our main findings are summarized as follows. The spread of COVID-19 had a negative impact on services exports and imports. This result does not change, even if we address endogeneity in our COVID-19 variables. We also demonstrate that the degree of the

impact varies, even among disaggregated service sectors, reflecting the nature of services. Travel services that rely heavily on mode 2 were affected the most, followed by transport services, which are mostly categorized as mode 1, but are partially connected directly to travel of mode 2 or the trade in goods.[1] Although the trade values *per se* are small, construction services that may largely depend on mode 4 in our dataset have also been affected. The harmful effects on trade in these services were more serious than those on the goods trade. Conversely, other service sectors such as goods-related services and others, including those that are typically of mode 1, had almost no effect.

The number of economic studies on COVID-19 has grown rapidly since 2020. Among the various strands of literature, our study belongs to the strand that analyzes COVID-19's influence on international trade. There are several empirical studies on the trade in goods (e.g., Friedt and Zhang, 2020; Hayakawa and Mukunoki, 2021a, 2021b, 2021c; Kejzar and Velic, 2020; and Meier and Pinto, 2020). These studies have found that the severity of COVID-19's damages in both exporting and importing countries led to a decreasing trade in goods. They also showed the propagation of such negative effects throughout supply chains. However, there are few studies on the trade in services. Two studies have conducted descriptive analyses on the services trade in India (Veeramani and Anam, 2021) and Spain (Minondo, 2021). Thus, this study is the first to systematically investigate the association between COVID-19 and the trade in services using global data and to conduct a comparison with the trade in goods.

The remainder of this paper is organized as follows. The next section discusses the basic issues regarding trade statistics in services. Section 3 provides an overview of the recent trade in services. After providing our empirical framework in Section 4, we present our estimation results in Section 5. Section 6 concludes.

2. Definition and Data of the Services Trade

The WTO General Agreement on Trade in Services (GATS) categorizes the services trade according to four modes of supply.[2] Mode 1 is cross-border supply, in which services are supplied from one country to another. In this case, a consumer in an importing country receives services from abroad or from a supplier located in an exporting country through its telecommunications or postal infrastructure. Typical examples are consultancy services

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[1] See the next section for the explanation of the four modes of services.

[2] Commercial linkages may exist among the four modes of supply. For example, a foreign company established under Mode 3 in Country A may employ nationals from Country B (Mode 4) to export services across borders into Countries B, C, etc. Similarly, business visits to Country A (Mode 4) may prove necessary to complement cross-border supply exports into that country (Mode 1) or to upgrade the capacity of a locally established office (Mode 3) (see https://www.wto.org/english/tratop_e/serv_e/cbt_course_e/c1s3p1_e.htm).

over the phone or legal services provided in one country to clients in another country by e-mail or video. Mode 2 is consumption abroad, in which services are provided in one country to a service consumer in another country. For this mode, one national of an importing country moves abroad or to an exporting country as a tourist, student, or patient to consume services in that exporting country.

The other two modes are as follows. Mode 3 is commercial presence, in which services are delivered by a service supplier of a country through the establishment of a territorial presence in another country. More specifically, services are provided to local consumers within an importing country by a locally established affiliate, subsidiary, or representative office of a foreign-owned firm such as a bank, hotel group, or construction company. Mode 4 is the presence of natural persons, in which a supplier of one country provides services through the presence of natural persons in another country. In this case, a foreign national of an exporting country moves temporarily to an importing country and then provides services within that importing country as an independent supplier or the employees of a service supplier.

This GATS definition of the four modes of supply is significantly broader than the balance of payments (BOP) concept of services trade. Certain services transactions under the GATS definition, particularly in the case of mode 3, typically involve those between residents of the country concerned. The BOP, however, focuses on residency rather than nationality and counts transactions between residents and non-residents as services trade. Thus, BOP statistics are useful to capture services transactions mainly for cross-border supply (mode 1), consumption abroad (mode 2), and the presence of natural persons (mode 4), but do not sufficiently cover services, particularly those via commercial presence (mode 3). In that sense, Foreign Affiliates Statistics (FATS), which describe the activities of foreign affiliates, can be used as a supplement. Recently, the WTO provided a new experimental dataset, Trade in Services by Mode of Supply (TISMOS) that combines the BOP and FATS information to offer an overall picture of international trade in services according to the four modes of supply defined in the GATS.[3]

In our study, we employ data on the services trade on a BOP basis. As previously discussed, in BOP statistics, some services of the services trade are not sufficiently covered, particularly services trade via commercial presence. However, the BOP-based services trade statistics provide comprehensive information in terms of the coverage of countries, periods, frequency (such as quarterly and annually), and sectors/subsectors, in addition to the availability of more recent information. Therefore, this paper employs quarterly data on

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[3] TISMOS covers 200 individual economies for the 2005–2017 period. For more details on TISMOS, see the WTO website; https://www.wto.org/english/res_e/statis_e/trade_datasets_e.htm#TISMOS.

services trade on a BOP basis available from the United Nations Conference on Trade and Development (UNCTAD) STAT[4] and trade in goods from the WTO Data Portal.[5]

The services trade in the database we use is composed of four sectors—goods-related services, transport services, travel services, and other services. Goods-related services refer to manufacturing services on physical inputs owned by others and maintenance and repair services n.i.e.[6] The other services sector can be further decomposed into eight subsectors: construction, insurance and pension services (*insurance*, hereafter), financial services, charges for the use of intellectual property n.i.e. (*IP charges*), information, computer, and telecommunications (ICT) services, other business services (including research and development and professional and management consulting services,[7] and technical, trade-related, and other business services [8]), personal, cultural, and recreational services (including audiovisual and related services[9] and other personal, cultural, and recreational services [10]) (*personal services*), and government goods and services n.i.e. (*government services*).[11] This paper investigates not only the total services trade (i.e., aggregated trade in services), but also the disaggregated services trade along this sector/subsector classification.

Let us briefly discuss the major mode of aggregated and disaggregated service sectors.[12] According to the services trade statistics in 2017 available from the TISMOS, mode 3 is the dominant mode for services as a whole; the composition is 28% for mode 1, 10% for mode 2, 59% for mode 3, and 3% for mode 4. For disaggregated sectors, while mode 3 is dominant for most of them, there are some exceptions. For instance, transport is supplied mainly through mode 1, while goods-related services, tourism and business travel, and

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[4] See https://unctadstat.unctad.org/EN/Index.html.

[5] See https://data.wto.org/. The WTO Data Portal is jointly produced with UNCTAD and in cooperation with the International Trade Center (ITC) and the United Nations Statistics Division (UNSD).

[6] The term "n.i.e." means not included elsewhere, which is often used in the BOP statistics. While the former includes activities such as processing, assembly, labeling, and packing that are undertaken by enterprises that do not own the goods, the latter includes maintenance and repair work by residents on goods that are owned by non-residents and *vice versa*.

[7] This category covers legal services, accounting and management consulting services, public relations services, and advertising and market research services.

[8] This covers architectural, engineering, and other technical services; agricultural and mining services; operating leasing services; trade-related services; and other professional business services.

[9] This covers services related to the production of motion pictures, radio and television programs, and musical recordings. It also includes those services that are related to theatrical and musical productions, sporting events, circuses, and other similar events, such as expenditures on venues and advertising as well as compensation for the performers, directors, and producers involved in such events.

[10] This covers services related to education, such as correspondence courses and education via television or the Internet; services associated with museums and other cultural activities; and expenditures related to sporting competitions such as rewards, prizes, and fees for athletes.

[11] See, for instance, the Bank of Japan (2020) for the details of the BOP categorization.

