THE IMPACT OF ECONOMIC OPENNESS ON SERVICE TRADE DURING THE COVID PANDEMIC

How openness to trade could help to soften shocks and promote economic recovery

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1. Introduction

We live in a time of unprecedented globalization and international trade. Never before has it been this easy for people and goods to make their way across borders and travel around the world (Arvin, Pradhan, & Nair, 2021). This has brought people great opportunities in terms of jobs, travel and overall welfare and convenience, however this high degree of interconnectivity has also shown some downsides. The ability for people to travel ever faster and further, meant that the Spanish Flu could become a global pandemic killing over 50 million people worldwide (Tauberger & Morens, 2006) The same effect can be seen in global trade. The German economy collapsed in the 1930s in part due to the fallout of the Great Depression in the US (Temin, 1971) The strong ties between countries' financial structures meant that a slump in the US carried over to Europe and wreaked havoc on is economies. This was also the case with the great financial crisis of 2008 (French, Leyshon, & Thrift, 2007) in which the collapse of Wallstreet resulted in a global financial crisis. All of these cases show that while globalization and greater connectivity has been very beneficial for the world economy, it can also result in local problems or illnesses spreading rapidly and affecting countries globally. This has also been the case with the Coronavirus of 2019 (Mas-Comas, Jones, & Marty, 2020). In a short period of time the virus infected millions of people around the world, crippling international travel and causing widespread lockdowns.

Global events like the Great Depression and the Great Financial Crisis had a big impact on global trade (Madsen, 2001). The Great Financial Crisis saw a big drop in liquidity due to banks failing. This resulted in a massive drop in the number of goods imported and exported (McKibbin & Stoeckel, 2009), however the trade in services remained relatively unaffected (Shelburn, 2010). Studies have ascribed this to the nature of the two kinds of trade. Services are seen as a necessity and therefore not affected as much by a drop in overall purchasing power, as people would keep using services anyway (Ariu, 2016). But what happens when the crisis does not directly affect purchasing power but human interaction itself? This is of course the case with the coronavirus. Due to the highly contagious nature of the disease, governments put restrictions on travel and other interactions that rely on interpersonal contact. This directly affects the possibility to provide services, but does not necessarily affect the sale of goods. Therefore it would be interesting to see how the different sectors of trade are affected by the Covid pandemic, given the reactions in earlier global crises. Due to the pandemic being a recent development, there have not been a lot of studies into its effects, especially when it comes to service trade. There have been some studies into the effects on the goods trade (Friedt & Zhang, 2020) (Kejzar, Velic, & Damijan, 2020) (Hayakawa & Mukunoki, 2021) , but the research on services is limited. The most comprehensive research on services comes from (Ando & Hayakawa, 2022). They show that services on a whole have been affected more by the Covid pandemic than goods. There are however some differences between the disaggregated service sectors. These differences can be explained by the need for physical interpersonal contact in the different sectors. For example, there were significant effects in the travel sector but computer services hardly showed significant effects. They also showed that the number of cases, deaths and the stringency of the measures taken to stop the spread of Covid, all had a negative effect on the service trade. They thus showed that the service sector is not as impervious to economic crises as thought before.

To add to this existing literature I will first introduce economic openness into the equation. Economic openness is the degree to which nondomestic transactions, being imports and exports, take place and affect the size and growth of the national economy (Keman, 2013). In other words it can be seen as a countries openness to trade. This economic openness is given as a percentage of total trade (imports and exports) of GDP (Keman, 2013). Countries that produce more products for the internal market, in other words countries that are more self-reliant, show a lower percentage of economic openness.

These include countries like the US, Brazil and Japan (Appendix B). Countries that rely more on trade, tend to have a higher percentage of economic openness. These include countries like The Netherlands, Singapore and Luxemburg (Appendix B). Countries that have a higher degree of economic openness, rely more on trade. This means that they are also more susceptible to changes to international trade, as it forms a much larger part of their national source of income. In the existing literature economic openness is used as a proxy to show a countries 'real' openness to trade (Bleaney & Tian, 2022). This of course includes a lot of country and trade characteristics, which make it difficult to determine the exact features that this measure is a proxy for (Fujii, 2018). However, it is still the most available and therefore 'convenient' measure available to proxy openness to trade and will therefore be used in this study, despite the possible ambiguity of the results. To ensure that the degree of economic openness is not biased due to Covid, the degree will be calculated over 'base year' 2019 as it was the last year before the pandemic and thus serves as a good benchmark.

To show the effect of the pandemic on trade, I will differentiate between two instances of effect. Firstly, I will look at the initial Covid shock. Covid-19 hit most countries in the first and second quarters of 2020. Cases and deaths rose rapidly around the world, while local authorities struggled to control the virus and international travel came to a standstill. This also had an impact on international trade. This has been shown by the earlier research into the effect on the trade of goods (Kejzar, Velic, & Damijan, 2020) (Friedt & Zhang, 2020) (Hayakawa & Mukunoki, 2021) and the research into the effect on the trade of services (Ando & Hayakawa, 2022) (Veeramani & Anam, 2021) (Minondo, 2021). My research will show if there is a difference in effect on countries based on their degree of economic openness. Secondly, I will look at the recovery period from the pandemic. This is also something that has not been studied before and could therefore be an interesting addition to the existing literature. After the initial shock, countries started to slowly recover from the economic effects of the pandemic. Vaccinations played a big role in getting the virus under control and helping societies to open up again. I want to determine how long this economic recovery took and if the degree of economic openness made a difference for this recovery period. Lastly, I want to determine which service-sectors are most reliant on economic openness, to function during the pandemic. This could provide us with insights to keep economic effects to a minimum in a possible next pandemic. With greater connectivity around the world, it is not unlikely that something like the Covid pandemic could happen again in the future and by looking at these questions we can be better prepared by then.

In this study I found that countries with a higher degree of economic openness were affected more on the imports side, while closed countries experienced a bigger drop in exports. Overall, open countries experienced bigger drops in trade volume. There are benefits to economic openness when it comes to economic recovery after the pandemic, with several sectors showing a positive effect. However, there are also sectors that show a negative impact and it can therefore not be seen as a complete solution to economic recovery from Covid or future pandemics.

The rest of the thesis will be structured as follows. In section 2 I will discuss the data used for the study, economic openness and the sample selection for the study and give a definition for economic recovery and provide a way to measure this. Section 3 will contain a brief overview of the progression of Covid and trade from 2019-2021. Sections 4 and 5 will discuss the theory and empirical framework for the study. In section 6 I will present the empirical results of the study and section 7 will present the concluding remarks and discussion. Section 8 is composed of the Appendix and references.

2. Data

2.1 Data

The data used in this thesis was obtained from several sources and is focused on the years 2020 and 2021, as these years include the peak of the Covid pandemic, but also the first rounds of vaccinations. The pre-pandemic trade trends for 2018-2019 can be found in Appendix F.

Firstly, the data on service and merchandise trade volumes were obtained from the United Nations Council on Trade and Development (UNCTAD) (UNCTADstat, sd). This database has data on the worldwide trade in services and goods on an annual and quarterly basis. The data on service trade is made up of four different sectors: goods-related services, transport services, travel services and other services. This last category can be disaggregated into the following eight sectors: Construction, Insurance and pension services (*Insurance,* hereafter), Financial services, Charges for the use of intellectual property n.i.e[1] (*Intellectual Property charges).,* Telecommunications, computer and information services (*ICT services)*, Other business services, Personal, cultural and recreational services (*Personal services)* and Government goods and services n.i.e (*Government services)*. As this research focuses on the trade in services during the Covid pandemic, the data on the trade in goods is only used to calculate the degree of economic openness for each country. Both the trade in services and the trade in goods are categorized as trade to and from the world. This trade data is based on the *balance of payments* (BOP) concept of trade. This means that it mostly records transactions that take place between residents and non-residents (Melvin & Norrbin, 2017). Secondly, the data on GDP per country come from the Organization for Economic Cooperation and Development (OECD) (OECD, 2022). This database includes global data on GDP on an annual basis. For this study only the data for 2019 is used. Lastly, the data on COVID was obtained from the online database of OurWorldInData (OWID) (Mathieu, et al., 2022). This database is made up of daily data on Covid and includes, among others, the number of cases, deaths, vaccinations, people vaccinated and a stringency index of the restrictions against Covid. This daily data was aggregated into quarterly data, to be compatible with the data on trade. To this data I added country specific variables like population density and population size. The data for these variables came from the World Development Index (WDI) of the World Bank (Bank, sd).

2.2 Economic openness and sample selection

In this thesis I want to see if economic openness can have a beneficial impact when experiencing a trade shock. Economic openness shows an openness to trade which in turn means an overall more global orientation. This shows means a tendency towards international cooperation but also a bigger dependence on other nations. All of these factors could mean a different response to trade shocks. Economic openness is calculated by taking the sum of total trade in a country (imports and exports) and dividing it by its GDP (Keman, 2013) . As Covid heavily influenced both trade and GDP, 2019 is used as a 'base year' to determine the degree of economic openness. I then assume that this degree of economic openness is constant throughout the pandemic period 2020-2021. This is done to ensure that the measure is not biased because of Covid. Doing the aforementioned calculation using data from 2019, yielded percentages of economic openness ranging from 20% to 354%, where a higher percentage means a larger degree of economic openness. Based on these percentages a dummy variable was created to have value d=1 if the percentage of economic openness => 160% and have value d=0 if the percentage of economic openness <= 40%. Dummy variables d=1 are deemed 'economically open' and variables d=0 are deemed 'economically closed'. These cutoff values are chosen based on the distribution of economic openness in the sample countries and reflect a sort of natural cutoff value. This distribution is shown below in Figure 1**.** Since most countries fall in the range

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[1] 'Not included elsewhere'

of 40% to 160% economic openness, I exclude them from the analysis to ensure that only countries that are 'extremely' open or closed are used. This will most likely yield the clearest results on the impact of economic openness as the difference between the two groups is most substantial. Using a smaller difference seems less appropriate, as the underlying differences can get muddled by using the 'average' nations as well. The decision to not use continuous variables was based on the fact that the percentage of economic openness calculated for 2019, will not remain the same throughout the entire Covid period and can therefore induce bias. However, I do assume that the overall tendency to openness remains roughly the same. A dummy variable provides a better match for this assumption which results in less bias. After cross-referencing the data on economic openness with the data on service trade and the data on Covid, we are left with a sample that includes the quarterly data of 22 countries (Appendix A), half of which are 'economically open' and the other half are 'economically closed'.
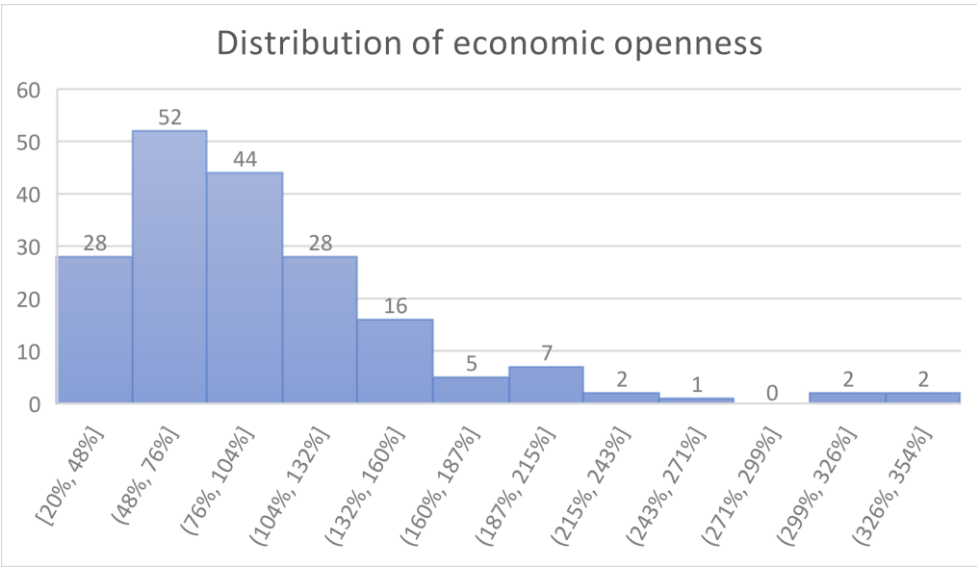
Figure 1: Distribution of the degree of economic openness

2.3 Economic Recovery

The economic recovery from COVID is measured as the number of quarters, after the initial shock, that it takes a service-sector to return to the pre-pandemic level. This pre-pandemic level will be taken as the last quarter of 2019 as this was the last quarter without COVID. As the first COVID- shock is not unilaterally felt, some countries and sectors experience an earlier shock than others, the quarters to recovery are taken as the difference between the first quarter that dips below the pre-pandemic level and the first quarter that returns to the pre-pandemic level. As the data in this thesis comes from the two years 2020 and 2021, there are eight quarters in total. These quarters are given a numerical value starting with Q1 of 2020 being given the value '1' and ending with Q4 of 2021 being given the value '8'. Should a sector not recover in the given timeframe, it will be given the value '9' to show that recovery is outside of the given timeframe. Sectors that do not show any shock at all but show growth instead, will be given the value '0' to show that no recovery took place. The recovery data will be split into two groups based on the degree of economic openness, to determine if this impacts the recovery time and the initial shock. Vaccinations and the number of people vaccinated are also important for the recovery, as it allowed governments to release restrictions to promote economic growth. Therefore, these two factors will also be taken into account.

3. Theoretical framework

This section will discuss the theoretical framework for the thesis. As mentioned before, the prevailing economic theory before the Covid pandemic was that services were less susceptible to economic shocks. This is due to their lower elasticity than the trade in goods, less dependance on external financing and less cyclical demand (Ariu, 2016) (Ceglowski, 2017) (Borchert & Mattoo, 2010). However, this has been shown to not always be true (Ando & Hayakawa, 2022). To determine the effect on the disaggregated service- sectors, I will first categorize them into four different 'modes of supply' following the GATS[2] categorization of trade. Mode 1 deals in cross border supply where services from one country are supplied to another. These services are received through the telecommunication- or postal- infrastructure of the recipient country (Ando & Hayakawa, 2022). Mode 2 occurs when a national of one country, moves abroad to another country to make use of its services there. This is the case for tourism, foreign students and people working abroad (Ando & Hayakawa, 2022). Mode 3 is the commercial presence of a foreign owned company (Ando & Hayakawa, 2022). This company renders services for the nationals of the country it is located in. An example of this could be a German bank operating in the US or a Dutch Insurance Provider, insuring people in Italy. Mode 4 concerns private individuals that move temporarily from an exporting country to an importing country and render their services in the importing country (Ando & Hayakawa, 2022).

