



Original Article

Impacts of COVID-19 Pandemic on International Trade in Goods of OECD Countries

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Abstract: The aim of this research is to analyze influences of the COVID-19 pandemic on international trade in goods of OECD countries. It is still too early to make an assessment of the impact of the virus based on full statistical evidence. Hence, we investigate trade among 37 OECD countries in 2019 and 2020 (trade data from OECD) to compare changes in global trade before COVID-19 (in 2019) and in the time of COVID-19 (in 2020). The disease burden of COVID-19 is measured in terms of the number of cases and deaths. We get COVID-19 data from the World Health Organization (WHO) monthly, trade data from OECD quarterly for a trade model that is based on the standard trade gravity variable from the CEPII gravity database [1]. Our findings can be summarized as follows: First, the COVID-19 pandemic has negative effects on the international trade of OECD countries, particularly exporting countries, because the development of the COVID-19 pandemic prevents trading activities worldwide. Meanwhile, the COVID-19 pandemic has positive affects on importing countries because of demand for medical goods or essential foods. However, the level of the COVID-19 effect on exporting countries is much bigger than for importing countries; COVID-19 is truly a disaster for our world. Second, trade policy measures of the response to the COVID-19 pandemic have led to negative effects in the short-term, but in the long-term these measures create positive impacts on international trade and economics as well.

Keywords: COVID-19, international trade, OECD countries.

1. Introduction

International trade is the exchange of capital, goods and services across international borders or territories because there is a need or want of

goods or services. The exchanges can be imports or exports. An import refers to a good or service brought into the domestic country. An export refers to a good or service sold to a foreign country. Production of goods and services

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requires resources. Every country has only limited resources. No country can produce all the goods and services that it requires. In general, no country is self-sufficient. A country has to depend upon other countries for importing the goods which are either non-available within it or are available, but in insufficient quantities. Similarly, a country can export goods, which are in excess quantity within it and are in high demand outside. A country has to buy from other countries what it cannot produce or can produce less than its requirements. Similarly, it sells to other countries those goods that it has in surplus quantities.

COVID-19, more commonly known as the coronavirus, was first detected in Wuhan, China in December 2019. It has since then plagued the entire world, affecting over 115 million people and has resulted in a whopping death count of approximately 2.6 million [2]. The International Monetary Fund (IMF) projected a 3% drop in the global gross domestic product (GDP) in 2020, much more than during the 2008-09 financial crisis, the largest decrease in 40 years [3]. This decrease was larger than the one provoked by the Great Recession between the third quarter of 2008 and first quarter of 2009 (a 10.2% decline). A global consequence of the Covid-19 pandemic is the enormous increase in the level of uncertainty [4]. The pandemic also has led to financial shocks that have created instabilities in the financial services sectors that are important for the smooth running of international trade. Almost all aspects of our lives have been conditioned by the outbreak, from the medical efforts to combat the pandemic, to its economic impact and government interventions.

After reviewing previous research, we decided to use updated data for the two whole years of 2019 and 2020. From that, our study can give a comprehensive outlook of COVID-19 impacts on international trade of OECD countries in the short-term and also the long-term. We also utilized the standard trade gravity variable from the CEPII gravity database (Head, Mayer & Ries 2010) supplementing it with data

on daily reported new cases of COVID-19 and COVID-19 related deaths aggregated to months to get reliable results.

2. Exports in goods of OECD countries

Nowadays, OECD countries account for a large share of international trade (approximately 80%) [5]. According to OECD, its members and Key Partners of OECD represent about 63% of world GDP, 80% of world trade and investment, 95% of world official development assistance, over half of the world's energy consumption, and 18% of the world's population. That is one of the reasons why we chose OECD for our research about the change in international trade, particularly in this harsh time, the COVID-19 period. That is the reason why we examine the consequences of COVID-19 on global trade in goods of selected OECD countries in this research.

Another reason is that data and figures about international trade of all countries in the world are limited; we could only examine the reality of GDP and numbers of trade in goods of selected OECD countries from reliable source such as WHO, WTO, OECD.

COVID-19 has had an immediate and strong impact on international trade. The first signs of the trade downturn were already evident in January 2020, with most of the major economies recording negative trends.

According to figures from National Accounts at a Glance, OECD, the trade indicator in most countries decreased below zero in countries such as Turkey, France, Romania, Canada, and the United Kingdom, but Poland, Italy, Germany, Norway, and Switzerland could remain with their trade index in a positive trend. However, the trade value of 40 countries and territories in the above figures reduced compared to 2019. The level of trade development in these countries is negative, which shows that trading activities in both goods and services deeply went down in 2020.