[12] For more details, see Appendix A. Note that the classification of disaggregated sectors in Appendix A is slightly different from ours on the BOP basis.

education services are mostly delivered via mode 2. Note that our data of services trade on the BOP basis basically do not cover mode 3. In that sense, the major mode in our dataset would be mode 1 for most of our sectors/subsectors including transport, while it may be mode 2 for good-related services as well as travel and mode 4 for construction.[13]

3. Trade in Services During the Pandemic

This section provides an overview of the trade in services amid the COVID-19 pandemic. First, let us briefly check the spread of COVID-19 and the related restrictive measures based on the stringency index. Figure 1 shows (a) the aggregated number of daily new confirmed cases and deaths attributable to COVID-19 in the world and (b) the world average of the stringency index. The former numbers are obtained from the COVID-19 Data Repository by the Center for Systems Science and Engineering at Johns Hopkins University.[14] The latter index is drawn from Hale et al. (2021) and records the strictness of the "lockdown-style" policies that primarily restrict people's behavior. A higher index indicates that more restrictive measures are in effect.

== Figure 1 ==

April 2020 witnessed the first COVID-19 peak in terms of the number of deaths. Although the number declined after this first peak, it increased again rapidly in the fourth quarter (Q4) of 2020. Conversely, the number of cases continued to increase without any significant peak, and expanded drastically in Q4 of 2020. Similar to the number of deaths, the world average severity of restrictive measures also recorded its highest level in April 2020. Although regulations seem to relax slightly thereafter, they maintained higher levels during Q3 and Q4 of 2020. Therefore, the services sectors, particularly those that require physical proximity between suppliers and consumers and the cross-border mobility of suppliers/consumers, may have been affected throughout the year.

How did the services trade respond to such drastically changed circumstances? Table 1 summarizes the annual patterns in world trade in services in the pre-pandemic year, 2019, and amid the pandemic, 2020, based on BOP statistics.[15] As mentioned in the previous

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[13] Over 90% of construction services are traded across borders via mode 3, suggesting that the dominant mode of construction services, in particular, is mode 3.

[14] See https://github.com/CSSEGISandData/COVID-19. Also see Dong et al. (2020).

[15] In Table 1, world exports exceed world imports. This asymmetry in trade in services is probably due to statistics. This is consistent with, for instance, the case of asymmetries in the UK's trade in services (ONS, 2017); mirror data (export-side data) is greater than import data. The figure for global exports and

section, we obtain quarterly data on the trade in services from UNCTAD STAT and trade in goods from the WTO Data Portal. For our sample, more or less a quarter of all services in the pre-pandemic year are for travel (22%/25% for exports/imports), around 20% are transport, [16] 3%–4% are goods-related services, and about half of all services are other services. [17] Among the subsectors of the other services, other business services account for half, followed by ICT services, IP services, and financial services.

== Table 1 ==

The annual changes in 2020 are as follows. The table shows that trade in services experienced a greater decline in 2020 than trade in goods. In terms of both global exports and imports, services trade and goods trade decreased by over 20% and 7%, respectively. Thus, contrary to the case of the GFC, the ongoing pandemic seems to have a larger negative effect on the services trade than on the goods trade. In addition, similar to the trade in goods, sectoral differences exist for the trade in services. [18] Travel services, in particular, decreased in 2020 by over 60%, followed by transport services with a decline of around 20% and goods-related services by less than 20%. Other services had a generally much smaller negative impact with a decline of 7%/5% for exports/imports, although the trade in some subsectors of other services declined by over 10%, such as construction for exports and imports and personal services for exports.

To observe the trade changes more closely, Figure 2 presents quarterly changes in the trade in services and goods as the index to Q1 of 2019. Trade in services and goods commonly experienced a huge drop in Q2 of 2020; close to −30% for the services trade and −20% for the goods trade. After that, however, the trade in goods realized a drastic recovery in Q3 in 2020 and even exceeded its pre-pandemic level in Q4 of 2020, clearly showing a V-shape recovery. On the other hand, the trade in services remained low and even slightly declined again from Q3 to Q4 of 2020 after an increase in Q3 from the bottom in Q2; the trade in services in Q3 and Q4 are around 80% of pre-pandemic levels. Some services sectors that require proximity between the suppliers and consumers and the cross-border mobility of suppliers/consumers must have directly suffered from the expanding spread of COVID-

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imports by the four modes of services provided in Shingal (2020) also shows that the former exceeds the latter.

[16] According to the WTO (2019), around half of global trade in transport services is induced by trade in goods. In 2017, one-third of global trade is directly related to the cost of shipping goods, mainly by sea or air, and 16% supports transport services such as cargo handling, storage, and warehousing.

[17] The sectoral composition based on TISMOS is available in Appendix A. The differences between the sectoral composition in Appendix A and Table 1 may be largely due to whether or not the services trade includes those via a commercial presence.

[18] For instance, see Hayakawa and Mukunoki (2021c) for sectoral differences in the impact on the trade in goods.

19 around the world, particularly in Q4 (Figure 1a), and continuing restricted mobility (Figure 1b).

== Figure 2 ==

Figure 3 presents the quarterly services exports and imports by disaggregated sectors as the index to Q1 of 2019. The most serious decline is observed for the trade in travel services, which is only 20% of the pre-pandemic level (Q1 of 2019) in Q2 of 2020, and is still only around 30% to 40% in Q3 and Q4 of 2020, indicating that this sector is still far from recovered. The trade in transport services also decreased and reached the bottom in Q2 of 2020, lower than 80%. Although trade in this sector gradually increased after that quarter, it was still more or less 80% of the pre-pandemic level in Q3 and Q4 of 2020. Similarly, trade in goods-related services reached the bottom in Q2 at 80% of the pre-pandemic level, which may partially reflect a decline in the trade in goods. The trade in construction services, particularly exports, declined significantly; the bottom of exports was less than 70% of the pre-pandemic level in Q1 of 2020, while the bottom of imports was about 80% in Q2 of 2020. Unlike these services, trade in personal services and financial services recorded the lowest levels in Q4 of 2020. In contrast, other sectors such as insurance, IP charges, and ICT services maintain their levels within plus and minus 10% of their pre-pandemic levels.

== Figure 3 ==

4. Empirical Framework

This section presents our empirical framework to examine the impact of COVID-19 on the trade in services. Compared with the trade in goods, those impacts are heterogeneous according to the services sectors/subsectors. As discussed in Hayakawa and Mukunoki (2021c), in the case of trade in goods, in importing countries the pandemic decreases consumption opportunities due to stay-at-home orders. This decrease further worsens business performance and thus lowers revenues and incomes. These decreases of consumption opportunity and income result in shrinking the demand size and imports of goods. Similarly, work-from-home orders in exporting countries decrease production in factories. Also, infection control measures in factories (e.g., social distancing) may lower productivity. These decreases reduce production sizes and thus the exports of goods. In sum, the severity of COVID-19 damages leads to decreasing both the exports and imports of goods.

On the other hand, the possible effects on the services trade are as follows. As in the case of the goods trade, labor shortages and income decreases caused by COVID-19 are, in

general, expected to reduce both services exports and imports. However, the more detailed effects will differ across services sectors, especially according to the services mode type. In particular, modes 2 and 4 tend to require physical proximity between suppliers and consumers and the cross-border movement of consumers (mode 2) or suppliers (mode 4). For example, travel services (mode 2) require the movement of consumers from importing countries to exporting countries. Similarly, in construction services (mode 4), foreign nationals of exporting countries, such as skilled professionals, must move temporarily to an importing country to provide services within its territory. Since such travelers and skilled professionals hesitate to move to countries in which COVID-19 is spreading, the COVID-19 damages result in decreasing mode 2 services exports and mode 4 services imports.