The BOP data used in this study are represented in Modes 1,2 and 4 of the GATS categorization, but Mode 3 is not accurately represented. This is due to the BOP concept using residency instead of nationality to count transactions (Ando & Hayakawa, 2022). Mode 3 usually occurs between nationals of the same country and is therefore not accurately measured. Therefore only mode 1, 2 and 4 will be counted in this study. Using this categorization of the service-trade, (Ando & Hayakawa, 2022) showed that Mode 2 and Mode 4 are most reliant on the possibility to move freely between borders and have physical interactions with others. Mode 1 is also reliant on travel between borders, but requires less physical interaction.

Economically open countries are, by nature, open to all kinds of international trade. Their infrastructures are built for it and their economies depend on it. The Covid pandemic created a shock for both the imports and exports of services. Domestic countermeasures like stay at home orders, reducing physical contact with others and closing down non-essential shops all drive down demand in importing countries (Del Rio-Chanona, Mealy, Pichler, Lafond, & Farmer, 2020). Spreading of the virus also creates a labor shortage, either due to people being sick at home or due to social distancing rules. This creates a problem for both imports and exports (Del Rio-Chanona, Mealy, Pichler, Lafond, & Farmer, 2020). There is also a loss of income due to the pandemic. Less demand means that some businesses have to close down which in turn results in lowered income. Lower income leads to more demand issues (Muellbauer, 2020). These are the general issues that occurred during the pandemic.

Even though these are issues that were not specific to open- or closed economies, we will most likely see a difference in the effect on imports and exports for these two groups. This has to do with the way in which economic openness is calculated. As mentioned before, economic openness is calculated by taking the total of a countries trade (imports and exports) and dividing it by its GDP. The GDP is calculated by taking the sum of consumption, investments, government spending and net exports (Bondarenko, 2017). Net exports are taken as the exports minus the imports. This means that countries with higher imports than exports, have a lower GDP than countries that have higher exports. This will result in a relatively higher degree of economic openness for countries with relatively high imports. Therefore, I expect to see bigger drops in real trade volume of imports for open economies and a bigger

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[2] General Agreement on Trade in Services

drop of exports in closed economies. These are their most dominant modes of trade and the effect of the demand and supply shocks will therefore be felt most in these sectors.

To determine the impact on specific sectors in the service trade, we will look at the different modes.

The main restrictions due to Covid were placed on the movement of people across borders. Whether due to testing, mandatory quarantines or closing down borders all together, it became more difficult to move from one country to another. The results in damages to the modes of trade that rely on the movement of people. This can be found in modes 2 (tourism and travel) and 4 (construction). The restrictions cut down the export of mode 2 trade and the import of mode 4 trade (Ando & Hayakawa, 2022). This is also the case for countries that are importers of mode 2 trade and exporters of mode 4 trade. Rising domestic cases will cause a country to restrict outgoing travel to keep the virus from spreading further. Modes 2 and 4 are therefore restricted in both imports and exports (Ando & Hayakawa, 2022). Due to the reliance of economically open countries on trade, it is expected that these changes will affect them the most.

Mode 1 imports and exports were affected the least by Covid because they do not rely as heavily on the physical movement of people. These include Financial services, Charges for the use of intellectual property, Insurance services, other business- services, and recreational services. Especially the Financial services, Intellectual Property charges and Insurance services showed little to no affect as their supply and demand could mostly shift online. The other mode 1 trade , transport, did show a significant drop in both imports and exports. This is because transport is also related to the availability of free travel and open borders. I expect to see a similar outcome for both economically open and closed countries in mode 1 trade.

Where I think the differences between the two groups will be the most significant, is in the recovery from the pandemic. It has been shown that economic openness is beneficial for economic growth (Yanikkaya, 2003) (Keho & Grace Wang (Reviewing Editor), 2017) (Liu, Song, & Romilly, 1997). This results in the expectation that open countries will recover more quickly from the economic ramifications of the pandemic. Because their economies are more attuned to trade, they will want to find a way to get trade going again as soon as possible. This could happen in several ways. Firstly, we could see an increase in trade in sectors that are not damaged as much by the pandemic. It is likely that these can be found in mode 1 of trade supply. This increase in trade could be used to offset the negative results from sectors that are affected more severely by Covid. Secondly, a quicker recovery could occur by releasing restrictions sooner to stimulate the economy. This could happen because open countries are more globally oriented and would therefore haven earlier access to vaccines and other medicine. This could result in improvement in modes 2 and 4 of trade, as it allows for domestic production to continue which increases income. Lastly, a higher degree of vaccinations and natural immunity due to a high number of cases in the past, also causes importing countries to release restrictions which makes mode 2 and 4 trade possible again. Again, open countries are more likely to release these restrictions sooner as they are more dependent on trade. While I expect open countries to recover more quickly on the whole, it will be interesting to see if this will also be the case for the imports which I expect will be hit the hardest.

4. Empirical framework

To determine if economic openness does indeed make a difference for the trade in services during the Covid pandemic, I explore the quarterly data for the 22 countries in the sample for the years 2020 and 2021 using a simple Ordinary Least Squares (OLS) regression. To account for the effects of COVID, I use the number of cases, deaths, total vaccinations, people vaccinated and the stringency index. There are

of course other factors at play in determining how and when people interact, but these variables should at least be a part of the process. This gives the following empirical model:

$$ServiceTrade_{iqy} = \beta_0 + \beta_1 * COVID_{iqy} + \beta_2 * EconOpenness_i + \epsilon$$

Where $ServiceTrade_{iqy}$ gives the volume of trade in the specific service sector for country i in quarter q of year y. β_0 is a constant, $COVID_{iqy}$ denotes the impact from COVID in country i in quarter q and year y, $EconOpenness_i$ determines if country i is considered economically 'open' or 'closed' and ϵ is the error term.

This is calculated separately for both imports and exports.

As mentioned before the impact of COVID is made up from several factors. These factors have both a more tangible impact on people's lives, for example the stringency of the restrictions has an active impact on peoples interactions, but also a more psychological impact that in turn influences behavior. COVID will be perceived as a more severe threat when the numbers of cases and deaths rise (Zhang & Luo, 2021), this will have an impact on the way people interact with each other and on their willingness to follow the restrictions. The number of vaccinations and people vaccinated will have the opposite effect (Arnon & Ricco, 2021). The more people are vaccinated, the less people will perceive the virus as a threat, both for themselves and the people they interact with. This will in turn decrease the willingness to follow restrictions as the perceived necessity of doing so also goes down.

5. Empirical Results

5.1 The progression of Covid between 2020 and 2021

By the first quarter of 2020 Covid had reached most countries is the world. Figure 2 below shows the change in daily cases and deaths over the aforementioned period, it also shows the change in the stringency of restrictions put in place against Covid.

(a) Number of cases and deaths worldwide
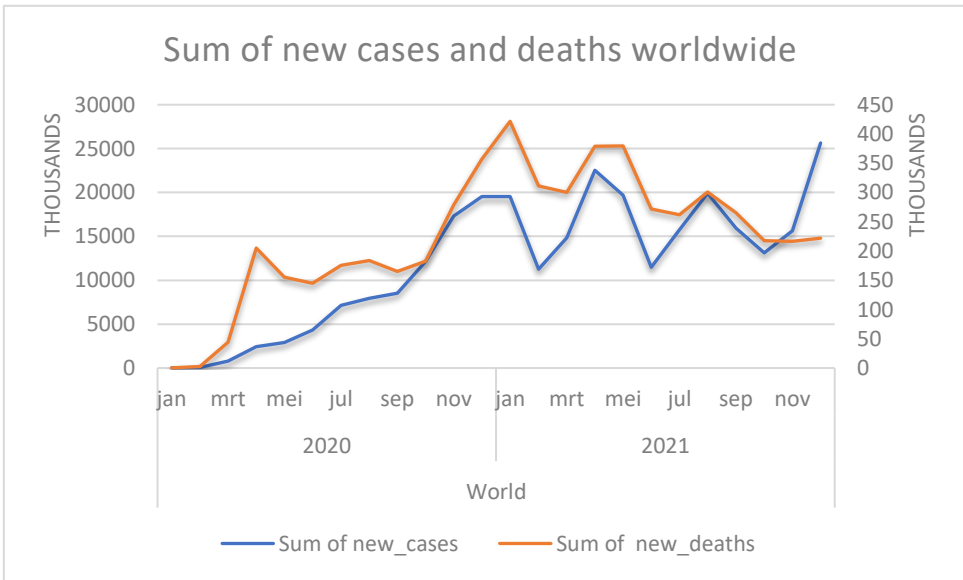
(b) Stringency Index
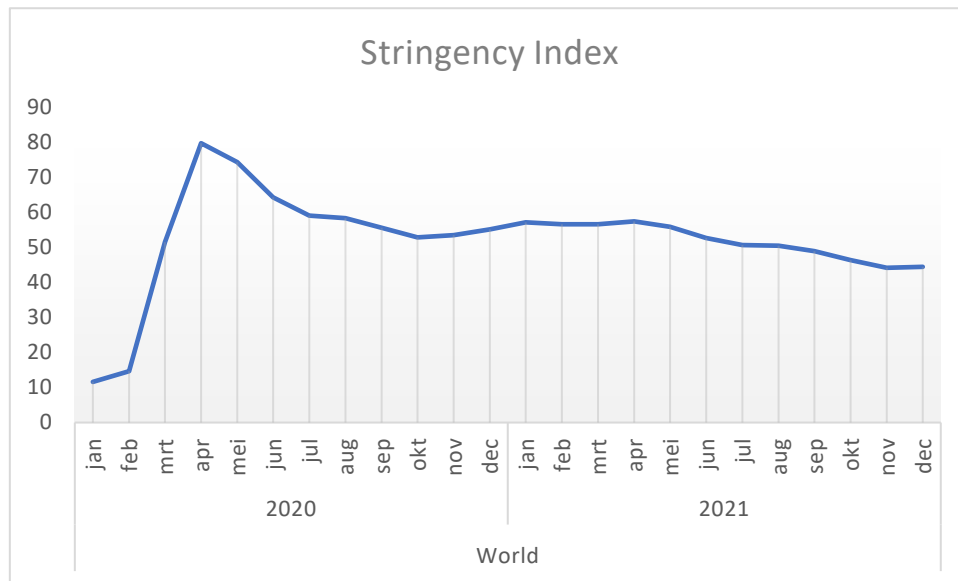
Figure 2: The progression of Covid-cases and -deaths and restrictions put in place

This figure depicts (a) the progression of Covid-cases and -deaths worldwide from January 2020 to December 2021 and (b) the stringency index of the restrictions put in place throughout the same period. *Notes:* The values for Covid represent the sum of weekly new cases and deaths, the stringency index is the average of measures in place.

Figure 2 (a) shows that the virus spread rapidly after February of 2020. The first peak in deaths can be observed in April of that year. Cases keep rising throughout the year, only slowing down at the very end in Q4 of 2020. Throughout 2021 both the number of cases and deaths peak several times. The number of deaths decrease slowly throughout the year, but the number of cases show a rapid rise again in Q4. The graph of the stringency index shows that the measures against the coronavirus were most severe April of 20202, coinciding with the first peak in deaths. After this peak, the index drops down to a score between 50 and 60, where it stays relatively stable throughout 2021. This means that throughout this period, international trade was possibly affected by the measures.

Figure 3 below depicts the number of vaccinations and people vaccinated worldwide until the end of 2021. People vaccinated refers to people that have received at least one vaccination, they do not have to be fully vaccinated to be counted in this graph.
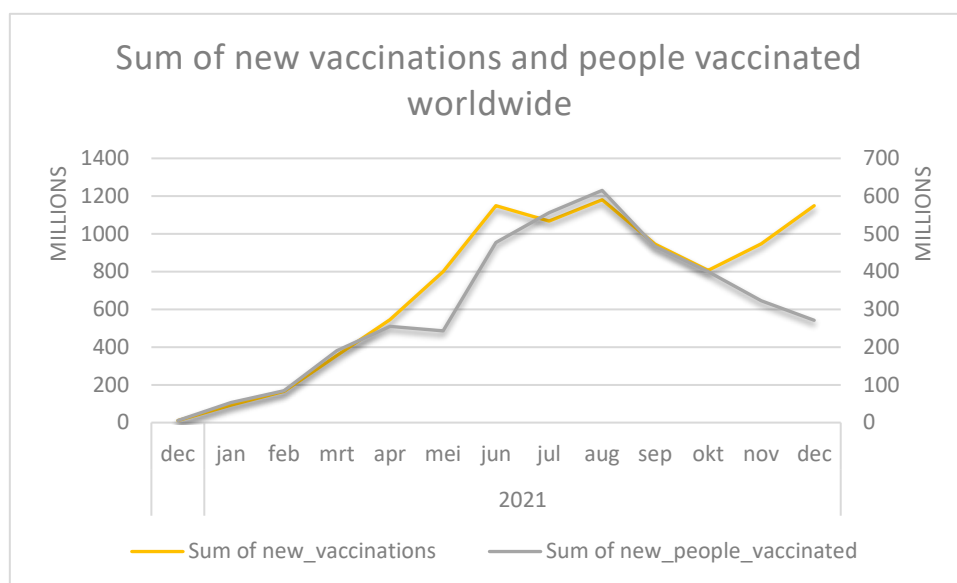
Figure 3: vaccinations and people vaccinated worldwide

This figure shows the number of new vaccinations and people vaccinated worldwide from December 2020 to December 2021. *Notes:* The values given are the sum of weekly new vaccinations and new people vaccinated.

Figure 3 shows that the vaccination program took off in December of 2020. We observe a steep rise in the number of vaccinations, until the first peak in June of 2021. Afterwards, the vaccinations slow down a bit before picking up speed again in Q4 of 2021. The number of people vaccinated has its peak in august of 2021, before dropping significantly towards the end of the year. This shows that throughout 2021, a sizeable portion of the population was vaccinated. This could possibly result in a greater sense of safety for the population. This could in turn cause more willingness to be in physical proximity to other people, thus making trade in certain services more viable throughout 2021.