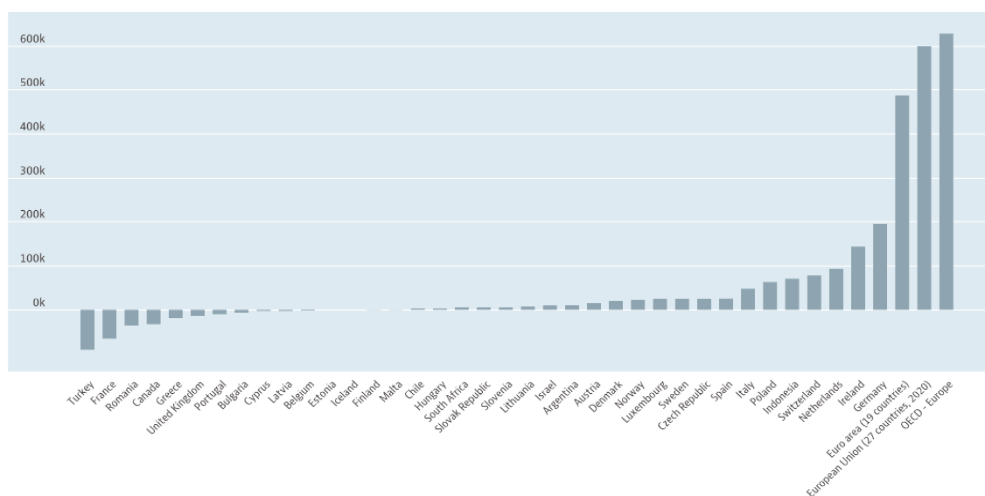


Figure 1: Trade in goods and services (Net trade, Million US dollars, 2020).

Source: National Accounts at a Glance, OECD (2021). Trade in goods and services.

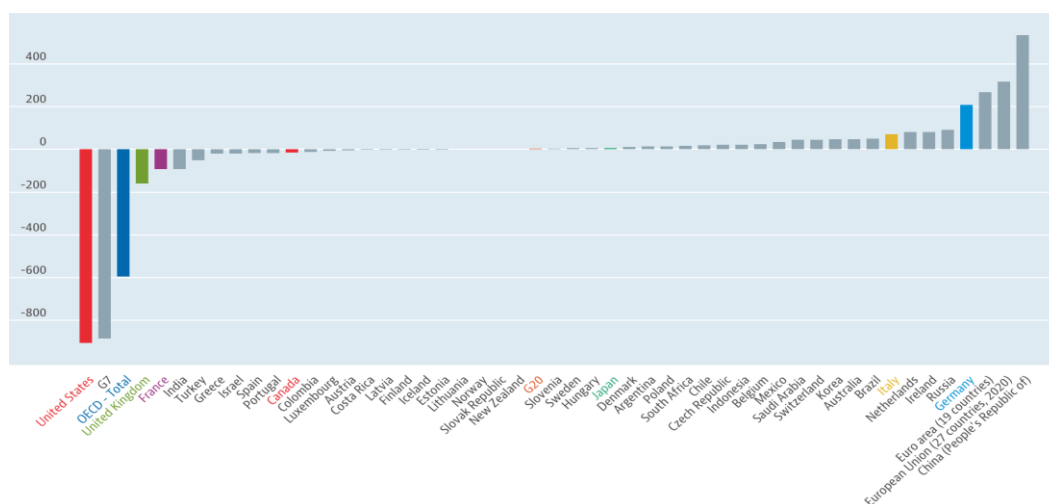


Figure 2: Trade in goods (Net trade, Billion US dollars, 2020)

Source: International trade, OECD (2021). Trade in goods.

In terms of 37 OECD countries, we examined more detail about trade in goods as in Figure 2. The United State suffered the biggest reduction in trade in goods as well as the greatest increase in COVID-19 new cases and new deaths. Trade in the goods of the United State and the OECD in total decreased at over -800 billion US dollars and -600 billion US dollars in sequence. That means there are some countries in the OECD that could maintain the value of

trade in goods at a positive number, for example, Korea, Italy, the Netherlands, Ireland, and Germany.