COVID-19 damages in the corresponding partner countries will also have a negative effect on services of these two modes. When the spread of COVID-19 becomes severe in a country, this country will restrict even people's *intra-national* movement to prevent its further spread, raising moving costs to international airports or the travel costs to adjacent foreign countries. In addition, foreign countries may restrict the entry of people from this country to avoid additional inflow of the virus. Furthermore, this country *per se* will raise the restriction level (e.g., quarantine duration) against entrants, including home nationals returning from abroad. As a result, the severity of COVID-19 damages in a country decreases its mode 2 services imports and mode 4 services exports. In short, services trade in these two modes will be negatively affected by the extent of COVID-19 damages in both exporting and importing countries.

The effects on mode 1 services trade are a bit different from those on the other two modes. Since mode 1 services trade does not require the movement of suppliers or consumers, this type of service may increase, especially during the pandemic period, and perhaps even thereafter (WTO, 2020). For example, stay-at-home orders may increase the demand for online recreational or educational channels (i.e., imports of personal services) in addition to the use of online meeting tools such as Teams, Zoom, or Skype, (i.e., imports of ICT services). However, there are also some sources that could yield negative effects. For example, COVID-19 forced various sports games to be canceled (e.g., baseball games in the United States or soccer games in Europe) as well as film shoots to be postponed. The decrease of this content would lower exports of personal services. Although our BOP-based services data do not sufficiently cover mode 3 services, services imports associated with FDI, such as financial services imports, will decrease if the COVID-19 pandemic reduces FDI.[19] Lastly, some services sectors/subsectors defined as mode 1, such as transport services, may

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[19] For example, Camino-Mogro and Armijos (2020) explored the effect of lockdown policy on FDI inflows in Ecuador using data aggregated weekly. They found a negative effect, especially on FDI from North and South American countries. In addition, Fu et al. (2021) investigated the effect of COVID-19 cases/deaths on FDI using global data from January 2019 to June 2020 and showed a significantly negative effect of COVID-19 in the host countries.

not be typical of mode 1, and seem to be directly or indirectly linked with other services categorized as modes 2 or 4. This will work to decrease this type of services trade.

We empirically investigate these impacts of the COVID-19 pandemic by exploring quarterly data for each country's exports to or imports from the world in 2019 and 2020. Our data are compiled in three dimensions (i.e., country, year, and quarter). Our empirical model is specified as follows:

$$Trade_{iyq} = \exp\{\beta \times COVID_{iyq} + \delta_{iy} + \delta_{iq} + \delta_{yq}\} \cdot \epsilon_{iyq} \qquad (1)$$

$Trade_{iyq}$ is the trade value in country i in quarter m of year y. We estimate this equation for exports and imports separately. $COVID_{iyq}$ is the extent of COVID-19 damages in country i. We control for three kinds of fixed effects (δ_{iy}, δ_{iq}, and δ_{yq}). ϵ_{iyq} is a disturbance term. As previously discussed, we expect negative effects to result from COVID-19 damages. As is consistent with this expectation, a non-negligible fraction of observations have a zero value for the trade in total services (around 20%). To naturally incorporate observations with zero-valued trade, we estimate this equation using the PPML method.

We obtain quarterly data on the services trade from the same source used in the previous section (i.e., UNCTAD STAT). We employ data from the first quarter of 2019 to the fourth quarter of 2020. We first examine exports or imports of total services. For comparison purposes, we also investigate those of total goods, of which the data are drawn from the WTO Data Portal. Then, we explore the effects on trade in each disaggregated services sector. To measure the extent of COVID-19's damage, we use the three indicators examined in the previous section. The first and second are the number of COVID-19 cases and the number of COVID-19 deaths, that is, the sum of the numbers of newly confirmed cases and deaths in each quarter. The numbers are set to zero for observations in 2019, and we add a value of one to these numbers before taking their logs. The third measure is the stringency index of lockdown-style policies. We take a simple average of the daily index by quarter. All these data are obtained from the same sources used in the previous section. Appendix B lists our study countries, which include 146 countries.

It is worth discussing the qualitative differences among these variables measuring the severity of COVID-19. The stringency index captures the existence of lockdown measures to avoid the spread of infection, which directly affects the movement of consumers or suppliers across borders. Although the numbers of cases and deaths primarily represent physical damages, larger numbers have more adverse psychological effects on even uninfected people. In particular, the effectiveness of lockdown policies depends on the cooperation of the citizenry. If they agree that the pandemic is relatively severe (e.g., a large number of newly confirmed cases or deaths), they tend to abide by strict control measures; otherwise, they attempt to violate them (Zhang et al., 2021). The number of cases may give people a different perception of COVID-19's severity from the number of deaths. Thus, these two different figures will have different elasticities on trade.

Finally, a set of fixed effects controls for various elements: δ_{iy} is country–year fixed effects, which control for countries' competitiveness as the respective services suppliers or demand sizes in the corresponding consumer services. Since this type of fixed effect also controls for population size, the effects of the number of cases or deaths are equivalent to those of their number per population. δ_{iq} is country–quarter fixed effects and controls for the seasonality of trade in each country. For example, the long holiday season, which is a chance for traveling abroad, differs by country. δ_{yq} is year–quarter fixed effects, which controls for variations in the demand and supply of services globally. This type of fixed effect plays a key role in capturing trading partners' demand and supply because our dataset is not defined at a bilateral level. Furthermore, given that most countries started to close their borders to foreign travelers starting approximately in the latter half of March 2020, this type of fixed effect may also control for the effects of people's cross-border movements.

5. Empirical Results

This section presents our estimation results of Equation (1). We first examine the trade in total services as well as the trade in total goods. Then, we analyze trade in various types of disaggregated services sectors.

5.1. Total Services

In Table 2, the upper panel shows the PPML estimation results for the trade in total services. Except for Column (I) using the number of cases for services exports, all the coefficients for COVID-19 damages are significantly negative. Specifically, a 1% rise of COVID-19 deaths decreases both the exports and imports of total services by around 0.01%. For comparison, the lower panel presents the corresponding results for the trade in goods. As found in previous studies such as Hayakawa and Mukunoki (2021c), COVID-19 damages have a significantly negative effect on the exports and imports of the trade in goods. In sum, this suggests that the spread of COVID-19 and more restrictive measures are negatively associated with exports and imports of services and goods in general.

=== Table 2 ===

We conduct two robustness checks on the aforementioned results. First, we examine how the effects of COVID-19 on the services trade differ between high-income and low-income countries. To do that, we interact the COVID-19 variables with a dummy variable on the high-income countries, which are based on the World Bank income classifications.

The results are shown in Table 3. For the trade in services, all of the coefficients for the interaction term are estimated to be insignificant. Non-interacted COVID-19 variables have similar results to those in Table 2. Thus, while the severity of COVID-19 decreases the trade in services, its negative effect is not significantly different in high-income and low-income countries. Conversely, we find a significant difference in its effect on imports in goods according to countries' income level, while there is no significant difference on the export side. This result for imports implies that the damages of COVID-19 decrease imports by low-income countries but do not necessarily reduce those by high-income countries.

=== Table 3 ===

Second, as discussed in the previous section, unlike the case of the trade in goods, the trade in services, especially in modes 2 and 4, tend to require physical proximity between suppliers and consumers or the cross-border movement of consumers or suppliers. Such movement of people (i.e., the inflow of foreigners or the return home of nationals from abroad) may result in raising the severity of COVID-19's damages. This possibility of reverse causality could create an endogeneity bias in our estimates. For example, exports of travel services imply the inflow of foreign tourists/business persons, which may increase the number of cases in the exporting countries. In this case, the error term has a positive correlation with the number of confirmed cases. The estimates calculated using the ordinary least squares method suffer from an upward bias. As a result, the negative effect of COVID-19 is underestimated.