5.2 Initial shock

As shown before, the COVID pandemic that hit countries around the world in 2020, proved to have a negative impact on the service trade as a whole. The purpose of this thesis is to determine if that negative impact was more or less the same, or differs depending on the level of economic openness of individual countries. Appendix F shows the change in average imports and exports for the period 2018-2019. This change is relative to Q4 of 2019, the same level that is used for the rest of the thesis. These graphs serve to show the change in trade in normal times and can be used as reference for trade during Covid. Figure 4 illustrates the impact COVID has had on the imports in disaggregated service sectors for countries considered (a) economically 'open' and (b) economically 'closed'. They represent the change, relative to the baseline of Q4 2019, of the average imports of both groups. The biggest drop in both groups is visible in the travel sector, with the imports of both goups falling by about 80% in Q2 of 2020. There are also similar drops in the imports of construction, with both groups falling to below 80% of the pre-pandemic level in Q2 2020. It is also interesting to observe that open economies seem to experience a bigger drop across the board. Examples of this can be seen in the following sectors: Intellectual property charges, other business services, personal services and government goods and services. When it comes to Intellectual property charges in closed economies, we observe an increase in trade volume from the start of the pandemic. This is a clear difference between the two groups. While closed economies mostly show a smaller impact from Covid, that is not true for the

transport sector. Here we see a bigger drop in imports from closed economies than from open economies.

(a) Open economies
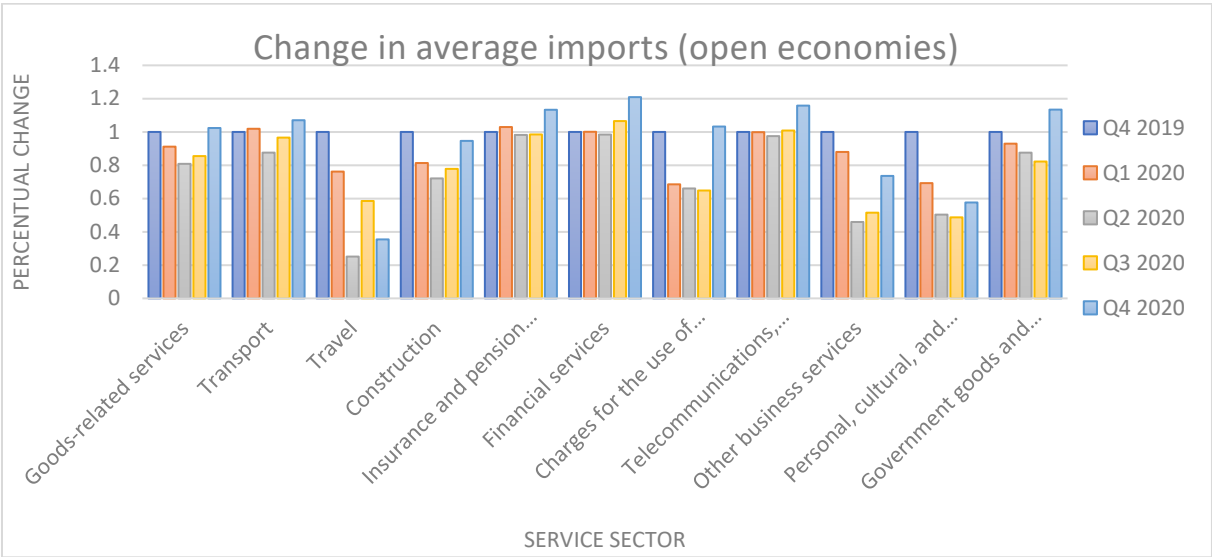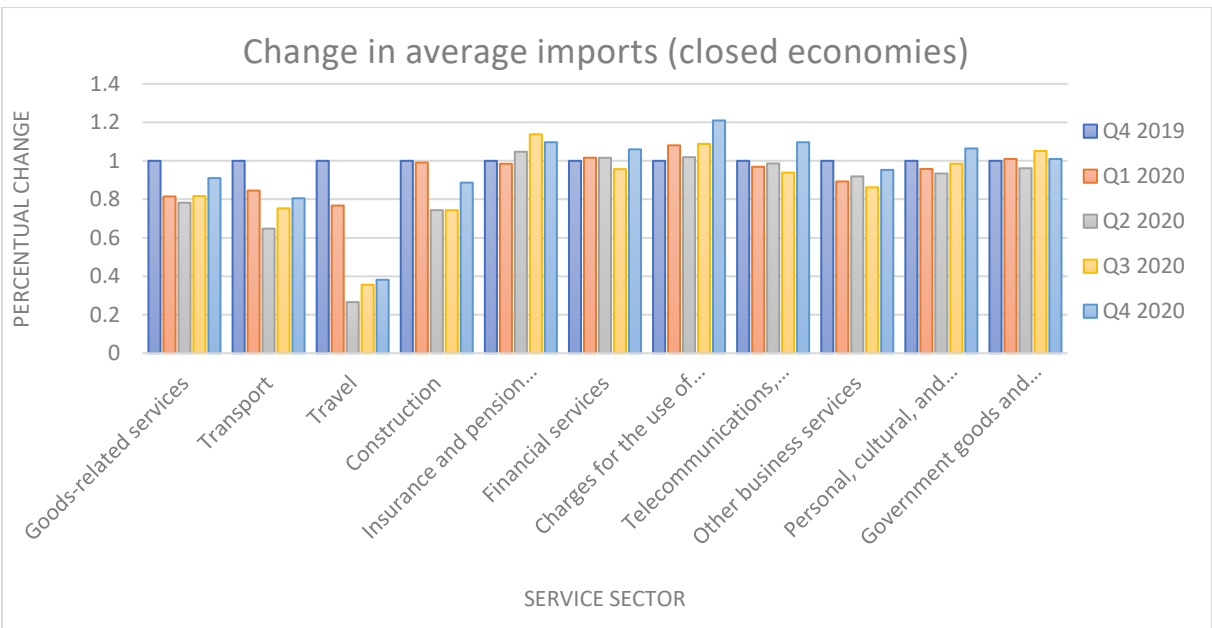
(b) Closed economies

Figure 4: Change in average service sector imports, relative to Q4 2019, for open and closed economies

This figure depicts the percentual change in service sector imports for (a) open economies and (b) closed economies, relative to Q4 of 2019. Q4 of 2019 serves as the base level from which the imports deviate due to Covid. The values on the y-axis represent the volume of trade as a percentage of the base level, i.e. 0.8 means 80% of pre-pandemic levels. Notes: For both groups I use a simple average of trade volume.

It is also interesting to note that service sectors were not exclusively harmed by the pandemic. Next to the increase in Intellectual property charges for closed economies, we see an increase in Insurance and pension services and Financial services for both groups.

(a) Open economies
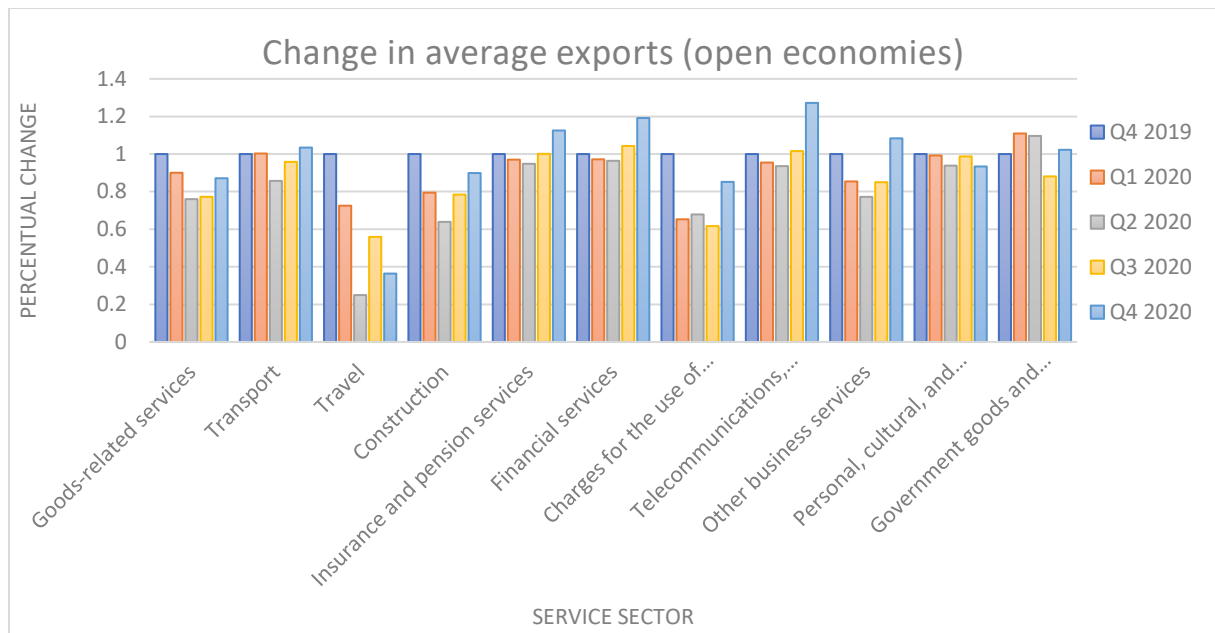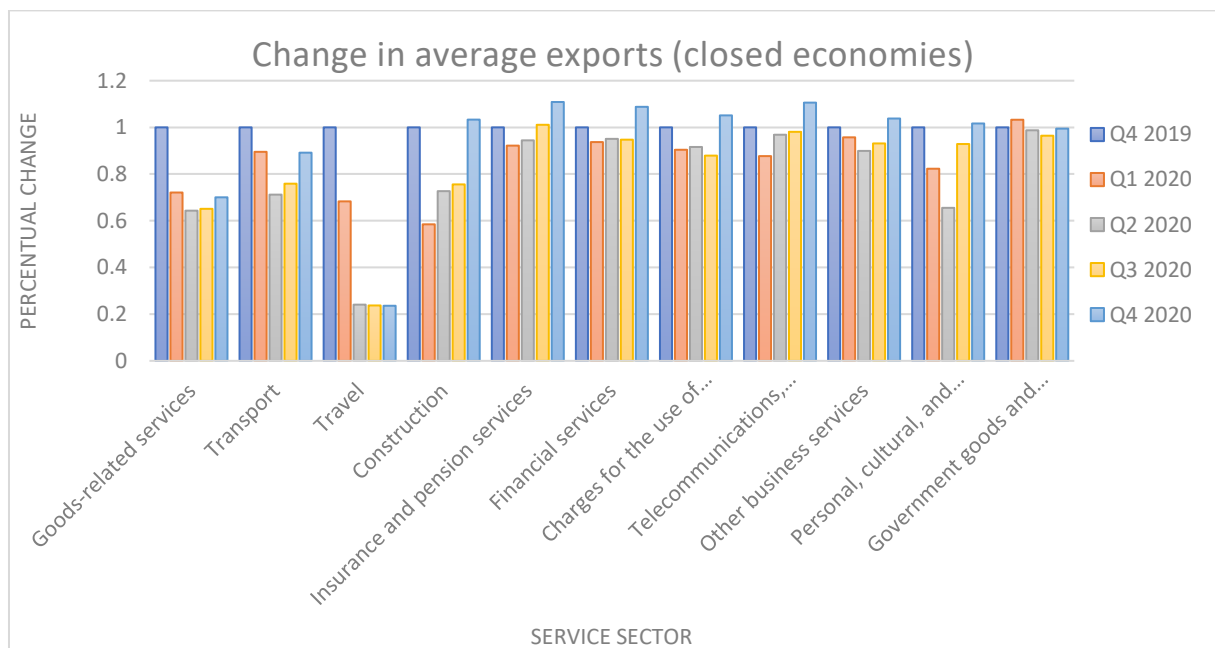
(b) Closed economies

Figure 5: Change in average service sector exports, relative to Q4 2019, for open and closed economies

This figure depicts the percentual change in service sector exports for (a) open economies and (b) closed economies, relative to Q4 of 2019. Q4 of 2019 serves as the base level from which the exports deviate due to Covid. The values on the y-axis represent the volume of trade as a percentage of the base level, i.e. 0.8 means 80% of pre-pandemic levels. Notes: For both groups I use a simple average of trade volume.

Figure 5 depicts the change in exports for the first year of the pandemic. As was the case with imports, the travel sector sees the biggest drop in both sectors. At the lowest point in Q2 2020 the trade volume is about 25% of the pre pandemic level. Open economies also show a large decrease in the export of Goods-related services (25%), Construction (40%), Intellectual property charges (40%) and Other business services (20%). For closed economies the biggest decreases can be found in exports of Goods-

related services (40%), Transport (30%), Construction (40%) and Personal, cultural and recreational services (35%). As was the case with imports, there are some sectors that were less affected by the pandemic. For both groups these sectors are: Insurance and pension services, Financial services and ICT- services. Government goods and services are also less affected.

To determine the effect of Covid and economic openness on trade, I analyzed the data using a Multivariate OLS regression. The results of the regression are depicted below in Table 1. The leftmost column shows the different service sectors and the variables used in the regression. The next columns show the predicted coefficient, standard error and p value of the coefficient. This is split between the effects on imports and exports.

Table 1: OLS regression of Covid and economic openness on service imports and exports

	Imports			Exports		
	Coefficient	Std. Error	p-value	Coefficient	Std. Error	p-value
Goods related services						
Stringency index	-8.489	4.827	0.080*	9.389	7.682	0.223
Number of cases	2.582	8.547	0.003***	3.521	1.360	0.010**
Number of deaths	-9.405	5.050	0.064*	-0.013	8.036	0.098*
Economic openness	368.000	157.000	0.020**	-126.000	250.000	0.614
Constant	996.000	311.000	0.002***	353.000	495.000	0.476
Mean	**733.000**			**876.000**		
Transport						
Stringency index	-5.171	36.600	0.888	-4.679	33.700	0.890
Number of cases	2.924	6.475	0.000***	1.871	5.973	0.002***
Number of deaths	-0.100	0.038	0.010**	-0.066	0.035	0.061*
Economic openness	-1,480.000	1,190.000	0.215	372.000	1,100.000	0.735
Constant	5,600.000	2,350.000	0.019**	4,170.000	2,170.000	0.057*
Mean	**5,140.000**			**4,410.000**		
Travel						
Stringency index	25.900	33.200	0.436	-53.200	16.100	0.001***
Number of cases	1.761	0.587	0.003***	1.803	2.857	0.000***
Number of deaths	-0.088	0.035	0.012**	-0.035	0.017	0.039**
Economic openness	-3,210.000	1,080.000	0.003***	-861.000	525.000	0.103
Constant	2,720.000	2,140.000	0.204	4,390.000	1,040.000	0.000***
Mean	**2,620.000**			**1,620.000**		
Other services						
Stringency index	-102.000	121.000	0.403	-100.000	143.000	0.483
Number of cases	0.010	2.148	0.000***	0.017	2.523	0.000***
Number of deaths	-0.216	0.127	0.091*	-0.331	0.149	0.028**
Economic openness	7,110.000	3,950.000	0.073*	6,930.000	4,640.000	0.137
Constant	17,100.000	7,810.000	0.030**	16,900.000	9,180.000	0.067*
Mean	**18,500.000**			**21,400.000**		
Number of observations	**173**			**173**		

As can be seen in Table 1, the number of cases and deaths are statistically significant in some degree for every service sector and both imports and exports. The number of cases is very statistically significant across every service sector, while significance of the number of deaths varies. The stringency index does not yield that many significant results. On the import side it is significant at a 10% level for goods related services and on the export side it is significant at a 1% level for travel. Economic openness shows statistical significance in a few sectors. For imports there is a 5% significance for goods related services, a 1% significance for travel and a 10% significance level for other services. There is no statistical significance for any of the sectors when it comes to exports. It is interesting to note that while the number of deaths and the stringency index have a negative coefficient, the number of cases has a highly significant positive coefficient. This is something that will be addressed in the discussion of the thesis. The sign of the economic openness coefficient is different for the two sectors for which it is significant. It is positive for goods related imports and other service imports but negative for travel imports.