Trade in goods of OECD countries fell in 2020 by -8.4% compared to 2019. The amount of trade in goods of OECD countries was 10952.41 billion USD and 10029.69 billion USD in 2019 and 2020 respectively. In the charts below, we present OECD and the top 10 countries (United States, United Kingdom, Italy,

Germany, Netherlands, Colombia, Spain, France, Mexico, Poland, Turkey) that were effected by COVID-19 the most, according to new cases and new deaths.

COVID-19 appeared from December 2019 so that the change in trade started from 2020 by time lag. In the Figure 4, we can see exports of OECD fell down sharply in Q2 after the big wave of COVID-19 in March 2020.



Figure 3: Trade in goods exports of selected OECD countries, Billion US dollars, Q1 2019 - Q4 2019
Source: OECD data.

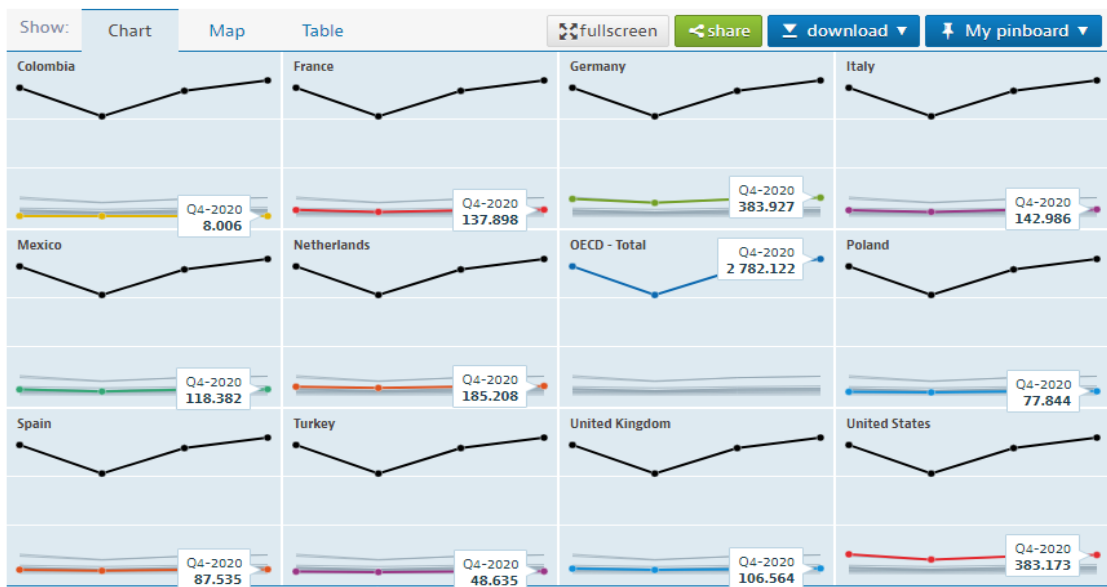


Figure 4: Trade in goods exports of selected OECD countries, Billion US dollars, Q1 2020 - Q4 2020.
Source: OECD data.

In 2020, the outlook for trade in goods of OECD countries was particularly uncertain, as the speed and shape of the recovery depended largely on how the general health situation evolved. The coronavirus gradually faded away and confinement and lockdown measures were lifted. The economic recovery was smoother than in the case of the revival of the pandemic at the end of 2020.

3. Theoretical framework

In front of the huge effects of COVID-19 on economics and social issues worldwide, many authors such as Hayakawa and Mukunoki (2020) [6], Bekkers and Koopman (2020) [4], Baker et al. (2021) [7], Vidya and Prabheesh (2020) [8] and etc. researched COVID-19 and its impacts; especially economists applied many different types of methodologies in order to find out the real influences of COVID-19. The COVID-19 pandemic disrupted economic growth through a reduction in the supply of intermediate products and through suspension of production owing to lockdowns. However, recent studies on the impact of the COVID-19 pandemic have mostly focused on financial markets [9-14]. Hence, the present study tries to analyze the impact of the COVID-19 pandemic on the world trade network. In the research named "Impacts of COVID-19 on international trade", evidence from the first quarter of 2020 by Hayakawa Kazunobu, Mukunoki Hiroshi, 2020, used amounts of GDP, new COVID-cases, new COVID-deaths in the first quarter of 2019 and 2020 in order to compare differences in these two periods of time. From this research, we examine three factors that present impacts of COVID-19 on international trade in a theoretical aspect.