To address this endogeneity issue, we estimate the logged version of Equation (1) using the instrumental variable (IV) method. In the literature, the number of COVID-19 cases or deaths tends to be instrumented by weather conditions. For example, Qiu et al. (2020) used the averages of daily maximum temperature, total precipitation, average wind speed, and the interaction between precipitation and wind speed in the preceding third and fourth weeks. These weather variables would work well in analyses at a daily or weekly level. However, in our quarterly-level analysis, these variables in 2020 would take a similar level to those in 2019. The country–quarter fixed effects absorb most variations in such weather variables. Therefore, we use the index on people's mobility in parks, the data for which were obtained from the COVID-19 Community Mobility Reports provided by Google.[20] This index indicates the percentage change in visits to parks, compared with those during the 5-week period from January 3–February 6, 2020. Since people's visits to parks are related to the COVID-19 situation but do not directly affect trade in services, we chose

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[20] See https://www.google.com/covid19/mobility/data_documentation.html. The figures for some countries (e.g., China or Iran) are not available.

this index as an instrumental variable.[21] One notable drawback of the IV method is that we are forced to drop observations with zero-valued trade when taking the log of trade values. In addition, estimations using the IV method must drop some countries that do not have data available on the mobility index (e.g., China) from the sample.

The estimation results by the IV method are reported in Table 4.[22] In all estimations, the test statistics for under-identification (Kleibergen–Paap rk Lagrange Multiplier (LM) statistic) and weak identification (Kleibergen–Paap rk Wald F) show reasonably high values. A high value in the former test indicates that the rank condition is satisfied and that the equations are identified, while a high value in the latter test suggests that our IV estimates are unlikely to suffer from bias due to weak instruments. For the services trade, all coefficients for COVID-19 variables are estimated to be significantly negative. In addition, the absolute magnitude of the coefficients rises compared with that in Table 2. For example, a 1% rise in COVID-19 deaths decreases services exports by 0.09% and services imports by 0.05%. Furthermore, similar to the trade in services, COVID-19 variables have significantly negative coefficients for the trade in goods.

=== Table 4 ===

Last, we compare the magnitude of the COVID-19 impact between the trades in services and goods. All of the preceding results showed that the spread of COVID-19 and restriction measures were likely to have a more harmful effect on services imports than on goods imports. As we examine more closely in the next subsection, this greater effect in the services trade must be related to the nature of the service type (e.g., physical proximity between suppliers and consumers). On the export side, our PPML estimation results show that the absolute values of the coefficients are slightly lower for total services than for total goods, though the opposite results are obtained in the IV estimation. In the proceeding analyses, we further explore which services sectors receive more severe effects from COVID-19 on exports.

5.2. Disaggregated Services

Next, we examine the effects of COVID-19 on trade in disaggregated services. Table 5 presents the PPML estimation results for four services sectors—goods-related services, transport services, travel services, and other services. This table clearly illustrates a

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[21] The COVID-19 Community Mobility Reports provide mobility indices on various sites, including not only parks but also workplaces and retail shops. However, the mobility in the latter two sites seems to be related to service activities. To lower the possibility of this connection, we chose mobility in parks.

[22] The first stage estimation shows a significantly negative coefficient for the mobility index. Namely, people's visits to parks are negatively associated with the severity of COVID-19.

contrasting picture between two sectors and the other two, suggesting heterogeneous effects among the services sectors. The absolute values of the coefficients are negative and statistically significant in all cases of exports and imports for the transport and travel sectors, except for the number of cases for transport exports (I). On the other hand, no case with statistical significance is found for goods-related services, while only two, (III) and (V), out of six equations have negative and statistically significant coefficients for other services. As other services are a composite of various services subsectors, we will conduct a further examination later.

=== Table 5 ===

As discussed in Section 2, travel services account for a quarter of all services on a BOP basis in the pre-pandemic year 2019. On the export side, the absolute values of the coefficients on the COVID-19 numbers/stringency index are the highest for travel among the four services sectors and the goods sector. This suggests that travel exports tend to have the most harmful impacts. This is probably because the situations of COVID-19 spread and restriction policies in countries of the services suppliers must influence the degree of acceptance of travelers from abroad. Similarly, the absolute values of the coefficients are the highest for travel among the four services sectors and the goods sector on the import side as well, indicating the most serious effects. In addition, the negative effects are likely to be greater for services imports than exports. As discussed in the previous section, the spread of COVID-19 as well as the restrictive mobility requirements in a country must substantially raise international travel costs. This result indicates that the rise in such costs critically reduced the imports of travel services.

Regarding transport services, the absolute values of the coefficients on the COVID-19 numbers/stringency index are the second-largest, following travel, among the four services sectors and the goods sector for both exports and imports. This suggests how significantly the COVID-19 numbers and mobility-related measures impede the trade of this services sector. In contrast with travel, however, the negative effects are greater for exports than imports. The WTO (2020) emphasizes the following effects on transport services: (i) shipping disruptions caused by strict restrictions on maritime crew disembarkation and substitution, (ii) significant bottlenecks in air cargo transportation induced by the grounding of most of the world's passenger aircraft fleet, which normally transports almost half of all air cargo shipments, and (iii) significant congestion and delays for cross-border freight transport due to the reintroduction of border controls, with severe impacts on goods trade and on the global supply chains in terms of costs and times.

International passenger transport services and cross-border freight transport services are categorized as mode 1 (cross-border supply), which does not require the movement of consumers or suppliers across borders. However, the aforementioned factors must have

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seriously influenced the degree of services supply or services exports. In addition, given the fact that around one-half of the global trade in transport is driven by the goods trade, a decline in the goods trade due to demand/supply shocks, if any, must directly induce a decline in the supply of transport services. On the import side, however, international passenger transport services are certainly related to the demand for travel, which basically takes the form of mode 2. Similarly, cross-border freight transport services, particularly air cargo transportation services, are indirectly related to travel demand. In that sense, the spread of COVID-19, as well as mobility restrictions on people, must have affected services imports of this sector.

Goods-related services (i.e., manufacturing services on physical inputs owned by others and maintenance and repair services n.i.e.) are unlikely to have suffered from the pandemic, as no case with statistical significance suggests for exports and imports. There would be several possible reasons behind there being no impact on this sector. First, as found in Section 3, the trade in goods declined by a lesser extent than the trade in services, and it started to recover quickly. Second, manufacturing activities *per se* may not have been seriously damaged. For instance, Ando et al. (2021) emphasized that production systems in East Asia seem to be almost intact, thus far, although the negative impacts on trade did exist temporarily. Like the previous shocks, such as the 2008–2009 GFC and the 2011 East Japan Earthquake, strong incentives to maintain production networks were effective. In consequence, quick adjustments for recovery were implemented amid the COVID-19 pandemic, although the negative impacts were transmitted through production networks. Third, e-commerce has expanded explosively amid the COVID-19 pandemic to cope with social distancing practices and limited mobility. The increase of e-commerce use may raise the demand for trade in some goods, creating a need for goods-related services.

Table 6 presents the PPML estimation results for eight subsectors of the other services sector. Among them, the construction services subsector has negative and statistically significant coefficients on the COVID-19 numbers for both exports and imports, without any statistical significance for the stringency index. Moreover, these absolute values are higher for exports than imports. As discussed in Section 2, construction services that are accounted in the BOP statistics mostly take the form of mode 4 or the presence of natural persons, although the dominant type of this sector is mode 3 when it is included. For mode 4, foreign nationals of exporting countries, such as skilled professionals, must move temporarily to importing countries to provide services within the territory of the importing countries. Therefore, as found in travel services, the COVID-19 numbers in both exporting and importing countries must have severely affected the movement of these services suppliers from their countries to the countries of their clients. Note that the trade value of this subsector *per se* is smaller than the other services subsectors.