Table 2 shows the effects of Covid and economic openness on the disaggregated sectors that make up the 'other services'. Again, the leftmost column shows the different sectors and the regression variables. The results are split into imports and exports.

Table 2: OLS regression of Covid and Economic openness on disaggregated 'other services' imports and exports

	Imports			Exports		
	Coefficient	Std. Error	p-value	Coefficient	Std. Error	p-value
Construction						
Stringency index	0.031	2.695	0.991	7.889	7.212	0.276
Number of cases	5.815	4.772	0.225	1.238	1.277	0.333
Number of deaths	-5.698	2.819	0.045**	-0.013	7.544	0.076*
Economic openness	-272.000	87.700	0.002***	-742.000	235.000	0.002***
Constant	460.000	174.000	0.009***	560.000	464.000	0.229
Mean	**291.000**			**549.000**		
Insurance and pension services						
Stringency index	-16.600	11.100	0.138	-2.208	5.434	0.685
Number of cases	1.481	1.966	0.000***	5.946	9.621	0.000***
Number of deaths	-0.021	0.012	0.076*	-9.924	5.684	0.083*
Economic openness	-591.000	361.000	0.104	380.000	177.000	0.033**
Constant	1,870.000	715.000	0.010**	387.000	350.000	0.271
Mean	1,300.000			697.000		
Financial services						
Stringency index	-31.500	16.900	0.064*	-74.400	32.700	0.024**
Number of cases	1.296	2.984	0.000***	4.370	5.789	0.000***
Number of deaths	-0.021	0.018	0.237	-0.056	0.034	0.102
Economic openness	2,170.000	548.000	0.000***	1,920.000	1,060.000	0.074*

Constant	2,470.000	1,090.000	0.024**	5,110.000	2,110.000	0.016**
Mean	**2,290.000**			**3,860.000**		
Charges for the use of intellectual property						
Stringency index	26.100	34.000	0.444	-57.600	24.200	0.018**
Number of cases	1.562	6.027	0.010**	3.536	4.286	0.000***
Number of deaths	-0.054	0.036	0.132	-0.065	0.025	0.011**
Economic openness	1,950.000	1,110.000	0.079*	-654.000	788.000	0.407
Constant	744.000	2,190.000	0.735	5,080.000	1,560.000	0.001***
Mean	**3,490.000**			**2,880.000**		
ICT services						
Stringency index	-10.900	13.700	0.427	79.600	49.600	0.111
Number of cases	1.111	0.242	0.000***	1.934	8.789	0.029**
Number of deaths	-0.025	0.014	0.080*	-0.066	0.052	0.205
Economic openness	-369.000	445.000	0.408	4,010.000	1,610.000	0.014**
Constant	2,660.000	881.000	0.003***	-2,210.000	3,200.000	0.490
Mean	**2,220.000**			**4,690.000**		
Other business services						
Stringency index	-56.000	60.200	0.354	-44.600	47.100	0.346
Number of cases	3.485	0.001	0.001***	0.006	8.342	0.000***
Number of deaths	-0.074	0.063	0.239	-0.100	0.049	0.044**
Economic openness	4,680.000	1,960.000	0.018**	1,780.000	1,530.000	0.248
Constant	7,770.000	3,870.000	0.046**	6,990.000	3,030.000	0.022**
Mean	**8,100.000**			**7,610.000**		
Personal, cultural and recreational services						
Stringency index	-7.182	4.456	0.109	-7.734	3.983	0.054*
Number of cases	7.139	7.889	0.000***	6.490	7.051	0.000***
Number of deaths	-9.779	0.005	0.037**	-0.010	4.166	0.017**
Economic openness	-138.000	145.000	0.343	87.500	130.000	0.501
Constant	595.000	287.000	0.040**	583.000	256.000	0.024**
Mean	**446.000**			**477.000**		
Government goods and services						
Stringency index	-7.552	4.282	0.080*	-8.103	3.995	0.044**
Number of cases	5.888	7.581	0.000***	5.707	7.074	0.000***
Number of deaths	-4.737	4.479	0.292	-7.644	0.004	0.069*
Economic openness	-320.000	139.000	0.023**	-309.000	130.000	0.018**
Constant	671.000	276.000	0.016**	822.000	257.000	0.002***
Mean	**392.000**			**469.000**		

Number of observations	**173**			**173**		

Notes: This table depicts the results of the Multivariate OLS regression. ***, ** and * depict the level of statistical significance at a 1%, 5% and 10% level respectively. The trade volume is taken as the real value in millions of US dollars therefore values are x1,000,000.

When looking at the Covid effects on imports in Table 2, we can see that the stringency index does not have much statistical significance. It is only significant at a 10% level for Financial services and Government goods and services. It does have a negative coefficient for both of these sectors. The number of cases has high significance in all sectors except construction. In all sectors the coefficient is positive. The number of deaths has significance in a few sectors. It has significance at a 10% level for insurance and pension services and ICT services. It is significant at a 5% level for construction and personal services. In all cases the sign of the coefficient is negative Economic openness shows high significance in most sectors. However, there is no significance for insurance and pension services, ICT services and personal services. The sign also differs between sectors, with a positive sign for financial services, intellectual property charges and other business services, but a negative sign for construction and government goods and services. There are some differences in the way restrictions affect imports and exports. On the export side there is a significant effect for intellectual property charges and personal services next to the sectors that were affected on the import side as well. The number of cases is highly significant for all export sectors, the sign stays positive. The number of deaths is now significant for intellectual property charges, other business services and government goods and services, but not for ICT services. The sign remains consistently negative. Economic openness shows significance for insurance and pension service and ICT services, but lost its significance for intellectual property charges and other business services. The sign differs between sectors again so there is no unilateral impact.

To determine if these results do in fact point to a possible effect of economic openness on trade and are not due to another hidden factor, I added two more control variables to the existing regression: population density and population size. As can be seen in Appendix B, countries that have a higher degree of economic openness, often have a higher population density than the more closed countries. Population density most likely has an effect on the spread of Covid and on the perception of Covid as a threat. This could result in Covid effects being bigger for more population dense countries. This could in turn result in overestimated economic openness results. The overall population size is added as a control to simulate the size of a country, to make a better comparison between countries that have a large population, like the US and China, to countries that have a smaller population, like Belgium and Luxemburg. The results of this regression can be seen in Table 3.

Table 3: OLS regression of population variables, Covid and Economic openness on service imports and exports

	Imports			Exports		
	Coefficient	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**
Goods related services						
Population density	0.125	0.046	0.007***	0.155	0.034	0.000***
Population size	0.000	0.000	0.032**	0.000	0.000	0.000***
Number of cases	0.000	0.000	0.003***	0.000	0.000	0.000***
Number of deaths	-0.008	0.005	0.097*	-0.005	0.004	0.182
Stringency index	-9.503	4.748	0.047**	-3.394	3.526	0.337
Economic openness	450.000	173.000	0.01**	1,200.000	129.000	0.000***

Constant	840.000	306.000	0.007***	-489.000	227.000	0.033**
Mean	**733.000**			**876.000**		
Transport						
Population density	1.744	0.183	0.000***	1.680	0.199	0.000***
Population size	0.000	0.000	0.000***	0.000	0.000	0.000***
Number of cases	0.003	0.000	0.000***	0.002	0.000	0.000***
Number of deaths	-0.062	0.020	0.002***	-0.035	0.021	0.105
Stringency index	-54.200	18.900	0.005***	-44.500	20.600	0.032**
Economic openness	3,380.000	692.000	0.000***	4,260.000	752.000	0.000***
Constant	1,450.000	1,220.000	0.237	595.000	1,320.000	0.654
Mean	**5,140.000**			**4,410.000**		
Travel						
Population density	-0.019	0.125	0.880	-0.002	0.152	0.989
Population size	0.000	0.000	0.000***	0.000	0.000	0.000***
Number of cases	0.001	0.000	0.000***	0.002	0.000	0.000***
Number of deaths	-0.051	0.013	0.000***	-0.030	0.016	0.073*
Stringency index	-35.100	13.000	0.008***	-62.400	15.700	0.000***
Economic openness	3,300.000	475.000	0.000***	120.000	575.000	0.835
Constant	-697.000	837.000	0.406	3,870.000	1,010.000	0.000***
Mean	**2,620.000**			**1,620.000**		
Other services						
Population density	1.721	1.116	0.125	1.979	1.281	0.124
Population size	0.000	0.000	0.000***	0.000	0.000	0.000***
Number of cases	0.010	0.002	0.000***	0.017	0.002	0.000***
Number of deaths	-0.163	0.120	0.175	-0.260	0.138	0.061*
Stringency index	-176.000	116.000	0.131	-202.000	133.000	0.129
Economic openness	14,600.000	4,220.000	0.001***	17,400.000	4,850.000	0.000***
Constant	11,600.000	7,440.000	0.120	9,590.000	8,550.000	0.263
Mean	**18,500.000**			**21,400.000**		
Number of observations	173			173		

Notes: This table depicts the results of the Multivariate OLS regression. ***, ** and * depict the level of statistical significance at a 1%, 5% and 10% level respectively. The trade volume is taken as the real value in millions of US dollars therefore values are x1,000,000.

Table 3 shows that adding population density and population size, results in higher coefficients for economic openness. This implies that the effect of economic openness was actually underestimated when not taking the population variables into account. By adding the population variables, the effects observed from the Covid variables are reduced significantly. Only the stringency index still shows a substantial negative effect. Significance is increased for most coefficients. The population size shows highly significant coefficients, however they have a low value. The only sectors where population density shows significant coefficients are goods related services and transport. The effects here are positive and quite substantial. Especially for transport imports and exports where an increase in population density results in higher trade volume of around 1.7 million for both sectors.

5.3 Economic recovery

This section will focus on a part that has not been covered a lot by the existing literature, the economic recovery from the pandemic. As can be seen in the previous section, Covid made a large impact on the total trade volume in different service sectors. Figure 5 shows the percentual change in average imports from the Q2 of 2020 onward, to showcase the economic recovery.

(a) Open economies
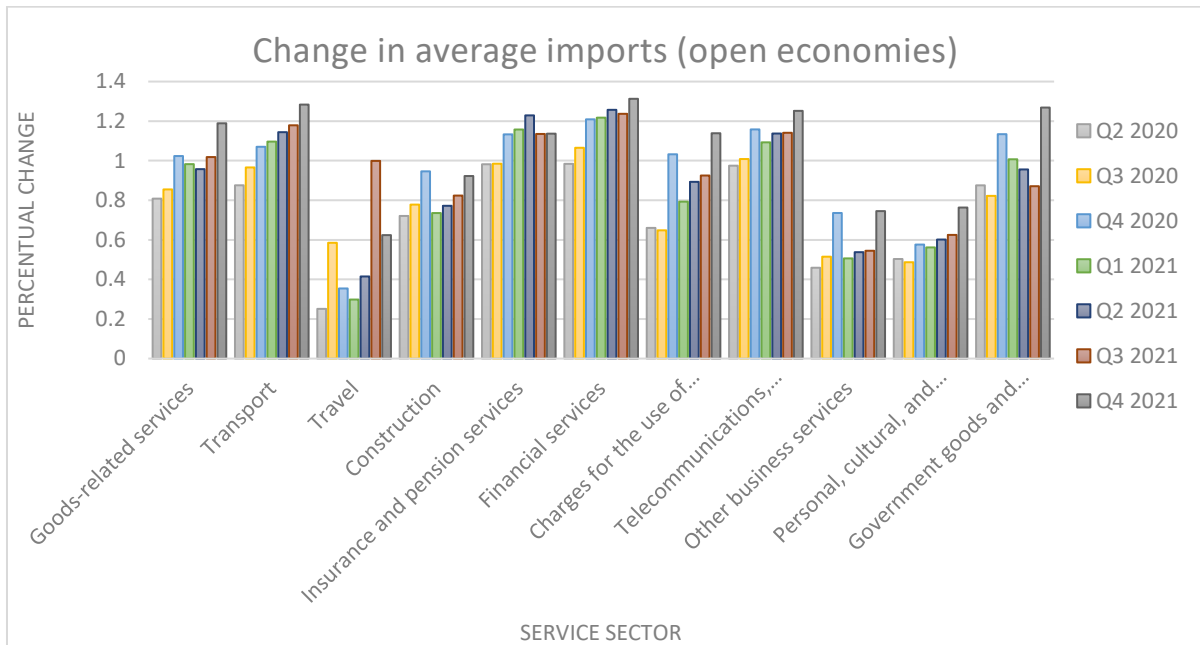
(b) Closed economies

Figure 6: Economic recovery of imports for open and closed economies

This figure showcases the economic recovery of service imports from Q2 of 2020 to Q4 of 2021. It shows both (a) open economies and (b) closed economies. Recovery is based on the pre-pandemic level of Q4 2019 denoted

by the value '1' in the graph. The values on the y-axis represent the volume of trade as a percentage of the base level, i.e. 0.8 means 80% of pre-pandemic levels. Notes: For both groups I use a simple average of trade volume.

Figure 6 shows the different quarters of recovery nicely. Most service sectors in the group of open economies (a) reach the pre pandemic level of trade by the end of 2020. Some sectors, like transport, insurance and pension services and ICT services, show steady growth afterwards. Other sectors, like goods related services, construction, intellectual property charges, other business services and government goods and services, experience another drop in trade volume in Q1 of 2021. There are also two sectors that have shown no recovery in the studied timeframe. These are the other business services and personal services. The highest level they reach is about 75% of pre-pandemic trade. The travel sector also shows an interesting pattern. It remains at a fraction of the pre-pandemic level for most of 2020 and 2021, only rising to 60% of the pre pandemic level in Q3 of 2020, before falling again. In Q3 of 2021 there is a sharp increase again which brings travel up to the pre-pandemic level, but the next quarter sees a sharp decrease again. This volatility is most likely tied to the pandemic.