3.1. COVID-19 burden in exporting countries

COVID-19 spreads through contact face-to-face at close distances, which lead to social distancing and lockdown measures. These measures limit people's mobility in workplaces

first and then in entertainment activities. For example, school closures force some workers to be absent from work in order to care for their children or employees work from home due to social distancing measures. This creates plenty of trouble for us, leading to discontinuity at work and misunderstanding between co-workers. In the previous research, Dingel and Neiman (2020) calculated the share of jobs for various industries that could be performed at home [15]. For instance, the share is about 22% for manufacturing and about 5% for agriculture, forestry, fishing, and hunting. These figures, once again, demonstrate that not all work can be completed at home. All of these factors, of course, reduce supplies of goods, shift the country's supply curve upward and make it steeper.

In summary, it is natural that the COVID-19 burden in an exporting country decreases the scale of production, which leads to a decrease in export supply.

Meanwhile, enterprises without efficient production still must pay fixed costs such as depreciation cost, wage or rent costs. Each link in the production chain has a dependent relationship; a problem in one link could lead to unproductiveness in the whole production chain. Hence, many countries have attempted to sustain economic activity by applying telecommuting systems. If these systems improve productivity or efficiency, exports could increase. However, it is not easy for workers at factories to take up use of this production method. It is also less feasible in countries with less developed information technology infrastructure. Moreover, the scale of production would decrease much more in countries or industries where remote work/operation is less feasible. For example, it is difficult to realize such operations in labor-intensive industries or in industries that need an in-person presence for production. Exports are likely to decrease in such industries and countries due to decreased productivity.

The measures adopted to prevent COVID-19 lead to delays in exporting activities. Thousands

of goods produced that could not be delivered to foreign countries had to be sold in the domestic market at a lower price than their value. In fact, the domestic market could not consume this big amount of production. That is the reason why exporting firms needed to cut down the quantity of goods exported.

All in all, from the view of real productivity and the view of managers who make crucial actions, decisions and policies in exporting firms, we can see that COVID-19 has negative influences on both of these sides. The COVID-19 disaster caused the supply curve (from exporting activities) to decrease sharply without time limit or control.

3.2. COVID-19 burden in importing countries

The effect of the COVID-19 burden on trade in an importing country will mainly come from a decrease in aggregate demand in that country. Citywide or nationwide lockdowns reduce people's earnings from business and lead to a drop in aggregate demand. Even if people maintain their earnings, thanks to the government providing sufficient benefits to cover the loss of earnings, the fear of infection decreases their visits to retail stores or supermarkets, resulting in decreased demand.

In addition, lockdown measures in most countries worldwide cause the limitation of imported goods and especially service activities like tourism activities. Hence, a lot of importing countries cannot implement their business. Lockdowns are implemented in order to contain the spread of the infection. As a result of lockdowns, the manufacturing sector comes to a complete standstill in these economies.

On the other hand, uncertainty about the future or "panic buying" may increase demand for some kinds of products such as fast food or essential goods. However, in the long-term, the demand for these products does not increase due to a decrease in people's income in the time of COVID-19.

In fact, the import demand for sanitation or medical products, such as face masks and hand sanitizer, may increase due to increased demand

for products that defend against COVID-19 infection. Due to the demand for medical products increasing sharply, the price of these products increases quickly. This instability harms both consumer and producer. When the demand rises, consumers must pay a high price to buy medical products. At the same time, producers extend their manufacture because of huge demand, but this leads to an inventory situation because capacity consumption of the market has limitations.

All in all, although the demand for some kinds of products could increase in the short-term during the COVID-19 pandemic, the aggregate demand does not increase. That means the demand curve also decreases quickly as mentioned in the supply curve above.

3.3. COVID-19 burden in neighboring countries

COVID-19 burden in neighboring countries has both negative and positive effects on those countries in terms of international trade.

First is a positive effect thanks to the "substitution effect". Decreased exports from a country's neighbors due to COVID-19 create an export opportunity for that country because importing countries may change their import source from the neighboring countries to that country. For example, Vietnam is one of the top countries that have controlled the COVID-19 epidemic very well. Meanwhile, China could not; the spread of COVID-19 was out of control. Evidence is that there are more than 90 million new COVID-19 cases in China, including more than 4.6 million people deaths from COVID-19 [2].

In addition, COVID-19 may lower market prices due to decreased demand levels. This decrease in trade prices in the international market may increase imports in other countries such as neighboring countries.