=== Table 6 ===

The rest of the subsectors, i.e., commercial services in the other services sector, show a negative impact only for either exports or imports. The negative coefficients with statistical significance for exports are found in some cases for ICT services, other business services, and personal, cultural, and recreational services; (II) and (III) for ICT services, (III) for other business services (research and development, professional and management consulting services, and technical, trade-related, and other business services), and (I) to (III) for personal, cultural, and recreational services. The majority of these services are mode 1 or cross-border supply. These results suggest that the spread of COVID-19 and the related restrictive policies may impede the supply of services. The insignificant results for imports may be because the negative effect of COVID-19 in the countries of the consumers of these services is offset by their positive effect. The demand for online services, such as audiovisual content, probably mainly in the form of business-to-consumer (B2C) services, must have risen worldwide, especially when stay-at-home orders are in effect. This countervailing influence may create insignificant results for imports.[23]

Conversely, the numbers of COVID-19 deaths and new cases (and restrictive measures) are negatively associated with imports for insurance and pension services, financial services, and IP usage charges, without any significant results for exports. This implies that the COVID-19 situation in a country in which consumers are located may negatively affect the demand for these services. These services must be provided via commercial presence or cross-border supply in general. As transactions via commercial presence are not sufficiently covered in our data on a BOP basis, services of these subsectors in our dataset must be mostly dependent on mode 1. The cross-border supply of some of these services may be available online, but the spread of COVID-19 may reduce business-to-business (B2B) transactions of these services; for instance, the demand for cross-border insurance or financial services such as foreign exchange transactions may decline due to the shrinkage of FDI or trade activities, and the demand for the use of IP rights with charges across borders may decrease due to the slowdown in economic or firms' activities.

As previously discussed, while the harmful effects are likely to be greater for services imports than for goods imports, they tend to be slightly greater for goods exports than services exports in general, as our PPML results suggest. However, exports of the disaggregated services sectors with negative and statistically significant results, including transport, travel, and construction, have larger coefficients in the absolute term than goods exports. The major modes of these services are mode 2, mode 4, or any other mode that is

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[23] The WTO (2020) emphasizes that the social distancing measures adopted by governments have boosted demand for audiovisual content, for both entertainment and information purposes. It also mentions that since a large proportion of the audiovisual content consumed is foreign in many countries, the increase in demand is associated with greater trade in this sector.

directly connected with services of modes 2 or 4.[24] This suggests that the harmful effects on exports of these types of services were more serious than on goods exports. In sum, the spread of COVID-19 had a negative impact on services exports as well as imports, and the harmful effects on trade are greater for services with major modes 2 or 4 or those directly or indirectly related to them. On the other hand, other services sectors such as goods-related services and others that are typically mode 1, including ICT services, had almost no significant effect.

6. Concluding Remarks

This study empirically examined the impact of COVID-19 on services exports and imports using quarterly data for 146 countries in 2019 and 2020. Our empirical results showed that the spread of COVID-19 had a negative impact on services exports and imports. Furthermore, we found heterogeneous effects according to the disaggregated services sector, reflecting the nature of services. For example, travel services that rely heavily on mode 2 were affected the most, followed by transport services that are mostly categorized as mode 1 but partly connected with mode 2 travel or the goods trade. Namely, mobility restrictions and social distancing measures imposed for public health reasons have decreased tourism, transport, and construction services. Such harmful effects on trade are greater for services with major modes 2 or 4 or those directly or indirectly related to them than for goods. Conversely, other services sectors such as goods-related services and others that are typical mode 1, including ICT services, had almost no significant effect. This result may indicate the importance of services that enable online supply, such as telecom and computer services during the pandemic, to provide these ICT services *per se* and expand new opportunities for providing online services of other sectors/subsectors. In the future, the increased supply of services through digital networks could enhance the resilience of the services trade, especially trade through mode 1, to the pandemic.

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[24] The results for the services trade and the goods trade in Tables 2, 5, and 6 are summarized in Appendix C, with the suggested major modes of each disaggregated services sector for trade on a BOP basis.

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Table 1. World Trade in Services and Goods (Billions of USD, %)

	Export					Import				
	2019		2020		Growth	2019		2020		Growth
	Value	Share	Value	Share	(%)	Value	Share	Value	Share	(%)
Total services	5,125	100	4,045	100	-21	4,690	100	3,660	100	-22
Goods-related services	202	4	168	4	-17	142	3	126	3	-11
Transport	866	17	700	17	-19	990	21	777	21	-22
Travel	1,111	22	405	10	-64	1,170	25	453	12	-61
Other services	2,946	57	2,743	68	-7	2,388	51	2,267	62	-5
Construction	97	2	74	2	-24	59	1	51	1	-13
Insurance	106	2	104	3	-3	152	3	159	4	5
Financial services	455	9	443	11	-3	225	5	223	6	-1
IP charges	378	7	365	9	-3	338	7	320	9	-5
ICT services	502	10	494	12	-2	346	7	340	9	-2
Other business services	1,235	24	1,122	28	-9	1,106	24	1,005	27	-9
Personal services	74	1	60	1	-18	75	2	69	2	-8
Government services	61	1	57	1	-8	55	1	51	1	-8
Total goods	17,644		16,442		-7	18,029		16,688		-7

Source: UNCTAD and WTO, based on the BOP basis.

Table 2. PPML Estimation Results: Services versus Goods

	Export			Import		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Services						
COVID	-0.013	-0.012*	-0.320**	-0.013*	-0.012***	-0.473***
	[0.013]	[0.007]	[0.141]	[0.008]	[0.004]	[0.180]
Measure	Case	Death	String	Case	Death	String
Number of obs	940	938	940	940	938	940
Pseudo R-sq	0.998	0.998	0.998	0.998	0.998	0.999
Goods						
COVID	-0.023***	-0.010***	-0.400**	-0.010***	-0.004	-0.178***
	[0.007]	[0.002]	[0.163]	[0.004]	[0.003]	[0.069]
Measure	Case	Death	String	Case	Death	String
Number of obs	728	726	728	720	718	720
Pseudo R-sq	0.999	0.999	0.999	0.999	0.999	0.999

Notes: This table reports the estimation results obtained using 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. In all specifications, we control for country–year fixed effects, country–quarter fixed effects, and year–quarter fixed effects.

Table 3. PPML Estimation Results: High-Income Countries

	Export			Import		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Services						
COVID	-0.023	-0.017*	-0.526*	-0.019*	-0.012**	-0.490***
	[0.020]	[0.009]	[0.280]	[0.011]	[0.006]	[0.171]
COVID * High	0.027	0.017	0.316	0.018	-0.001	0.027
	[0.020]	[0.013]	[0.232]	[0.016]	[0.015]	[0.172]
Measure	Case	Death	String	Case	Death	String
Number of obs	940	938	940	940	938	940
Pseudo R-sq	0.998	0.998	0.998	0.998	0.998	0.999
Goods						
COVID	-0.027***	-0.009***	-0.369***	-0.016***	-0.006	-0.297***
	[0.009]	[0.002]	[0.133]	[0.002]	[0.004]	[0.076]
COVID * High	0.013	-0.004	-0.051	0.019***	0.005	0.200***
	[0.010]	[0.009]	[0.070]	[0.005]	[0.005]	[0.050]
Measure	Case	Death	String	Case	Death	String
Number of obs	728	726	728	720	718	720
Pseudo R-sq	0.999	0.999	0.999	1.000	0.999	1.000

Notes: This table reports the estimation results obtained using 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. In all specifications, we control for country–year fixed effects, country–quarter fixed effects, and year–quarter fixed effects.