When looking at the group of closed economies (b), we can see that the travel sector shows the least amount of recovery. There are no spikes like with the open economies. The goods related services have also not recovered, while this was the case for the open economies. Closed economies do have a better performance in other business services, personal services and construction, which reached pre-pandemic levels by Q2 of 2021, Q4 of 2021 and Q4 of 2021 respectively. Figure 6 gives a visual representation of the number of quarters that it took a certain sector to reach pre- pandemic levels again, after falling below this level.

(a) Open economies

(b) Closed economies

Recovery time for imports (closed economies)

Category	Recovery Time (Quarters)
Government goods and services n.i.e.	1
Personal, cultural, and recreational services	3
Other business services	7
Telecommunications, computer, and information services	3
Charges for the use of intellectual property n.i.e.	0
Financial services	1
Insurance and pension services	1
Construction	7
Travel	8
Transport	6
Goods-related services	8

QUARTERS

▢ Recovery Time

Figure 7: Number of quarters to economic recovery of imports for open and closed economies

This figure depicts the number of quarters that it took a certain trade sector to return to pre- pandemic levels, counted from the first moment of falling below this level. *Notes:* no recovery in the timeframe was given a '9' for quarters to recovery to show that recovery lies outside the analyzed timeframe.

Figure 7 shows the difference in recovery time clearly. There are especially big differences between the recovery of both transport and goods related services. It is also interesting to note that intellectual property charges for closed economies do not show any recovery. The reason behind this is that that sector did not fall below pre-pandemic levels at all in the studied timeframe. On the whole it seems like closed countries have a faster recovery period for the service sectors making up the 'other services', while open economies recovered faster in goods related services and transport. Open economies also saw a larger recovery in travel, while not getting back to pre-pandemic levels completely.

Figure 8 shows the change in average exports and the different quarters of recovery.

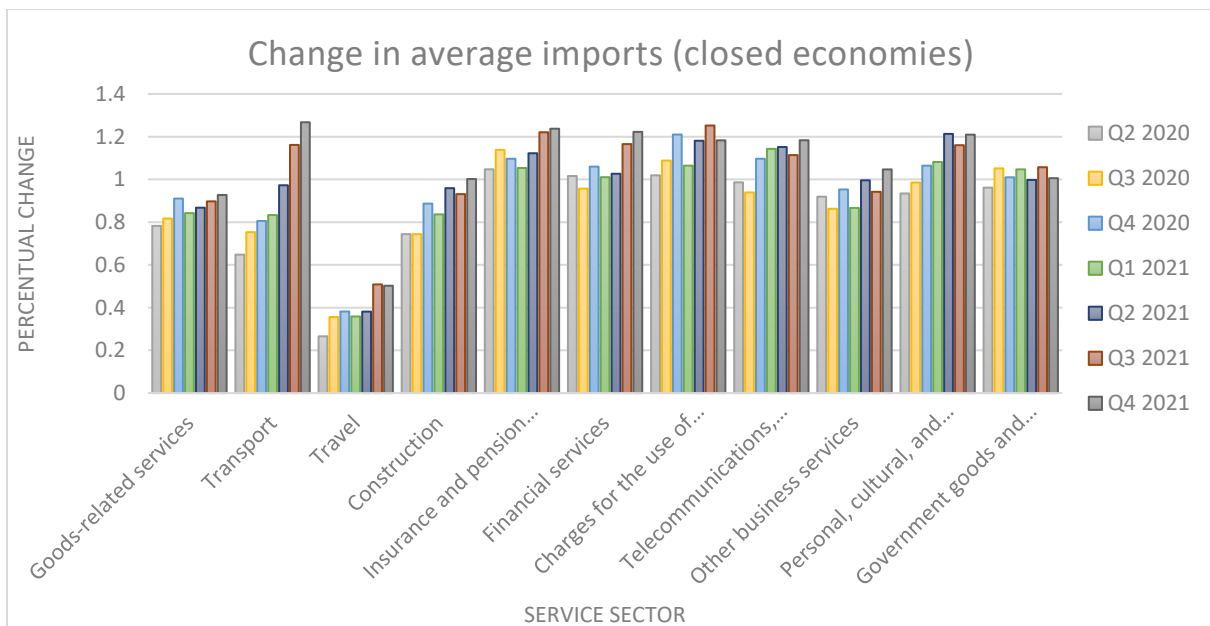(a) Open economies
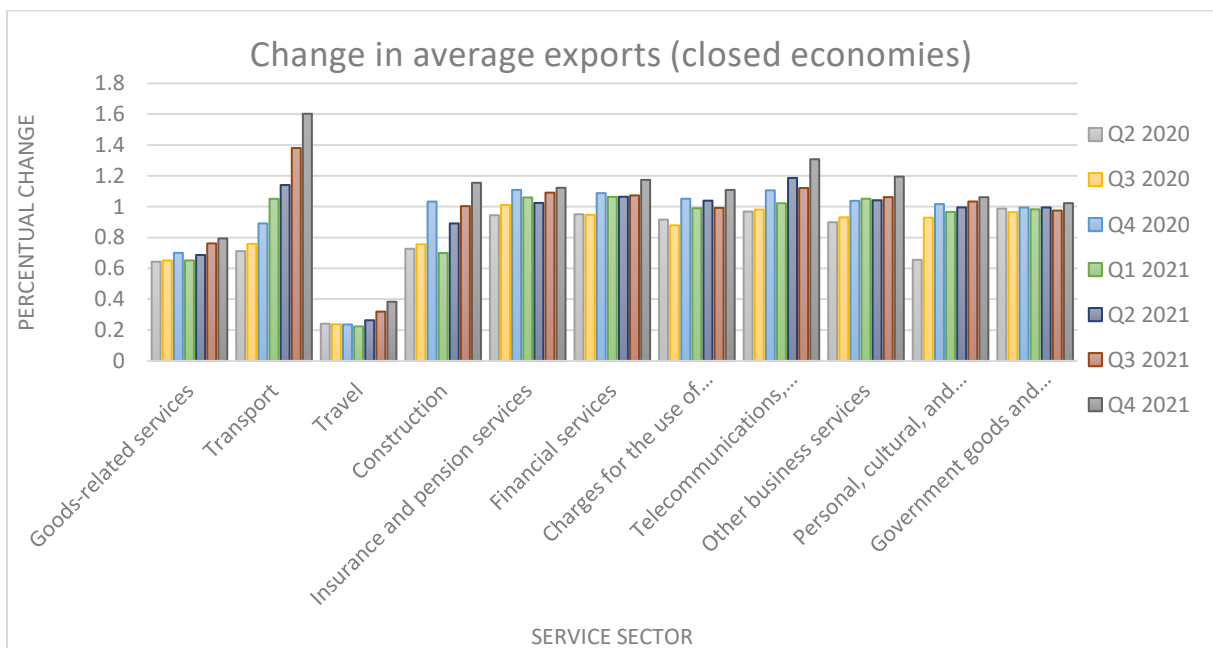
(b) Closed economies

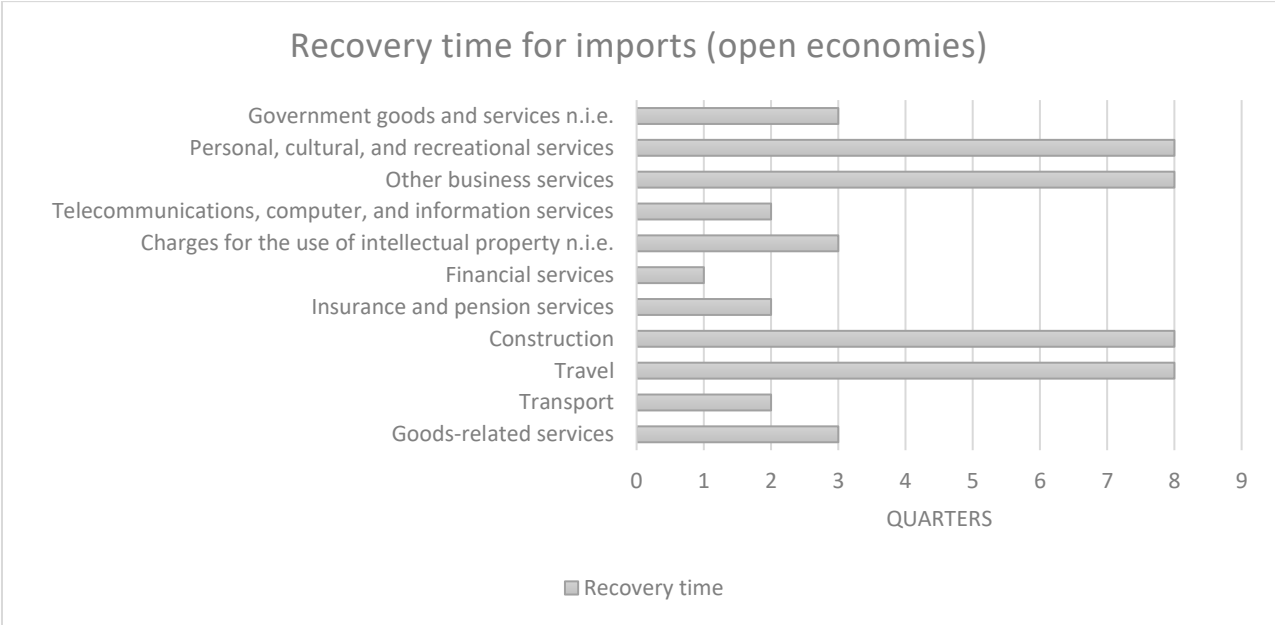Figure 8: Economic recovery of exports for open and closed economies

This figure showcases the economic recovery of service exports from Q2 of 2020 to Q4 of 2021. It shows both (a) open economies and (b) closed economies. Recovery is based on the pre-pandemic level of Q4 2019 denoted by the value '1' in the graphs. The values on the y-axis represent the volume of trade as a percentage of the base level, i.e. 0.8 means 80% of pre-pandemic levels. Notes: For both groups I use a simple average of trade volume.

As Figure 8 shows, most export sectors of open economies (a) returned to pre-pandemic levels in 2021. Only travel and intellectual property charges did not recover, with travel ending at around 60% and intellectual property charges at 90% of pre-pandemic trade. Construction, other business services and personal services all returned to pre-pandemic levels, this is different from the import side. It is also

striking that the growth after recovery is much greater for exports than for imports. While imports for open economies reach a highpoint of 130% of pre-pandemic levels, the exports reach about 142%.

For the group of closed economies (b) there is no recovery for goods related services and travel, the same as with imports. Most service exports reach pre-pandemic levels by the end of 2020 and keep growing afterwards. Especially the transport sector shows a big increase in trade volume, reaching 160% of pre-pandemic trade by the end of 2021. Overall, there are a lot of similarities between imports and exports for closed economies.

Figure 9 shows the number of quarters that it took the different export sectors to recover. This is calculated in the same way as with imports.

(a) Open economies

Recovery time for exports (open economies)