The second impact is a negative effect, which we call the "contagion effect." Negative production shocks resulting from COVID-19 in a country may reduce production of other countries through supply-chain networks, particularly in the globalization era. As

mentioned above, international or foreign trade is recognized as the most significant determinants of economic development of a country, all over the world. Every country in the world is now a member of, at least, one international trade agreement. That means international trade and foreign direct investment play a larger role in transmitting shocks to domestic production in other countries because the elasticity of substitution between imported intermediates and domestic factors is smaller and smaller. The price of products may be due to input-output linkages. As a result, exports of a country drop if it relies on materials or intermediates imported from neighboring countries with a COVID-19 burden.

4. Empirical framework

By using the Poisson pseudo-maximum likelihood method, Hayakawa and Mukunoki (2020) provide early evidence for the impacts of the ongoing coronavirus pandemic on international trade [6]. However, the data is limited in the first quarter in 2019 and 2020. Therefore, we could not have an overview of the longer period of time. As with these authors, due to unavailability of data and figures about trade in services and GDP figures in most countries in the world in 2019 and 2020, we were only able to implement our research based on data about trade in goods of 37 selected OECD countries. Data has been drawn from the OECD database. Regarding COVID-19 data, we collected it from WHO from daily figures all over the world.

Traditionally, the gravity model has been regarded as the workhorse of the international trade literature and widely applied by empiricists thanks to its ability to produce “some of the clearest and most robust findings in empirical economics” [16]. By relating trade flows directly to market size and inversely with trade costs, usually in the form of geographical distance between exporters and importers as a proxy for transport costs, the gravity model seeks to

delineate some deep regularities in international trade flow and production. In mathematical terms, the gravity model can be conveniently written as follows:

$$Export_{ijt} = \exp\{\beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GD_{jt} + \beta_3 stringency_{jt} + \beta_4 \ln Common\ language_{jt} + \beta_5 \ln Common\ contiguity_{jt}\} \times \epsilon_{ijt}$$

Where:

$Export_{ijt}$ indicates export values from country i to country j at time t.

$\ln GDP_{it}$ and $\ln GDP_{jt}$ are each country's gross domestic product in logarithmic term.

$\ln Distance_{jt}$, $\ln Common\ language_{jt}$, $\ln Common\ contiguity_{jt}$ represent the geographical distance and cultural similarities between countries as proxies for trade cost in logarithmic terms, and lastly ϵ_{ijt} is a random error.

The β_i are regression parameters or coefficients to be estimated.

Theoretically, the gravity model suggests that larger country pairs are expected to trade more, while countries that are further apart in geography to interact less, possibly because transport costs between them are higher. Indeed, the model has become a key tool for those who aim at studying impacts of trade-related policies or exogenous forces that have disruptive effects on trade flows. Accordingly, to reach this study's objects an extended gravity model is presented as follows:

$$Export_{ijt} = \exp\{\beta_1 COVID_case_{it} + \beta_2 COVID_case_{jt} + \beta_3 stringency_{it} + \beta_4 stringency_{jt} + \beta_5 \ln GDP_{it} + \beta_6 \ln GD_{jt} + \delta_{ij} + \delta_{it}\} \times \epsilon_{ijt} \quad (1)$$

$$Export_{ijt} = \exp\{\beta_1 COVID_death_{it} + \beta_2 COVID_death_{jt} + \beta_3 stringency_{it} + \beta_4 stringency_{jt} + \beta_5 \ln GDP_{it} + \beta_6 \ln GD_{jt} + \delta_{ij} + \delta_{it}\} \times \epsilon_{ijt} \quad (2)$$

The nine metrics used to calculate the stringency index are: school closures; workplace closures; cancellation of public events; restrictions on public gatherings; closures of public transport; stay-at-home requirements; public information campaigns; restrictions on internal movements; and international travel controls.

Table 1: Summary of the variables in the model

Variables	Meaning	Units
$Export_{ijt}$	Export values from country i to j at time t Here the nations that are included in the study are 37 country members of OECD, and two time points of interest are 2019 and 2020	US dollars
$COVID_case_{it}$	The number of confirmed cases that are infected with COVID-19 in exporting country i at time t	Thousand cases
$COVID_case_{jt}$	The number of confirmed cases that are infected with COVID-19 in importing country j at time t	Thousand cases
$COVID_death_{it}$	The number of people who died of COVID-19 in exporting country i at time t	Thousand people
$COVID_death_{jt}$	The number of people who died of COVID-19 in importing country j at time t	Thousand people
$stringency_{it}$	Highest stringency index imposed by exporting country j at time t	Any integer between 0 and 100
$stringency_{jt}$	Highest stringency index imposed by importing country j at time t	Any integer between 0 and 100
$lnGD_{it}$	Logarithm of GDP value of exporting country i at time t	GDP value in US dollars
$lnGD_{jt}$	Logarithm of GDP value of importing country j at time t	GDP value in US dollars
δ_{ij}	Fixed effects regarding the time-invariant trading characteristics of the two countries i and j , encompassing traditional factors such as distance, common language, common contiguity, etc.	
δ_t	Time fixed effects	

Source: Compiled by the author.