Table 4. IV Estimation Results: Services versus Goods

	Export			Import		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Services						
COVID	-0.097***	-0.091***	-1.204***	-0.054***	-0.050***	-0.663***
	[0.026]	[0.025]	[0.326]	[0.016]	[0.014]	[0.177]
Measure	Case	Death	String	Case	Death	String
Number of obs	766	764	766	766	764	766
Underidentification test	40.3	38.2	36.1	40.3	38.2	36.1
Weak identification test	52.8	43.4	65.5	52.8	43.4	65.5
Goods						
COVID	-0.044***	-0.038***	-0.530***	-0.041***	-0.035***	-0.506***
	[0.014]	[0.012]	[0.169]	[0.008]	[0.006]	[0.096]
Measure	Case	Death	String	Case	Death	String
Number of obs	664	662	664	656	654	656
Underidentification test	38.3	41.2	35.0	37.7	40.7	34.2
Weak identification test	51.9	50.5	54.2	50.5	49.5	53.0

Notes: This table reports the estimation results obtained using the IV method. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in parentheses are those clustered by country. In all specifications, we control for country–year fixed effects, country–quarter fixed effects, and year–quarter fixed effects. The underidentification test and weak identification test show the Kleibergen–Paap rk LM statistic and Kleibergen–Paap rk Wald F statistic, respectively.

Table 5. PPML Estimation Results for the Services Sectors

	Export			Import		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Goods-related services						
COVID	-0.013	-0.011	-0.062	0.006	0.007	-0.127
	[0.010]	[0.008]	[0.210]	[0.010]	[0.009]	[0.226]
Measure	Case	Death	String	Case	Death	String
Number of obs	652	650	652	700	698	700
Pseudo R-sq	0.994	0.994	0.994	0.994	0.994	0.994
Transport						
COVID	-0.023	-0.022***	-0.541***	-0.015***	-0.010***	-0.306***
	[0.017]	[0.007]	[0.208]	[0.005]	[0.003]	[0.080]
Measure	Case	Death	String	Case	Death	String
Number of obs	910	908	910	916	914	916
Pseudo R-sq	0.996	0.996	0.997	0.997	0.997	0.997
Travel						
COVID	-0.066**	-0.045**	-1.056**	-0.091***	-0.060***	-1.854***
	[0.028]	[0.021]	[0.447]	[0.026]	[0.010]	[0.544]
Measure	Case	Death	String	Case	Death	String
Number of obs	916	914	916	916	914	916
Pseudo R-sq	0.987	0.987	0.987	0.991	0.991	0.991
Other services						
COVID	-0.006	-0.005	-0.162**	-0.011	-0.011*	-0.551
	[0.006]	[0.004]	[0.072]	[0.010]	[0.006]	[0.347]
Measure	Case	Death	String	Case	Death	String
Number of obs	904	902	904	910	908	910
Pseudo R-sq	0.999	0.999	0.999	0.998	0.998	0.998

Notes: This table reports the estimation results obtained using 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. In all specifications, we control for country–year fixed effects, country–quarter fixed effects, and year–quarter fixed effects.

Table 6. PPML Estimation Results for Sub-Sectors in Other Services

	Export			Import		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Construction						
COVID	-0.063***	-0.039***	-0.589	-0.029***	-0.018***	-0.456
	[0.013]	[0.005]	[0.399]	[0.007]	[0.005]	[0.280]
Measure	Case	Death	String	Case	Death	String
Number of obs	570	568	570	626	624	626
Pseudo R-sq	0.989	0.989	0.989	0.987	0.987	0.987
Insurance and pension services						
COVID	0.002	0.003	0.155	-0.026**	-0.013*	-0.304
	[0.010]	[0.008]	[0.169]	[0.012]	[0.007]	[0.190]
Measure	Case	Death	String	Case	Death	String
Number of obs	664	662	664	748	746	748
Pseudo R-sq	0.994	0.994	0.994	0.995	0.995	0.995
Financial services						
COVID	-0.011	-0.002	-0.095	-0.020**	-0.024***	-0.173
	[0.014]	[0.008]	[0.183]	[0.008]	[0.008]	[0.120]
Measure	Case	Death	String	Case	Death	String
Number of obs	700	698	700	724	722	724
Pseudo R-sq	0.998	0.998	0.998	0.996	0.996	0.996
Charges for the use of intellectual property						
COVID	-0.016	-0.003	-0.095	-0.030***	-0.022***	-0.259*
	[0.010]	[0.008]	[0.105]	[0.010]	[0.005]	[0.134]
Measure	Case	Death	String	Case	Death	String
Number of obs	602	600	602	678	676	678
Pseudo R-sq	0.999	0.999	0.999	0.998	0.998	0.998

Notes: This table reports the estimation results obtained using 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. In all specifications, we control for country–year fixed effects, country–quarter fixed effects, and year–quarter fixed effects.

Table 6. PPML Estimation Results for Sub-Sectors in Other Services (Cont.)

|	Export			Import		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Telecommunications, computer, and information services						
COVID	-0.012	-0.008*	-0.210*	-0.001	0.001	0.008
	[0.008]	[0.004]	[0.115]	[0.007]	[0.005]	[0.093]
Measure	Case	Death	String	Case	Death	String
Number of obs	750	748	750	754	752	754
Pseudo R-sq	0.998	0.998	0.998	0.997	0.997	0.997
Other business services						
COVID	-0.009	-0.005	-0.285***	-0.02	-0.019	-1.164
	[0.006]	[0.004]	[0.103]	[0.014]	[0.013]	[0.722]
Measure	Case	Death	String	Case	Death	String
Number of obs	728	726	728	742	740	742
Pseudo R-sq	0.999	0.999	0.999	0.994	0.994	0.994
Personal, cultural, and recreational services						
COVID	-0.027**	-0.019*	-0.339**	0.007	0.018	0.304
	[0.012]	[0.010]	[0.170]	[0.025]	[0.021]	[0.415]
Measure	Case	Death	String	Case	Death	String
Number of obs	602	600	602	640	638	640
Pseudo R-sq	0.991	0.991	0.991	0.99	0.991	0.991
Government goods and services						
COVID	-0.037***	-0.016*	-0.439*	0.044	0.012	0.810*
	[0.009]	[0.009]	[0.235]	[0.027]	[0.011]	[0.428]
Measure	Case	Death	String	Case	Death	String
Number of obs	854	852	854	884	882	884
Pseudo R-sq	0.99	0.99	0.99	0.99	0.99	0.99

Notes: This table reports the estimation results obtained using 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. In all specifications, we control for country–year fixed effects, country–quarter fixed effects, and year–quarter fixed effects.