(b) Closed economies

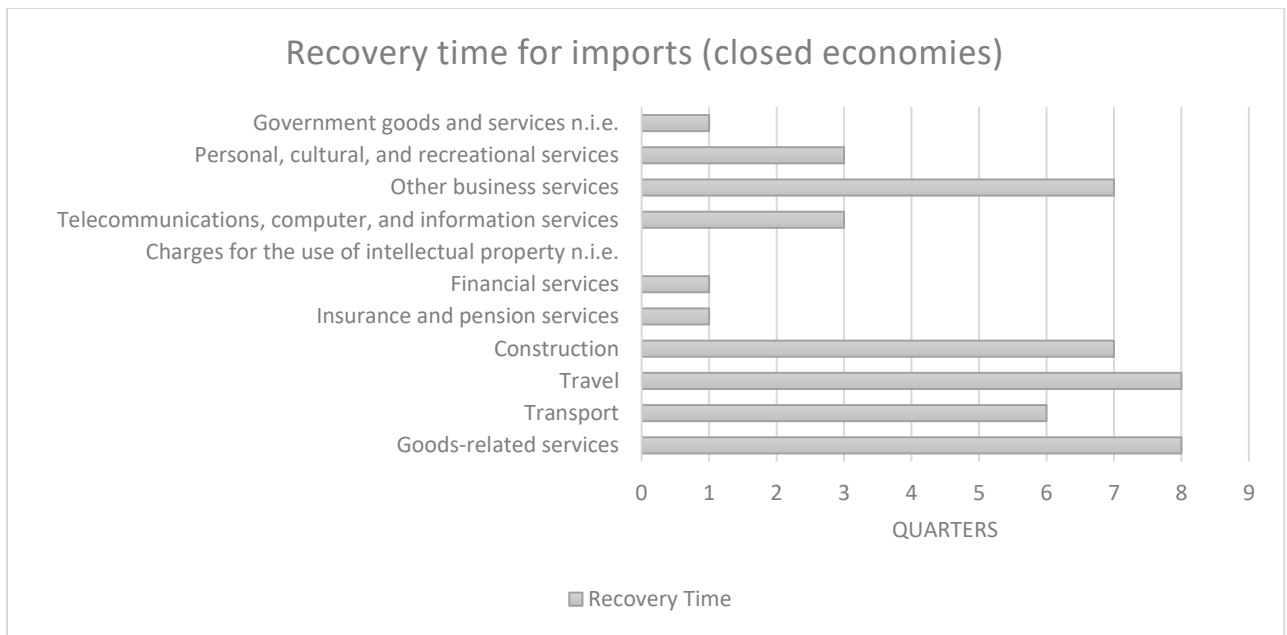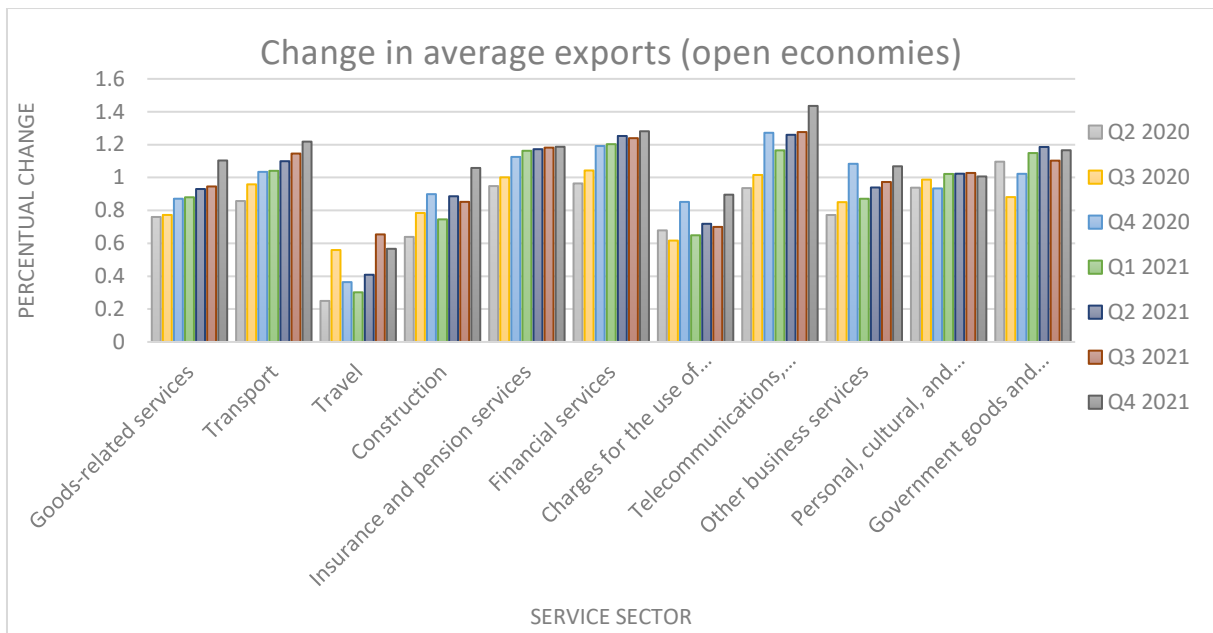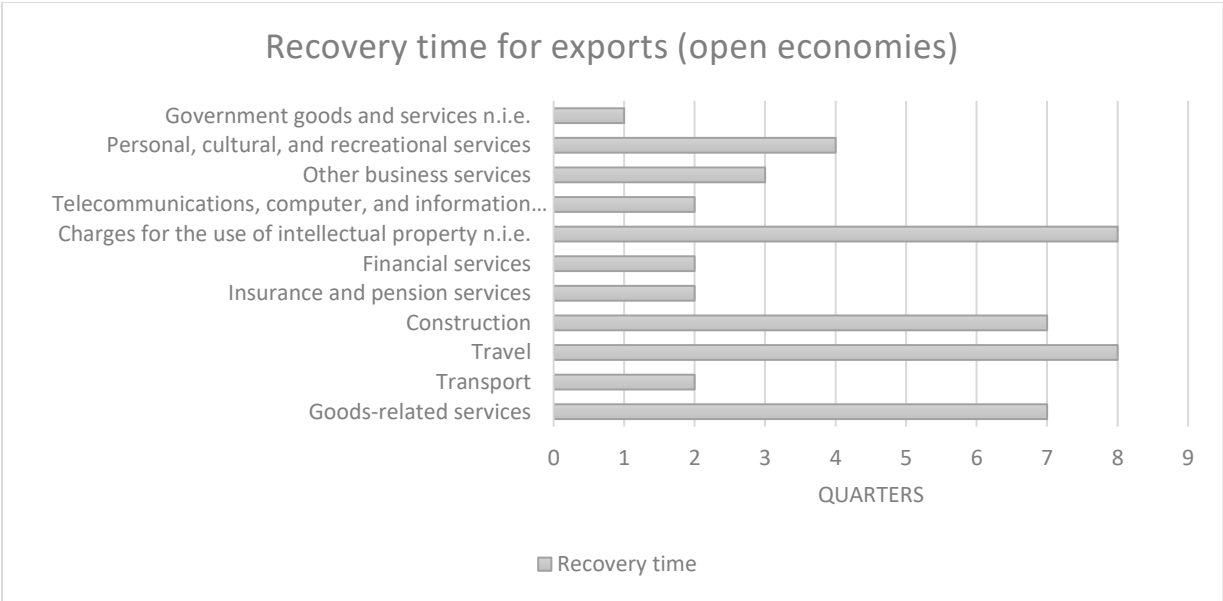Recovery time for exports (closed economies)
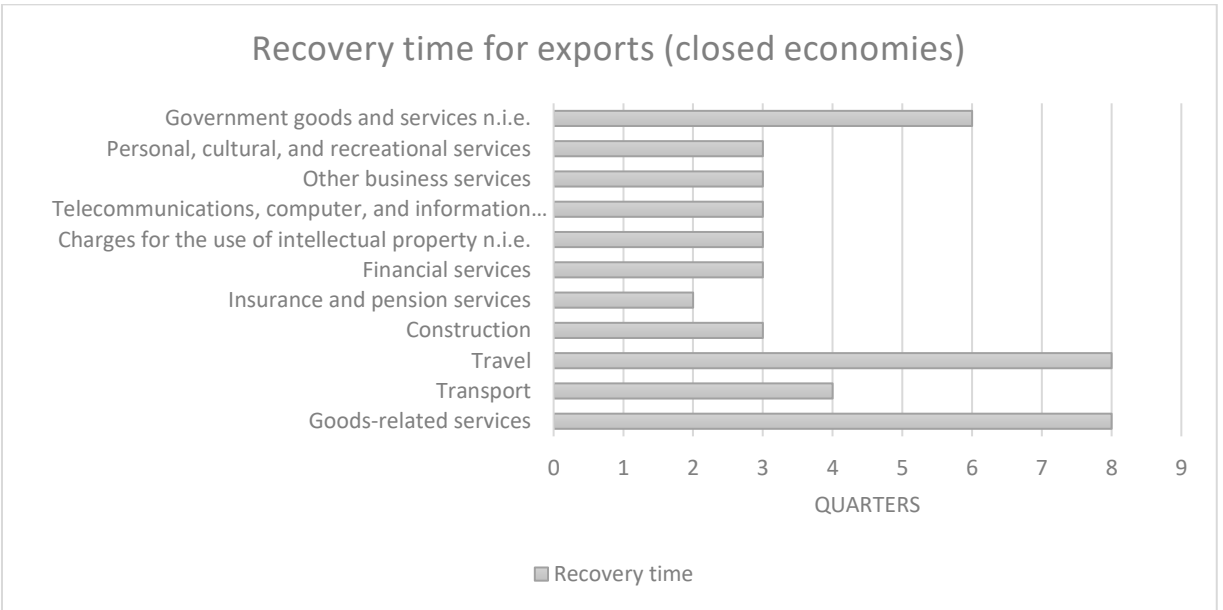
Figure 9: Number of quarters to economic recovery of exports for open and closed economies

This figure depicts the number of quarters that it took a certain trade sector to return to pre- pandemic levels, counted from the first moment of falling below this level. *Notes:* no recovery in the timeframe was given a '9' for quarters to recovery to show that recovery lies outside the analyzed timeframe.

Figure 9 shows that certain export sectors for open economies recovered more quickly than import sectors and that there are less sectors that did not recover at all. However, goods related services and intellectual property charges differ significantly between imports and exports. For closed countries this is also the case for other business services, construction and transport. However, recovery is slower for government goods and services, financial services and insurance and pension services. The exports of intellectual property charges did also not experience the same growth as the imports.

To possibly explain the economic recovery from the pandemic, I analyzed the data using a Multivariate OLS regression using the number of vaccinations, people vaccinated and booster jabs delivered. I also control for economic openness to see if this made an impact on the recovery. Table 4 presents the results of this regression.

Table 4: OLS regression of number of vaccinations, people vaccinated, boosters and economic openness on service imports and exports

	Imports			Exports		
	Coefficient	Std. Error	p-value	Coefficient	Std. Error	p-value
Goods related services						
Economic openness	512.000	427.000	0.240	566.000	358.000	0.125
Vaccinations	-9.477	8.902	0.296	0.000	7.473	0.992
People vaccinated	2.826	2.060	0.181	2.715	1.729	0.127
Boosters	3.949	3.857	0.314	5.686	3.238	0.090*
Constant	457.000	371.000	0.228	-24.700	311.000	0.937
Mean	**733.000**			**876.000**		
Transport						
Economic openness	1,820.000	3,030.000	0.551	3,830.000	2,230.000	0.096*
Vaccinations	-0.100	6.317	0.123	-2.026	4.650	0.966
People vaccinated	3.547	1.462	0.022**	1.327	1.076	0.227
Boosters	6.992	0.274	0.016**	0.337	2.015	0.105
Constant	2,410.000	2,630.000	0.367	621.000	1,940.000	0.751
Mean	**5,140.000**			**4,410.000**		
Travel						
Economic openness	120.000	1,580.000	0.940	-470.000	1,800.000	0.796
Vaccinations	-2.914	3.294	0.384	-1.735	3.751	0.000***
People vaccinated	0.138	7.622	0.080*	4.172	8.682	0.000***
Boosters	3.823	1.427	0.012**	7.146	1.626	0.000***
Constant	884.000	1,370.000	0.525	1,340.000	1,560.000	0.399
Mean	**2,620.000**			**1,620.000**		
Construction						
Economic openness	14.100	143.000	0.922	220.000	212.000	0.309

Vaccinations	7.075	2.990	0.025**	2.811	4.433	0.000***
People vaccinated	-1.106	6.920	0.121	-4.321	1.026	0.000***
Boosters	-7.296	1.296	0.578	-0.284	1.921	0.150
Constant	130.000	125.000	0.305	-19.500	185.000	0.917
Mean	**291.000**			**549.000**		
Insurance and pension services						
Economic openness	-237.000	1,480.000	0.874	686.000	710.000	0.342
Vaccinations	-1.155	3.085	0.001***	-4.671	1.482	0.004***
People vaccinated	3.222	7.140	0.000***	1.282	3.429	0.001***
Boosters	4.294	1.337	0.003***	1.717	6.420	0.012**
Constant	853.000	1,290.000	0.513	247.000	618.000	0.692
Mean	**1,300.000**			**697.000**		
Financial services						
Economic openness	4,240.000	2,410.000	0.089*	4,660.000	5,110.000	0.369
Vaccinations	-1.139	5.029	0.031**	-3.907	1.066	0.001***
People vaccinated	2.928	1.164	0.018**	1.037	2.466	0.000***
Boosters	4.232	2.179	0.062*	1.373	4.618	0.006***
Constant	811.000	2,100.000	0.702	1,710.000	4,440.000	0.704
Mean	**2,290.000**			**3,860.000**		
Charges for the use of intellectual property						
Economic openness	3,270.000	4,140.000	0.435	-1,540.000	3,250.000	0.640
Vaccinations	-4.114	0.863	0.637	-2.642	6.781	0.001***
People vaccinated	1.483	1.996	0.464	6.982	1.569	0.000***
Boosters	2.246	3.738	0.553	0.951	2.938	0.003***
Constant	1,370.000	3,600.000	0.705	2,520.000	2,830.000	0.380
Mean	**3,490.000**			**2,880.000**		
ICT services						
Economic openness	368.000	1,130.000	0.747	6,320.000	5,850.000	0.289
Vaccinations	-0.579	2.354	0.020**	-6.357	1.220	0.606
People vaccinated	1.814	5.447	0.002***	2.329	2.823	0.416
Boosters	2.717	1.020	0.012**	3.971	5.286	0.459
Constant	1,310.000	981.000	0.193	498.000	5,080.000	0.923
Mean	**2,220.000**			**4,690.000**		
Other business services						
Economic openness	4,630.000	5,940.000	0.442	3,450.000	5,630.000	0.544
Vaccinations	-2.198	1.240	0.087*	-3.964	1.174	0.002***
People vaccinated	6.120	2.869	0.041**	1.126	2.717	0.000***
Boosters	8.798	5.371	0.112	1.587	5.088	0.004***
Constant	4,360.000	5,170.000	0.406	3,530.000	4,890.000	0.477

Mean	**8,100.000**			**7,610.000**		
Personal, cultural and recreational services						
Economic openness	-256.000	699.000	0.717	-109.000	588.000	0.854
Vaccinations	-5.886	1.459	0.000***	-5.118	1.227	0.000***
People vaccinated	1.611	3.377	0.000***	1.393	2.839	0.000***
Boosters	2.063	0.632	0.003***	1.774	5.315	0.002***
Constant	370.000	608.000	0.548	305.000	511.000	0.556
Mean	**446.000**			**477.000**		
Government goods and services						
Economic openness	-304.000	606.000	0.620	-212.000	574.000	0.715
Vaccinations	-5.279	1.264	0.000***	-5.018	1.197	0.000***
People vaccinated	1.461	2.925	0.000***	1.365	2.769	0.000***
Boosters	1.799	5.477	0.003***	1.723	0.518	0.002***
Constant	299.000	527.000	0.575	317.000	499.000	0.529
Mean	**392.000**			**469.000**		
Number of observations	**34**			**34**		

Notes: This table depicts the results from the multivariate OLS regression of economic openness, vaccinations, people vaccinated and boosters on disaggregated service sectors. ***, ** and * depict the level of statistical significance at a 1%, 5% and 10% level respectively. The trade volume is taken as the real value in millions of US dollars therefore values are x1,000,000.

Table 4 shows that economic openness does not have much significance on the import side, with only being significant for financial services at a 10% level. This is also the case for the export side where only the coefficient for transport shows statistical significance at a 10% level. Vaccinations show statistical significance for most import sectors. Only goods related services, transport, travel and intellectual property charges show no significance. With the exception of construction, the sign of the coefficients is negative. On the export side it is mostly the same but there is also significance for travel and intellectual property charges. The sign is negative again with the exception of construction. The number of people vaccinated shows strong significance for most sectors for both imports and exports. The sign is positive, except for construction, and the largest effects seem to be on the imports of business services. There are also large coefficients for travel and construction exports. Boosters are significant for most imports. On the export side it shows a strong significance for most sectors. It is also the only variable that shows some significance for goods related services. The sign is unilaterally positive and the impact seems to be largest for travel, goods related services and transport.

To determine if the coefficients in Table 4 are accurate, I add the population density as an extra control variable. Due to a high correlation between population size and the different recovery variables (Vaccinations, people vaccinated and boosters) I do not use this variable in the regression as it makes the coefficients difficult to interpret. The correlation matrix can be found in Appendix G. The results for this regression are shown below in Table 5.