5. Empirical results

Table 2 reports the baseline results for the regression of trade on COVID-19 burden while controlling for GDPs of exporters and importers, country pair and time fixed effects. The estimation results, which are derived using OLS and PPML methods, are both presented for comparison purposes. It is noted that standard errors in parentheses are clustered by country pairs, and are robust to heterogeneity across trade relationships of the OECD's nations. In all specifications, the dependent variable is the annual export values of goods for 2019, and 2020. Consistent with the previous estimation procedure of the gravity model, the export value here is also entered as logarithmic form in OLS, and as dollar value in PPML with the corresponding link function. The main variable

of interest is the extent of the COVID-19 burden, which is measured respectively as the number of cases infected with the virus, and the number of deaths due to the virus during the same period. The units for both the measures are in thousand people. This should be paid attention when the regression coefficients are to be interpreted.

As expected, for exporters, the COVID-19 burden inside the country shows significantly negative coefficients. In all specifications, both the number of cases and deaths in exporting countries have adverse effects on merchandise exports. The estimates are qualitatively similar between the two methods, although those of PPML are a bit smaller in terms of magnitude. In the worst case, it is estimated that one thousand additional cases of COVID-19 would cause, on average, a 0.0011% decrease in the annual export value of commodities. The

negative impact is even amplified when the extent of the burden is measured by the number of people who have died of COVID-19. Under OLS, one additional thousand deaths would trigger a reduction of 0.08% in the export value of goods on average, and under PPML the decrease is about 0.05%. In general, these estimates are consistent with previous studies on the impact of the COVID-19 pandemic-induced trade disruptions on commodities exports. For example, a study assessing the impact on exports from Commonwealth

countries indicates that compared to business as usual, the commodity exports to their main five destination markets are expected to decrease by between \$98 billion and \$123 billion in 2020. Decrease in workforce size and productivity in exporting countries could probably be the reasons for the significant fall in trade. It is also interesting that the coefficients across all of the specifications on importers are larger than those on exporters, suggesting the importance of market size in the counterpart country.

Table 2: Baseline estimations results

Explanatory variables	OLS		PPML	
	(I)	(II)	(III)	(IV)
Exporter's cases (in thousands)	-0.000011*** (0.000004)		-0.000009*** (0.000002)	
Importer's cases (in thousands)	0.000008* (0.000004)		0.000003** (0.000002)	
Exporter's deaths (in thousands)		-0.000846*** (0.000222)		-0.000516*** (0.000094)
Importer's deaths (in thousands)		0.000552** (0.000243)		0.000219** (0.000085)
Exporter's GDP (in log.)	0.882*** (0.177)	0.840** (0.180)	1.005*** (0.278)	0.939*** (0.276)
Importer's GDP (in log.)	0.891*** (0.177)	0.842*** (0.181)	1.064*** (0.278)	0.998*** (0.276)
Fixed effects				
Country-pairs	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Number of observations	2,658	2,658	2,658	2,658
R-squared	0.9471	0.9473		

Notes: Estimation results are derived using OLS (column I and II) and PPML (column III and IV) methods. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Standard errors reported in parentheses are clustered by country pairs. All specifications are controlled for country-pair and time fixed effects.

Source: Compiled by the author.

In this the regression stringency index is used as a proxy for the restrictiveness of measures and policies to prevent the COVID-19 pandemic, which can be hypothesized to have implications on goods' trade. As with the COVID-19 burden, measures of exporters and importers stringency are both entered in the equation, which helps shed light on the extent to which policy restrictiveness matters as a

determinant of the pattern of commodity trade. Results for the augmented gravity model are presented in Table 3.