Figure 1. Spread of COVID-19 and the Related Restrictive Regulations in the World
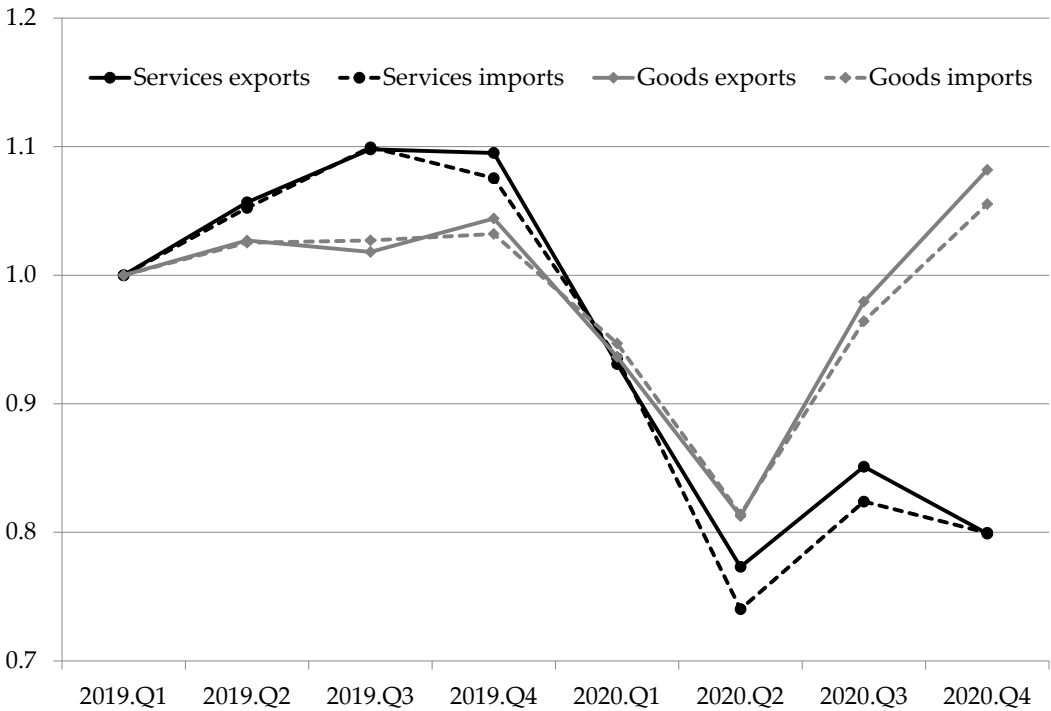
(a) The number of COVID-19 cases and deaths
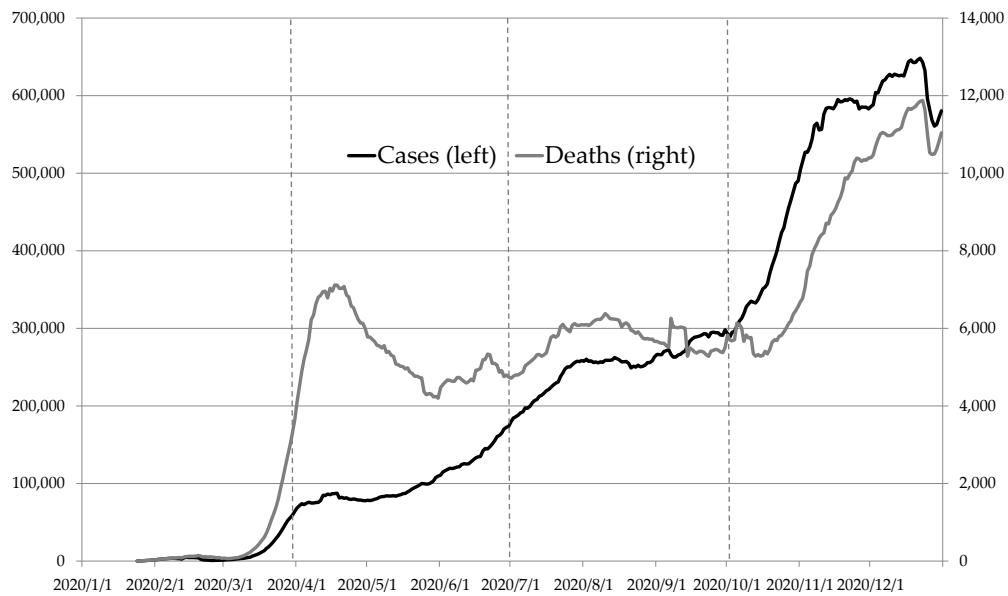
(b) Stringency index
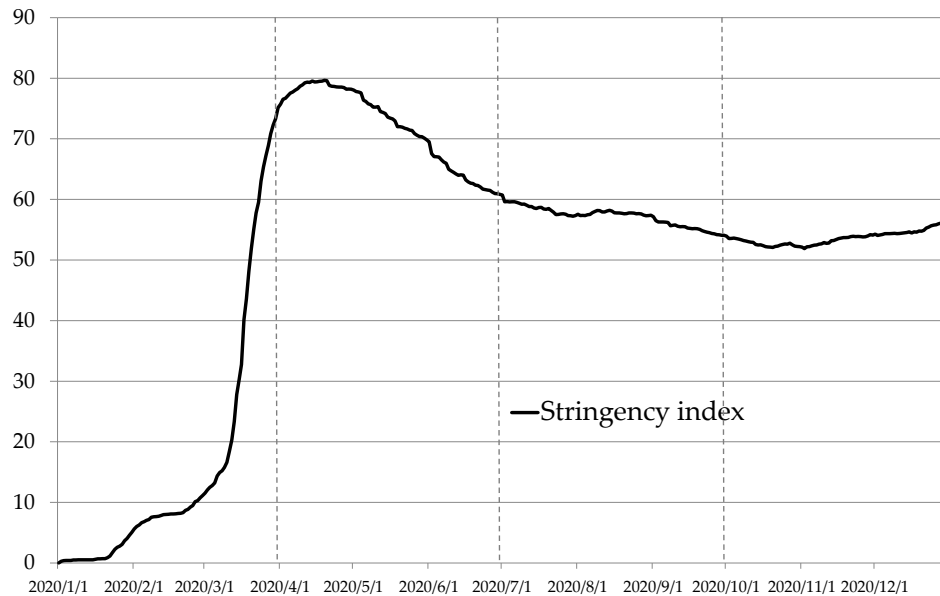
Source: Our World in Data.

Notes: The numbers of COVID-19 for the world are the aggregated daily new confirmed cases and deaths.
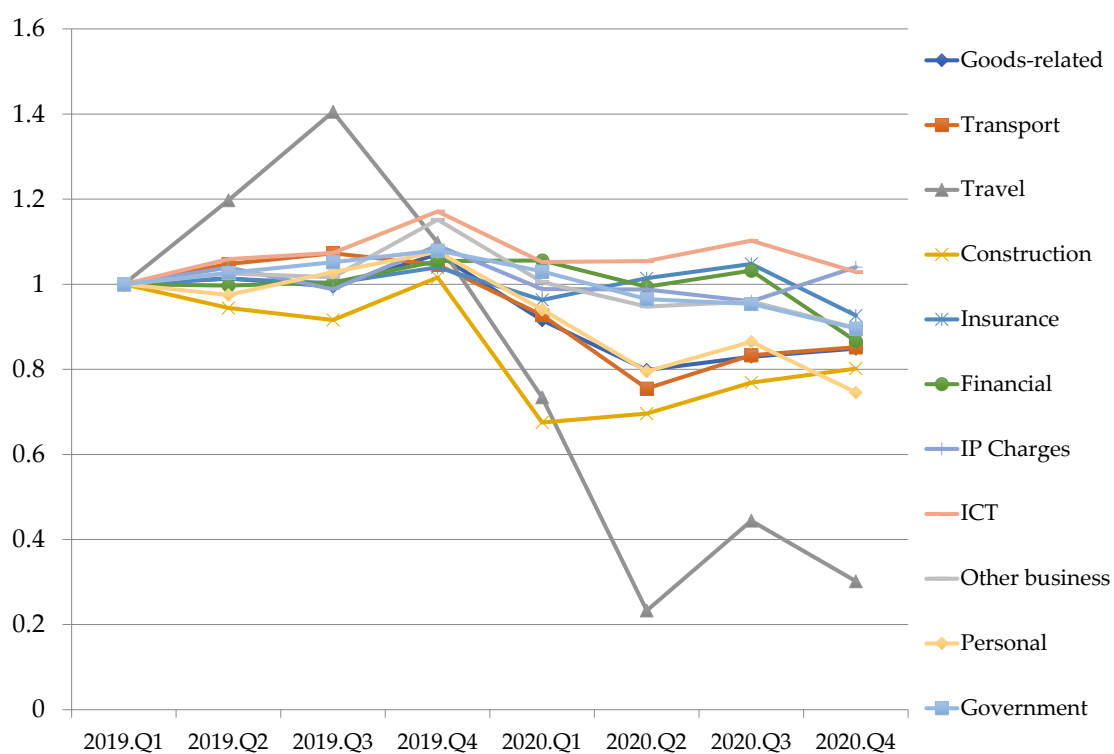The stringency index for the world is a simple average.