Table 5: OLS regression of population density, number of vaccinations, people vaccinated, boosters and economic openness on service imports and exports

	Imports			Exports		
	Coefficient	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**
Goods related services						
Population density	0.182	0.094	0.062*	0.231	0.072	0.003***
Vaccinations	-0.000	0.000	0.277	0.000	0.000	0.985
People vaccinated	0.000	0.000	0.163	0.000	0.000	0.082*
Boosters	0.000	0.000	0.300	0.000	0.000	0.056*
Economic Openness	357.000	415.000	0.398	370.000	317.000	0.254
Constant	449.000	355.000	0.216	-34.900	271.000	0.898
Mean	**733.000**			**876.000**		
Transport						
Population density	1.963	0.606	0.003***	1.937	0.373	0.000***
Vaccinations	-0.000	0.000	0.079*	-0.000	0.000	0.963
People vaccinated	0.000	0.000	0.009***	0.000	0.000	0.102
Boosters	0.001	0.000	0.007***	0.000	0.000	0.032**
Economic Openness	156.000	2,680.000	0.954	2,180.000	1,650.000	0.196
Constant	2,330.000	2,290.000	0.317	535.000	1,410.000	0.707
Mean	**5,140.000**			**4,410.000**		
Travel						
Population density	-0.013	0.370	0.971	0.001	0.422	0.997
Vaccinations	-0.000	0.000	0.392	-0.000	0.000	0.000***
People vaccinated	0.000	0.000	0.086*	0.000	0.000	0.000***
Boosters	0.000	0.000	0.014**	0.001	0.000	0.000***
Economic Openness	132.000	1,640.000	0.937	-471.000	1,860.000	0.802
Constant	884.000	1,400.000	0.532	1,340.000	1,590.000	0.407
Mean	**2,620.000**			**1,620.000**		
Other services						
Population density	2.287	3.151	0.474	2.088	4.254	0.627
Vaccinations	-0.001	0.000	0.03**	-0.001	0.000	0.003***
People vaccinated	0.002	0.001	0.009***	0.003	0.001	0.001***
Boosters	0.003	0.001	0.044**	0.005	0.002	0.008***
Economic Openness	9,800.000	13,900.000	0.488	12,200.000	18,800.000	0.521
Constant	9,400.000	11,900.000	0.436	9,010.000	16,100.000	0.579
Mean	**18,500.000**			**21,400.000**		
Number of observations	**34**			**34**		

Notes: : This table depicts the results from the multivariate OLS regression of population density, economic openness, vaccinations, people vaccinated and boosters on disaggregated service sectors. ***, ** and * depict the level of statistical significance at a 1%, 5% and 10% level respectively. The trade volume is taken as the real value in millions of US dollars therefore values are x1,000,000.

Table 5 shows a significant coefficient for population density for goods related services and transport. This is the case for both imports and exports. The coefficients also show a large impact on overall trade, with transport imports and exports increasing by almost 2 million when population density increases. A possible explanation could be that higher population density results in earlier natural immunity due to more exposure to Covid. While adding population density to the regression still shows high significance for the number of people vaccinated and boosters delivered, the coefficients are significantly lowered and almost negligible. The biggest effects can be observed for the Other services sector. The significance of economic openness is lost completely, which means that any effects earlier were overestimated.

Tables 4 and 5 show some possible explanation for economic recovery through the use of vaccinations and more exposure to Covid. However, this does not show the direct effect on the recovery time. To determine if the degree of economic openness possibly has an effect of the rate at which a country recovers economically, I used an OLS regression to analyze the recovery time data. The results of this regression are presented below in Table 6.

Table 6: OLS regression of economic openness on recovery time

	Imports			Exports		
	Coefficient	Std. Error	p-value	Coefficient	Std. Error	p-value
Goods related services						
Economic openness	-0.000	1.183	0.451	2.636	1.172	0,036**
Constant	5.727	0.000	0,000***	3.273	0.000	0,001***
Transport						
Economic openness	-2.545	0.000	0,001***	-1.636	1.080	0.145
Constant	5.909	0.000	0,000***	5.455	0.000	0,000***
Travel						
Economic openness	-2.091	0.000	0,035**	0.000	0.000	0.831
Constant	7.545	0.000	0,000***	6.818	0.000	0,000***
Other services						
Economic openness	0.000	1.220	0.713	-0.000	0.000	0.453
Constant	4.091	0.000	0,000***	4.091	0.000	0,000***
Financial services						
Economic openness	-0.000	0.000	0.254	-2.182	0.000	0,026**
Constant	2.364	0.000	0,000***	3.909	0.000	0,000***
Number of observations	**22**			**22**		

Notes: This table depicts the effect of economic openness on the number of quarters to recovery for selected service sectors. ***, ** and * depict the level of statistical significance at a 1%, 5% and 10% level respectively. The coefficients refer to the number of quarters to recovery from the moment of falling below the pre-pandemic level of Q4 2019.

Table 6 shows the results for the four main trade sectors and the financial services as it has a significant coefficient for exports. Economic openness is shown to have statistical significance at a 5% level for

exports of goods related services, imports of travel and exports of financial services. There is a 1% significance level for transport imports. In some sectors the recovery is significantly quicker for economically open economies. This is the case for transport and travel imports and financial services exports. Those service sectors recovered quicker by 2 quarters for open economies. It is the other way around for the exports of goods related services. That sector shows a slower recovery of 2 and a half quarters for the open economies.

6. Conclusion and Discussion

6.1 Concluding remarks

This thesis examined the impact of economic openness on trade during covid, using data from 22 countries for 2020 and 2021. These countries were split into separate groups based on their degree of economic openness. I analyzed the data based on two distinct periods in the Covid pandemic: the initial shock and the recovery period. When looking at the initial shock, we can see that Covid had a major impact on trade. Especially the imports and exports of travel were negatively affected by Covid. When looking at the variables that represent the effects from Covid, we can see that the number of deaths had a big negative impact on both imports and exports. This was expected based on earlier literature, but the results for the number of cases and the stringency index were more unexpected. Especially the positive coefficient for the number of cases was a surprising outcome and will be addressed in the discussion part. The low significance of the stringency index was also surprising. I will address this in the discussion as well. When looking at the recovery from Covid, we can see that there is a clear positive effect from the number of people vaccinated and the amount of boosters delivered. This was to be expected as vaccinations were used to open up economies again, which in turn boosts trade. The number of vaccinations is shown to have a negative effect on trade volume. This was also unexpected and will be addressed in the discussion.

The results for the effect of economic openness are as follows. When looking at the initial impact of Covid, it is clear to see that there is a difference in the way open and closed economies were affected. For the initial shock, open economies experienced bigger drops in trade volume for both imports and exports. Overall, imports were affected more heavily than exports for open economies. For closed economies we see bigger drops in trade volume for exports than imports. When looking at the regression results, we can see that economic openness is mostly beneficial for trade volume, only showing a negative coefficient for travel, construction and government goods and services. This seems to indicate that economic openness can mitigate some of the effects of the pandemic which in turn allows for a swifter recovery. This also partially follows from the results in the recovery section. Economic openness was shown to be possibly beneficial for the recovery of transport imports and exports and financial services exports.. On the other hand, it is bad for the recovery of goods related services and performed worse on the overall recovery of imports, with several sectors showing no return to pre-pandemic levels by the end of 2021. These recovery results showed less significance than the results for the initial impact, especially when population density was introduced. This means that these results are not conclusive and should therefore be studied further.

In sum, the larger the number of covid deaths, the bigger the impact on trade. On the other hand, the larger the number of vaccinated people and the more boosters delivered, the quicker trade can recover. Economic openness is positive for the trade volume of some service sectors and can be beneficial to a swifter recovery. However, the effect is dependent on the specific sectors. On the whole it seems that economic openness is more often positive than negative, but it does not offer a conclusive solution to trade problems during Covid.

6.2 Discussion

In this section I will discuss the validity of my findings through possible shortcomings in my research method and sample selection and address the unexpected results for the number of cases, stringency index and the number of vaccinations. Let me first address the validity of the findings. It is very likely that there were a multitude of different factors at play that influenced trade during Covid, that I did not take into account in this study. This means that the results inevitably suffer from omitted variable bias which in turn means that no decisive conclusions can be drawn based on the results. The conclusions from this thesis therefore warrant further study to determine their validity. The results themselves are possibly biased as well, which impacts their validity. The OLS method used for the analysis is not perfectly suited for analyzing time-series data, as it does not take country fixed effects into account. Factors like population density, which impacts the spread of Covid, are therefore not taken into account. Introducing population density and population size changed the results of the earlier regressions significantly, which showed this shortcoming. It is likely that there are other variables not accounted for. Further study into the subject would benefit from a method that is better suited to a time-series analysis. Another possible shortcoming can be found in the sample used for the study. The Covid pandemic only spans over two years, with the biggest shocks in 2020 and the recovery in 2021. This gives a limited number of observations for an analysis and using a small selection from the available data, yields an even smaller number of observations. It is difficult to draw a conclusion based on a low number of observations. This is especially true for the effect of vaccinations and boosters as they were introduced later on in the pandemic and their effect can only be studied over a short period of time. Further study into the subject could possibly use a larger sample size to decrease this bias. What poses further difficulty for the validity of the results is the inclusion of China into the sample. The Covid data from China is not very reliable as can be seen in Appendix C, this could have an impact on the validity of the results. Especially the data on the number of cases and deaths seems unreliable. Results for a regression excluding China can be found in Appendix D. This regression gives less significance to the number of deaths than the regression including China. On the other hand it awards more significance to the stringency index. The positive sign and significance of the number of cases are unchanged. These unexpected results are therefore not entirely due to the data from China. As mentioned before, the measure of economic openness to determine openness to trade is not without some scrutiny due to the ambiguity of the factors that it proxies. This means that the results obtained for economic openness purely serve to show a possible relation and require further study to determine the exact factors at play.

Next, I will discuss some of the results from this study. Some of these results were not expected after all. These results could be due to the shortcomings and biases mentioned above. However, the results for the stringency index and the number of cases could also be caused by the studied timeframe. To take the overall effect of Covid on trade, I used data from 2020 to 2021. Because of this wider timeframe, it could be that Covid effects for 2020 were biased due to effects from vaccinations in 2021. To determine if this is the cause of any bias, I ran a new regression. Using just the data from 2020 to show purely show the initial effect from Covid. The results for this regression can be found in Appendix E**.** While this regression gives more significance to the stringency index, it does not explain the entire bias. The coefficient for the number of cases remains positive and the coefficient for the number of deaths turned positive as well. The negative coefficients of the number of vaccinations can possibly be explained due to the fact that trade experienced a new drop at the beginning of 2021, which was after most countries started their vaccination campaigns. This could possibly lead to a faulty negative coefficient. The same could be the case for the positive coefficient of the number of cases. Trade started to recover after the big drops in Q1 of 2020, while the new cases kept rising. This could also lead to a faulty positive coefficient.

Keeping these shortcomings in mind, further research is necessary to be able to draw precise conclusions and recommendations from this study.

Appendix A: Countries used in the study

Argentina, Bangladesh, Belgium, Brazil, China, Colombia, Czechia, Ethiopia, Hungary, Indonesia, Ireland, Japan, Lithuania, Luxemburg, Malta, Netherlands, Nigeria, Pakistan, Singapore, Slovakia, Slovenia, United States.

Appendix B: Degree of economic openness and population density of sample countries

Country	Economic openness	Population density
Luxembourg	354%	245.2669884
Singapore	313%	7650.668269
Malta	313%	1615.41875
Ireland	257%	71.27594622
Belgium	211%	378.8332132
Netherlands	210%	420.9742898
Slovenia	194%	102.7953613
Slovakia	193%	111.2183765
Hungary	181%	104.5901322
Czechia	172%	134.4196683
Lithuania	164%	42.85284117
Bangladesh	38%	1141.076106
China	38%	147.0550107
Indonesia	37%	142.3155183
Colombia	36%	96.19999641
Japan	36%	333.2803222
Pakistan	35%	288.0284248
Nigeria	34%	228.2650054
Argentina	33%	16.39791217
Ethiopia	31%	104.4999438
Brazil	27%	25.1018127
United States of America	27%	33.73819612

Appendix C: China Covid data

Country	Quarter	AvG_stringency_index	AvG_total_boosters	new_cases	new_deaths	new_vaccinations	new_people_vaccinated_smoothed
China	q1-2020	75,44957143		82518	3288		
China	q2-2020	71,16626374		4016	39		
China	q3-2020	72,3223913		3343	0		
China	q4-2020	70,55097826		3276	0		
China	q1-2021	68,24544444		4915	2	39358000	
China	q2-2021	71,47384615		3006	0	1124854000	117012980
China	q3-2021	73,12532609		5838	3	966777000	397403875
China	q4-2021	71,82880435	74007000	7730	0	623880000	140530434

Appendix D: Regression results excluding China

	Imports			Exports		
	Coefficient	Std. Error	p-value	Coefficient	Std. Error.	p-value
Goods related services						
Economic Openness	289.000	72.500	0.000***	207.000	59.000	0.001***
Stringency Index	-9.384	4.843	0.054*	-6.883	3.941	0.083*
Number of cases	2.558	8.425	0.003***	0.319	0.069	0.000***
Number of deaths	-7.465	4.997	0.137	-3.772	4.067	0.355
Constant	787.000	315.000	0.013**	551.000	256.000	0.033**
Transport						
Economic Openness	1,060.000	348.000	0.003***	1,560.000	327.000	0.000***
Stringency Index	-66.000	23.300	0.005***	-55.600	21.900	0.012**
Number of cases	2.775	4.050	0.000***	1.752	3.803	0.000***
Number of deaths	-0.053	0.024	0.029**	-0.028	0.023	0.218
Constant	5,180.000	1,510.000	0.001***	3,740.000	1,420.000	0.009***
Travel						
Economic Openness	-145.000	163.000	0.376	-207.000	245.000	0.400
Stringency Index	-49.500	10.900	0.000***	-61.700	16.400	0.000***
Number of cases	1.604	1.898	0.000***	1.781	2.851	0.000***
Number of deaths	-0.043	0.011	0.000***	-0.029	0.017	0.086*
Constant	3,780.000	709.000	0.000***	4,500.000	1,070.000	0.000***
Construction						
Economic Openness	-33.500	25.500	0.192	-61.000	34.200	0.077*
Stringency Index	-5.070	1.705	0.003***	-7.805	2.286	0.001***
Number of cases	4.644	2.967	0.119	8.638	3.977	0.031**
Number of deaths	-2.493	1.760	0.159	-3.514	2.359	0.138
Constant	533.000	111.000	0.000***	776.000	149.000	0.000***
Insurance and pension services						
Economic Openness	-1.420	165.000	0.993	356.000	79.400	0.000***