It is clear from the table that the two variables of primary interest - the exporter and importer stringency scores - mostly have statistically insignificant coefficients, except for the PPML estimate of the exporter's stringency index in column (IV). The coefficient is

significant at least at a 10% level, indicating that a one point increase in an exporting country's stringency score - which equates to more restrictive COVID-19 countermeasures, as measured on a scale of 0 to 100 - is associated with a 0.2% increase in trade. This suggests that rigorous attempts to contain the infection of the pandemic may bring about a healing effect on the annual export value of goods. From a long-term

perspective, it could probably be the case, since when the pandemic is under control, the under-utilization of labor would be removed and exporting would reach its potential again. Based on these results, it could be argued that stringent policies in exporting countries have the potential to greatly improve the observed pattern of goods trade in the post-pandemic period.

Table 3: Estimations results with stringency indexes

Explanatory variables	OLS		PPML	
	(I)	(II)	(III)	(IV)
Exporter's cases (in thousands)	-0.000011*** (0.000004)		-0.000008*** (0.000002)	
Importer's cases (in thousands)	0.000008* (0.000004)		0.000004** (0.000002)	
Exporter's deaths (in thousands)		-0.000852*** (0.000223)		-0.000493*** (0.000095)
Importer's deaths (in thousands)		0.000560** (0.000243)		0.000244*** (0.000087)
Exporter's stringency index	0.001 (0.002)	0.001 (0.002)	0.002 (0.001)	0.002* (0.001)
Importer's stringency index	-0.002 (0.002)	-0.002 (0.002)	0.001 (0.001)	0.001 (0.001)
Exporter's GDP (in log.)	0.878*** (0.178)	0.836** (0.181)	1.131*** (0.291)	1.080*** (0.291)
Importer's GDP (in log.)	0.887*** (0.179)	0.839*** (0.182)	1.190*** (0.291)	1.138*** (0.291)
Fixed effects Country-pairs	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Number of observations	2,658	2,658	2,658	2,658
R-squared	0.9472	0.9473		

Notes: Stringency indexes are incorporated into all specifications to test their effects. Estimation results are derived using OLS (column I and II) and PPML (column III and IV) methods. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Standard errors reported in parentheses are clustered by country pair. All specifications are controlled for country-pair fixed effects and time fixed effects.

Source: Compiled by the author.

Finally, the model is estimated by quarterly period as well. The regression results derived by OLS and PPML are presented in Table 3 and 4, respectively. To shed light on differences between time lag and contemporary effects, the model now incorporates the terms for exporter's and importer's stringency scores and their lags in sequence. Due to data constraints, however, only a one-quarter lag is taken into account. Under OLS, the adverse impact of COVID-19 deaths in

exporting countries is still huge for international trade in the same quarter, but the COVID-19 confirmed cases no longer appear statistically significant in the results. This change is likely due to be the partialing-out effect caused by the entry of the exporter's stringency variable. It then can then be argued that in the short-term, the measures taken by the government to guard against the COVID-19 infection, such as mobility restriction or stay-at-home orders, have

a much greater negative impact on goods' trade. Once again, this favors the argument that the shock in workforce size and productivity in exporting countries could probably be the reasons for the significant fall in trade. Though the PPML estimates show a significant and negative coefficient for the exporter's COVID-19 variable, and a positive coefficient for the stringency index, which is different from those of OLS, there is a consensus for both estimates on the greater contribution of the COVID-19 deaths, and the importance of restrictive countermeasures against massive infection during the evolution of the pandemic for trade benefit in the long-term. That means the effects of trade measures and policies in long-term and short-term period are different.

The main variables of the COVID-19 burden show significantly negative coefficients for exporters only. Both the number of cases and deaths in exporting countries have negative effects on trade, whereas those in importing countries do not have significant coefficients. Thus, decreases in workforce size and productivity in exporting countries result in

decreased trade. Although this cannot identify whether the impact of COVID-19 decreased demand in importing countries, at the very least it did not lead to decreased trade. The estimation results in yearly and quarterly periods are different because of time lag and contemporary effects, the model now incorporates the terms for exporter's and importer's stringency scores and their lags in sequence. The adverse impact of COVID-19 deaths in exporting countries is still huge for international trade in the same quarter, but the COVID-19 confirmed cases no longer appear statistically significant in the results. This change is likely thanks to the exporter's stringency of trade measures and policies. By taking into force trade measures and policies to prevent COVID-19, OECD countries could recovery the trade situation in the following quarter, which are shown in the difference of estimation results. Obviously, the COVID-19 outbreak has already caused deep disruption to world trade, affecting both the supply and demand sides of the global trade. World trade is experiencing a harsh phase without control.