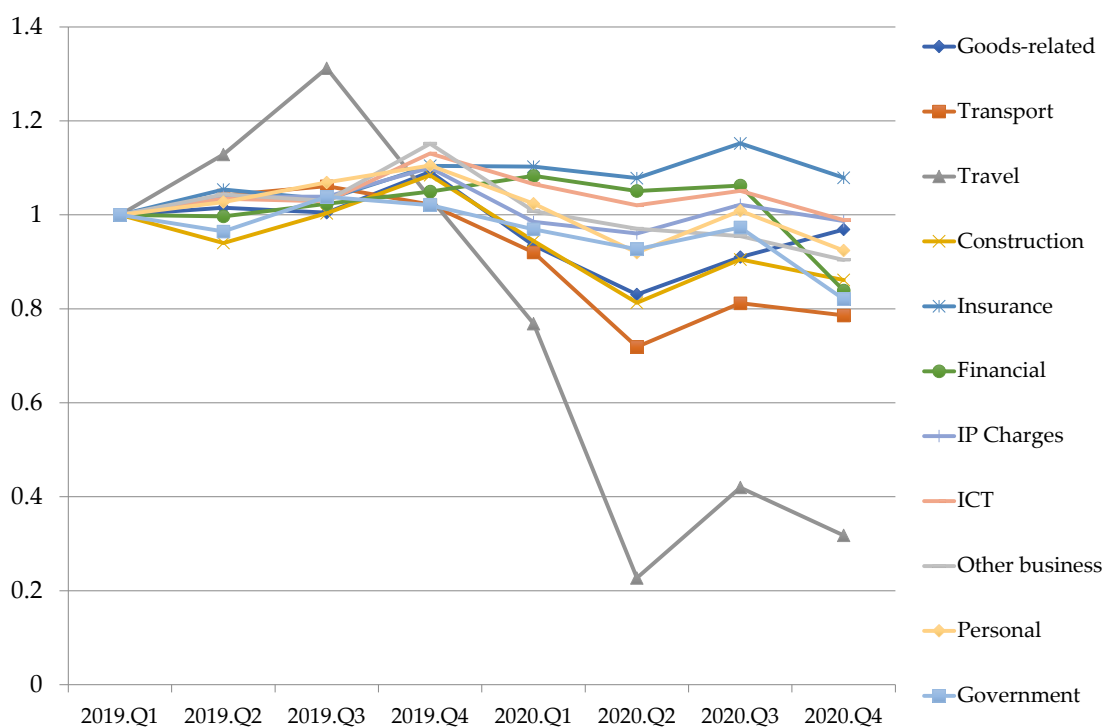Figure 2. Quarterly World Trade in Services and Goods (2019.Q1 = 1)

Figure 3. Quarterly World Trade in Services by Disaggregated Sector (2019.Q1 = 1)

(a) Exports

(b) Imports

Source: UNCTAD.

Appendix A. World Services Trade by the Mode of Supply in 2017 (Billions of USD)

	Export				Import				Sectoral
	Mode 1	Mode 2	Mode 3	Mode 4	Mode 1	Mode 2	Mode 3	Mode 4	share
Goods-related services	0	529	0	19	0	365	0	15	1%
Transport	2,102	709	1,566	0	2,491	787	1,569	0	12%
(sea, air, and other transports and postal&courier services)	(2,102)	(709)	(0)	(0)	(2,491)	(787)	(0)	(0)	
Tourism and business travel	0	2,453	541	0	0	2,435	522	0	8%
(business and other personal travel)	(0)	(2,453)	(0)	(0)	(0)	(2,435)	(0)	(0)	
Construction	0	0	1,378	126	0	0	978	87	3%
Insurance and financial services	1,732	0	5,934	0	1,306	0	5,810	0	19%
Charges for the use of intellectual property n.i.e.	1,160	0	0	0	1,277	0	0	0	3%
Telecommunications, computer, information and audiovisuals	1,335	6	3,809	300	819	7	3,916	202	13%
Other business services (excluding trade-related)	2,486	37	4,138	770	2,307	31	4,152	730	19%
Other personal services	24	0	171	8	18	0	178	7	1%
Education services	16	291	38	8	11	271	30	6	1%
Heritage and recreational services	17	0	150	6	18	0	123	6	0%
Health services	7	35	131	2	9	33	115	3	0%
Trade-related services (Distribution)	2,123	0	5,388	0	2,409	0	5,491	0	20%
Total Services (sum of level 1 items above)	11,001	4,059	23,243	1,240	10,666	3,929	22,884	1,058	100%
- By mode share in total commercial services	28%	10%	59%	3%	28%	10%	59%	3%	

Source: TISMOS.

Notes: TISMOS combines information from BOP and FATS and thus includes mode 3. The most major mode among the four modes other than mode 3 is highlighted. For transport services and travel services, the sum of the subcomponents is also presented in parentheses. The sectoral share of world trade is calculated based on the average of world exports and world imports. The categories of this table are slightly different from those of the BOP.

Appendix B. Study Countries (146)

Afghanistan, Albania, Algeria, Angola, Argentina, Aruba, Australia, Austria, Azerbaijan, Bahamas, Bangladesh, Belarus, Belgium, Belize, Bermuda, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Cabo Verde, Cambodia, Cameroon, Canada, Chile, China, China, Hong Kong SAR, China, Macao SAR, China, Taiwan Province of, Colombia, Congo, Dem. Rep. of the, Costa Rica, Croatia, Cyprus, Czechia, Denmark, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Eswatini, Ethiopia, Fiji, Finland, France, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Guyana, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea, Republic of, Kuwait, Kyrgyzstan, Lao People's Dem. Rep., Latvia, Lebanon, Lesotho, Liberia, Lithuania, Luxembourg, Madagascar, Malaysia, Malta, Mauritania, Mauritius, Mexico, Moldova, Republic of, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russian Federation, Rwanda, Saudi Arabia, Serbia, Seychelles, Singapore, Slovakia, Slovenia, Solomon Islands, South Africa, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Liechtenstein, Tajikistan, Tanzania, United Republic of, Thailand, Timor Leste, Tonga, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Kingdom, United States of America, Uruguay, Uzbekistan, Vanuatu, Venezuela, Viet Nam, Zambia, Zimbabwe

Appendix C. Summary of the PPML Results for Trade in Services on the BOP Basis and Their Major Modes: Comparison with the Goods Trade

	Suggested major mode: BOP	Major mode: TISMOS	Export Case	Export Death	Export Index	Import Case	Import Death	Import Index
Total goods			N	N	N	N		N
Tota services				N, L	N	N, L	N, L	N, L
Goods-related services	Mode 2	Mode 2						
Transport	Mode 1 (linked with Mode 2)	Mode 1		N, L	N, L	N, L	N, L	N, L
Travel	Mode 2	Mode 2	N, L	N, L	N, L	N, L	N, L	N, L
Construction	Mode 4	Mode 3	N, L	N, L		N, L	N, L	
Insurance	Mode 1	Mode 3				N, L	N, L	
Financial services	Mode 1	Mode 3				N, L	N, L	
IP charges	Mode 1	Mode 1				N, L	N, L	N, L
ICT services	Mode 1	Mode 3		N	N			
Other business services	Mode 1	Mode 3			N			
Personal services	Mode 1	Mode 3	N, L	N, L	N			
Government services			N, L	N, L	N, L			P

Source: Tables 2, 5, and 6 and Appendix A.

Notes: "N" and "P" denote negative and positive results with statistical significance, respectively. "L" indicates a larger effect of COVID-19 for the respective services sector/subsector than the goods sector. "Suggested major mode: BOP" is the most major mode, other than mode 3, in Appendix A for each disaggregated sector.