Stringency Index	-23.400	11.000	0.035**	-3.928	5.305	0.460
Number of cases	1.460	0.191	0.000***	5.896	9.230	0.000***
Number of deaths	-0.014	0.011	0.214	-6.811	5.475	0.215
Constant	1,740.000	715.000	0.016**	104.000	345.000	0.764
Financial services						
Economic Openness	1,990.000	225.000	0.000***	2,230.000	484.000	0.000***
Stringency Index	-23.200	15.000	0.125	-64.100	32.300	0.049**
Number of cases	1.297	2.618	0.000***	4.365	5.627	0.000***
Number of deaths	-0.010	0.016	0.514	-0.041	0.033	0.220
Constant	227.000	978.000	0.817	2,210.000	2,100.000	0.294
Charges for the use of intelectual property						
Economic Openness	1,610.000	504.000	0.002***	-119.000	377.000	0.753
Stringency Index	7.221	33.700	0.831	-61.300	25.200	0.016**
Number of cases	1.524	5.860	0.010**	3.523	4.381	0.000***
Number of deaths	-0.037	0.035	0.283	-0.061	0.026	0.019**
Constant	47.600	2,190.000	0.983	4,990.000	1,640.000	0.003***
ICT services						
Economic Openness	342.000	164.000	0.038**	2,830.000	724.000	0.000***
Stringency Index	-29.900	10.900	0.007***	45.300	48.400	0.350
Number of cases	1.066	1.903	0.000***	1.874	8.421	0.027**
Number of deaths	-0.011	0.011	0.331	-0.041	0.050	0.416
Constant	2,570.000	711.000	0.000***	-3,000.000	3,150.000	0.342
Other business services						
Economic Openness	3,380.000	907.000	0.000***	2,390.000	646.000	0.000***
Stringency Index	-73.000	60.600	0.230	-85.900	43.200	0.048**
Number of cases	3.454	1.055	0.001***	5.586	7.510	0.000***
Number of deaths	-0.052	0.063	0.407	-0.063	0.045	0.157
Constant	5,840.000	3,940.000	0.140	5,720.000	2,810.000	0.043**
Personal, cultural and recreational services						
Economic Openness	-9.463	68.300	0.890	149.000	60.800	0.015**
Stringency Index	-9.001	4.566	0.050**	-7.771	4.064	0.058*
Number of cases	7.090	7.943	0.000***	6.468	7.070	0.000***
Number of deaths	-8.316	4.712	0.079*	-8.505	4.194	0.044**
Constant	590.000	297.000	0.049**	390.000	264.000	0.141
Government goods and services						
Economic Openness	-94.500	65.400	0.150	-108.000	62.300	0.084*
Stringency Index	-9.486	4.370	0.031**	-8.705	4.162	0.038**
Number of cases	5.829	0.760	0.000***	5.674	7.240	0.000***

	Coefficient	Std. Error	p-value			
Number of deaths	-3.219	4.510	0.476	-6.850	4.295	0.113
Constant	694.000	284.000	0.016**	823.000	270.000	0.003***
Number of cases	**165**			**165**		

Appendix E: Initial Covid shock regression using just data from 2020

	Imports			Exports		
	Coefficient	**Std. Error**	**p-value**	**Coefficient**	**Std. Error**	**p-value**
Goods related services						
Economic Openness	298.000	214.000	0.168	-156.000	344.000	0.652
Stringency Index	-15.400	6.101	0.013***	-0.749	9.783	0.939
Number of cases	9.084	1.328	0.496	6.390	2.129	0.765
Number of deaths	1.505	8.657	0.862	7.292	0.014	0.601
Constant	1,420.000	403.000	0.001***	888.000	646.000	0.173
Transport						
Economic Openness	-1,160.000	1,480.000	0.437	987.000	1,190.000	0.408
Stringency Index	-54.100	42.200	0.204	-56.500	33.700	0.098*
Number of cases	9.439	9.195	0.308	5.681	7.344	0.441
Number of deaths	0.014	0.060	0.821	0.027	0.048	0.572
Constant	7,820.000	2,790.000	0.006***	6,200.000	2,230.000	0.007***
Travel						
Economic Openness	-3,840.000	1,690.000	0.026**	-1,380.000	900.000	0.129
Stringency Index	2.289	48.100	0.962	-87.700	25.600	0.001***
Number of cases	7.734	0.001	0.463	1.307	5.576	0.815
Number of deaths	-0.063	0.068	0.363	0.065	0.036	0.076*
Constant	4,640.000	3,180.000	0.148	6,980.000	1,690.000	0.000***
Construction						
Economic Openness	-257.000	119.000	0.034**	-688.000	309.000	0.029**
Stringency Index	-3.180	3.381	0.350	0.801	8.804	0.928
Number of cases	3.470	7.360	0.639	7.167	1.916	0.709
Number of deaths	-0.004	0.005	0.360	-0.011	0.012	0.391
Constant	626.000	223.000	0.006***	874.000	582.000	0.137
Insurance and pension services						
Economic Openness	-548.000	518.000	0.294	337.000	243.000	0.170

Stringency Index	-38.500	14.800	0.011**	-9.792	6.922	0.161
Number of cases	3.216	3.211	0.320	1.644	1.507	0.278
Number of deaths	0.069	0.021	0.002***	0.021	9.821	0.035**
Constant	3,080.000	974.000	0.002***	834.000	457.000	0.072*

Financial services

Economic Openness	2,010.000	726.000	0.007***	1,770.000	1,440.000	0.223
Stringency Index	-48.300	20.700	0.022**	-118.000	41.000	0.005***
Number of cases	3.413	4.496	0.450	1.262	0.892	0.161
Number of deaths	0.051	0.029	0.089*	0.176	0.058	0.003***
Constant	3,460.000	1,360.000	0.013**	7,690.000	2,710.000	0.006***

Charges for the use of intelectual property

Economic Openness	1,610.000	1,420.000	0.259	-509.000	1,120.000	0.652
Stringency Index	-5.533	40.300	0.891	-102.000	31.900	0.002***
Number of cases	9.158	8.767	0.299	1.262	6.952	0.073*
Number of deaths	8.972	0.057	0.988	0.113	0.045	0.015**
Constant	2,460.000	2,660.000	0.357	7,610.000	2,110.000	0.001***

ICT services

Economic Openness	-324.000	599.000	0.590	3,680.000	2,040.000	0.076*
Stringency Index	-34.900	17.000	0.044**	39.300	58.100	0.500
Number of cases	3.320	3.710	0.374	7.132	1.265	0.575
Number of deaths	0.034	0.024	0.164	0.021	0.082	0.800
Constant	3,920.000	1,130.000	0.001***	-238.000	3,840.000	0.951

Other business services

Economic Openness	5,330.000	3,170.000	0.097*	2,000.000	2,130.000	0.352
Stringency Index	-127.000	90.200	0.162	-124.000	60.700	0.044**
Number of cases	8.454	1.964	0.668	1.498	1.321	0.260
Number of deaths	0.118	0.128	0.361	0.211	0.086	0.017**
Constant	12,000.000	5,960.000	0.048**	11,300.000	4,010.000	0.006***

Personal, cultural and recreational services

Economic Openness	-108.000	202.000	0.595	77.200	184.000	0.676
Stringency Index	-14.100	5.754	0.016**	-14.000	5.238	0.009***
Number of cases	1.789	1.252	0.157	3.041	0.114	0.009***
Number of deaths	0.029	8.164	0.001***	0.016	0.007	0.032**
Constant	977.000	380.000	0.012**	957.000	346.000	0.007***

Government goods and services

Economic Openness	-312.000	200.000	0.123	-340.000	190.000	0.078*
Stringency Index	-15.100	5.696	0.010**	-15.600	5.412	0.005***
Number of cases	1.031	1.240	0.408	0.129	1.178	0.275
Number of deaths	0.033	8.081	0.000***	0.025	7.679	0.002***

Constant	1,110.000	376.000	0.004***	1,290.000	358.000	0.001***
Number of cases	**85**			**85**		

Appendix F: Pre-Covid trade trends in sample countries, Imports and Exports (2018-2019)

(a) Imports

Change in average imports

(b) Exports

Change in average exports

Appendix G: Correlation matrix of independent variables

	Economic openness	Population density	Population size	Stringency index	Number of cases	Number of deaths	Vaccinations	People vaccinated	Boosters
Economic openness	1								
Population density	0.2372	1							
Population size	-0.4892	-0.1079	1						
Stringency index	-0.5629	-0.133	0.3343	1					
Number of cases	-0.4907	-0.1273	0.2979	0.1936	1				
Number of deaths	-0.5445	-0.1405	0.2948	0.3068	0.9376	1			
Number of vaccinations	-0.4606	-0.1003	0.9862	0.3314	0.238	0.2804	1		
People vaccinated	-0.5689	-0.1309	0.8703	0.3731	0.4442	0.5617	0.9048	1	
Boosters	-0.3242	-0.0632	0.889	0.2162	0.1984	0.1261	0.8692	0.6251	1

References

Ando, M., & Hayakawa, K. (2022, juni). Impact of COVID-19 on trade in services. . *Japan and the world Economy*, p. 12.

Ariu, A. (2016, januari). Crisis-proof services: Why trade in services did not suffer during the 2008–2009 collapse. *Journal of international Economics*, pp. 138-149.

Arnon, A., & Ricco, J. (2021). *Epidemiological and economic effects of the COVID-19 vaccine in 2021*. Retrieved from Penn Wharton Budget Model: https://budgetmodel.wharton.upenn.edu/issues/2021/3/1/epidemiological-and-economic-effects-of-covid-19-vaccine

Arvin, M. B., Pradhan, R. P., & Nair, M. (2021). Uncovering interlinks among ICT connectivity and penetration, trade openness, foreign direct investment, and economic growth: The case of the G-20 countries. *Telematics and informatics*.

Bank, W. (n.d.). *World Development Index Databank*. Retrieved from World Bank Data: https://databank.worldbank.org/reports.aspx?source=2&series=EN.POP.DNST&country=#

Bleaney, M., & Tian, M. (2022). The trade-GDP ratio as a measure of openness. *The World Economy*.

Bondarenko, P. (2017, February 28). *Gross domestic product.* Retrieved from Encyclopedia Britannica: https://www.britannica.com/topic/gross-domestic-product

Borchert, I., & Mattoo, A. (2010, September 28). The crisis-resilience of service trade. *The service industries journal*, pp. 2115-2136.

Ceglowski, J. (2017, januari 11). Unpacking services trade during the Great Trade Collapse: time series evidence for the US. *Review of World Economics*, pp. 457-486.

Del Rio-Chanona, M., Mealy, P., Pichler, A., Lafond, F., & Farmer, D. (2020, August 29). Supply and demand shocks in the COVID-19 pandemic: an industry and occupation perspective. *Oxford review of Economic Policy*, pp. 94-137.

El Khoury, A. C., & Savvides, A. (2006, augustus). Openness in services trade and economic growth. *Economics Letters*, pp. 277-283.

French, S., Leyshon, A., & Thrift, N. (2007). A very geographical crisis: the making and breaking of the 2007–2008 financial crisis. *Cambridge Journal of Regions, Economy and Society*, 287-302.

Friedt, F. L., & Zhang, K. (2020). The triple effect of covid-19 on Chinese exports: first evidence of the export supply, import demand and GVC contagion effects. *Covid Economics*, 72-109.

Fujii, E. (2018). What does trade openness measure. *Oxford Bulletin of Economics and Statistics*, 868-888.

Hayakawa, K., & Mukunoki, H. (2021). The impact of COVID-19 on international trade: Evidence from the first shock. *Journal of the Japanese and International Economies*.

Keho, Y., & Grace Wang (Reviewing Editor), M. (2017, May 31). The impact of trade openness on economic growth: The case of Cote d'Ivoire. *Cogent Economics en Finance*.

Kejzar, K. Z., Velic, A., & Damijan, J. P. (2020). COVID-19, trade collapse and GVC linkages: European experience. *Covid Economics*, 222-244.

Keman, H. (2013, june 4). *economic openness.* Retrieved from Encyclopedia Britanica: https://www.britannica.com/topic/economic-openness

Liu, X., Song, H., & Romilly, P. (1997). An empirical investigation of the causal relationship between openness and economic growth in China. *Applied Economics*, pp. 1679-1686.

Madsen, J. B. (2001). Trade Barriers and the Collapse of World Trade During the Great Depression. *Souther Economic Journal*, 848-868.

Mas-Comas, S., Jones, M. K., & Marty, A. M. (2020). COVID-19 and Globalization. *One Health*.

Mathieu, E., Ritchie, H., Rodés-Guirao, L., Appel, C., Giattino, C., Hassel, J., . . . Rosser, M. (2022). *Coronavirus Pandemic (COVID-19).* Retrieved from OurWorldInData: https://ourworldindata.org/coronavirus#coronavirus-country-profiles

McKibbin, W. J., & Stoeckel, A. (2009). The Potential Impact of the Global Financial Crisis on World Trade. *World Bank Policy Research Paper No.5134*.

Melvin, M., & Norrbin, S. (2017). Chapter 3 - The Balance of Payments. In M. Melvin, & S. Norrbin, *International Money and Finance (Ninth Edition)* (pp. 59-83). Academic Press.

Minondo, A. (2021). Impact of COVID-19 on the trade of goods and services in Spain. *Applied Economic Analysis*, 58-76.

Muellbauer, J. (2020, April 11). *The coronavirus pandemic and US consumption.* Retrieved from VoxEU: https://cepr.org/voxeu/columns/coronavirus-pandemic-and-us-consumption

OECD. (2022). *Gross domestic product (GDP) (indicator).* Retrieved from OECD: https://data.oecd.org/gdp/gross-domestic-product-gdp.htm

Shelburn, R. C. (2010). The global financial crisis and its impact on trade: the world and the european emerging economies. *Shelburne, R. C. (2010). The global financial crisis and its impact on trade: tUnited Nations Economic Commission for Europe-Discussion Papers Series*.

Tauberger, J., & Morens, D. (2006). 1918 influenza: The mother of all pandemics. *Emerging Infectious Diseases*, 15-22.

Temin, P. (1971). The beginning of the depression in Germany. *The Economic History Review*, 240-248.

UNCTADstat. (n.d.). Retrieved from UNCTADstat: https://unctadstat.unctad.org/EN/Index.html

Veeramani, S., & Anam. (2021). COVID-19 Impact on Exports of Services: Opportunities, Challenges and Suggestions for India. *FIIB Business Review*, 315-326.

Yanikkaya, H. (2003, October). Trade openness and economic growth: a cross country empirical investigation. *Elsevier*, pp. 57-89.

Zhang, X., & Luo, W. Z. (2021). Top-Down and Bottom-Up Lockdown: Evidence from COVID-19 Prevention and Control in China. *Journal of Chinese Political Science*, 189-211.