Table 4: Estimation results for quarterly period using OLS

Explanatory variables	OLS			
	(I)	(II)	(III)	(IV)
Exporter's cases (in thousands)	-0.000008 (0.000007)		-0.000009 (0.000007)	
Importer's cases (in thousands)	0.000024*** (0.000008)		0.000020*** (0.000008)	
Exporter's deaths (in thousands)		-0.001406*** (0.000517)		-0.001455*** (0.000511)
Importer's deaths (in thousands)		0.001841*** (0.000587)		0.001578*** (0.000571)
Exporter's stringency index	-0.002** (0.001)	-0.002*** (0.001)		
Importer's stringency index	0.000 (0.001)	0.000 (0.001)		
Lag of exporter's stringency index			-0.003*** (0.001)	-0.003*** (0.001)
Lag of importer's stringency index			0.004*** (0.001)	0.004*** (0.001)
Exporter's GDP (in log.)	0.892*** (0.049)	0.910*** (0.050)	1.087*** (0.059)	1.104*** (0.059)
Importer's GDP (in log.)	0.909*** (0.048)	0.922*** (0.050)	1.103*** (0.058)	1.114*** (0.058)
Fixed effects Country-pairs	Yes	Yes	Yes	Yes

Year	Yes	Yes	Yes	Yes
Quarter	Yes	Yes	Yes	Yes
Trade period	quarterly	quarterly	quarterly	quarterly
COVID-19 period	quarterly	quarterly	quarterly	quarterly
Number of observations	10,632	10,632	10,632	10,632
R-squared	0.9400	0.9401		

Notes: Stringency indexes are incorporated into all specifications to test their effects. Estimation results are derived using OLS (column I and II) and PPML (column III and IV) methods. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Standard errors reported in parentheses are clustered by country pairs. All specifications are controlled for country-pair fixed effects and time fixed effects.

Source: Compiled by the author.

Table 5: Estimation results for quarterly period using PPML

Explanatory variables	PPML			
	(I)	(II)	(III)	(IV)
Exporter's cases (in thousands)	-0.000013*** (0.000002)		-0.000015*** (0.000002)	
Importer's cases (in thousands)	0.000012*** (0.000002)		0.000009*** (0.000002)	
Exporter's deaths (in thousands)		-0.001185*** (0.000139)		-0.001294*** (0.000141)
Importer's deaths (in thousands)		0.000893*** (0.000123)		0.000714*** (0.000125)
Exporter's stringency index	0.001* (0.000)	0.001* (0.000)		
Importer's stringency index	-0.000 (0.000)	-0.000 (0.000)		
Lag of exporter's stringency index			0.000 (0.000)	0.000 (0.000)
Lag of importer's stringency index			0.001*** (0.000)	0.001*** (0.000)
Exporter's GDP (in log.)	1.048*** (0.054)	1.045*** (0.055)	1.235*** (0.064)	1.207*** (0.062)
Importer's GDP (in log.)	1.119*** (0.054)	1.112*** (0.055)	1.307*** (0.064)	1.274*** (0.062)
Fixed effects Country-pairs	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Quarter	Yes	Yes	Yes	Yes
Trade period	quarterly	quarterly	quarterly	quarterly
COVID-19 period	quarterly	quarterly	quarterly	quarterly
Number of observations	10,632	10,632	10,632	10,632

Notes: Stringency indexes are incorporated into all specifications to test their effects. Estimation results are derived using OLS (column I and II) and PPML (column III and IV) methods. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Standard errors reported in parentheses are clustered by country pair. All specifications are controlled for country-pair fixed effects and time fixed effects.

Source: Compiled by the author.

6. Conclusion

In particular, OECD countries have decided to establish export controls over certain medical products (medical ventilators, certain drugs, personal protective equipment) in the form of temporary export bans or the addition of licensing/authorization requirements. Other countries, concerned with the security of their food supplies, have introduced export restrictions over specific agricultural products, and these decisions have generated genuine concerns about potential food shortages in the global market in the second part of year 2020. In addition, OECD countries apply lockdown measures, closures and social distancing, and in a short time, which lead to limit trade activities.

Although some of the short-term consequences of the COVID-19 pandemic for international trade are serious, they do appear unpredictable and unmanageable. From this perspective, one could expect that once the pandemic disappears (or is at least under control), international trade will go back to business as usual. However, in a different time frame, the potential impact of the pandemic may be more profound than initially anticipated, leading to structural changes in the process of international trade. The bigger its impact, the greater are the changes that we will see in the international trade relations.

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