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The European Refugee Crisis and Services Trade in Greater Copenhagen

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Abstract

This paper analyzes trade in services' vulnerability to exogenous shocks in order to contribute to the often-neglected area of international trade in services. It is accomplished by examining how Sweden's border measures during the European refugee crisis affected services trade between Sweden and Denmark. The impact of the border measures is estimated with a difference-in-differences model: Sweden's trade flows with Denmark are compared to a counterfactual scenario, which is created by utilizing data on Sweden's trade flows with Norway and Finland. All types of services are allocated to and analyzed through three of the four GATS modes of supply. The results do not find that the border measures hurt services trade between Sweden and Denmark. On the contrary, it finds a positive impact on consumption abroad, explained by the boost cross border travel received due to the sudden increase of publicity. The non-negative impact is further explained by the deep integration in the Greater Copenhagen Area and the temporary expectations of the border measures. Alternatively, the result indicates that bilateral statistics on trade in services or the allocation of services categories to the modes of supply is inadequate – highlighting the need for more detailed data and further research in the area.

Keywords: *Trade in Services, Difference-in-Differences, Border Controls, Schengen, European Refugee Crisis*

List of Abbreviations

BPM6 = Sixth edition of the Balance of Payments and International Investment Position Manual

DID = Difference-in-Differences

DSB = Danske Statsbaner

EBOPS 2010 = Extended Balance of Payments Services Classification 2010

EEA = European Economic Area

EU = European Union

Eurostat = Statistical Office of the European Union

FATS = Foreign Affiliate Trade Statistics

GATS = General Agreement on Trade in Services

GDP = Gross Domestic Product

IMF = International Monetary Fund

MSITS 2010 = Manual on Statistics of International Trade in Services 2010

OECD = Organization for Economic Co-operation and Development

SCB = Statistics Sweden

TISMOS = Trade in Services data by Mode of Supply

UN = United Nations

UNCTAD = United Nations Conference on Trade and Development

UNHCR = United Nations High Commissioner for Refugees

UNWTO = United Nations World Tourism Organization

WTO = World Trade Organization

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1. Introduction

In the wake of multiple escalating wars and conflicts worldwide, 2015 witnessed the highest number of forcibly displaced people (65.3 million) since the aftermath of World War II (UNHCR, 2016). In the European Union (EU), the number of asylum seekers doubled in 2015 to 1.3 million people (Melchior, 2021). In response to what became referred to as the *European Refugee crisis*, many European countries changed their asylum legislation and implemented border controls to stop the influx of refugees. Among those countries were Sweden, which changed its refugee policy from having the most nonrestrictive asylum legislation in the EU to one following the minimum level accepted by the EU (Swedish Migration Agency, 2020).

In November 2015, the Swedish police started to conduct border controls at the Öresund bridge and harbors connecting Sweden to Denmark and Germany. Additionally, validation of passengers' travel documents became mandatory for all cross-border transport operators. These border measures interfered greatly with trains from Denmark to Sweden, i.e., across the Öresund bridge. Train passengers experienced more frequent delays, more train changes, fewer departures, more crowded trains, greater uncertainty, and much longer traveling times. People who wanted to consume or provide a service on the other side of Öresund had to endure the more troublesome train journeys, chose another mode of transport, find another way to supply the service, or abstain the trade. Thus, although the border measures were motivated by non-trade considerations, it effectively re-erected a trade barrier inside the highly integrated region of southern Sweden and eastern Denmark – better known as the Greater Copenhagen Area.

Seeking to contribute to the increasingly relevant topic of services trade, this paper uses Sweden's border measures during the European refugee crisis as a natural experiment to analyze the vulnerability of trade in services to exogenous shocks. Considering the extensive travel restrictions amidst the COVID-19 pandemic, we believe it to be highly relevant to focus on the relationship between mobility impediments and services trade. By exploring this, we hope to be a source of inspiration and to set a foundation for future research on the vulnerability of economic integration between countries, particularly regarding services trade. The question this paper sets out to answer is the following:

How did the border measures implemented in Sweden during the European refugee crisis affect bilateral trade in services between Sweden and Denmark?

Trade in services is relatively unexplored in international economics. However, it is gaining more and more attention as information technology is improving the tradability of services, and more detailed services data is collected (WTO, 2019; 2020). Additionally, services are certainly not trivial for the economy. The 2019 issue of the World Trade Report published by the World Trade Organization (WTO) focuses on services trade and highlights that services are becoming a central determinant of an economy's competitiveness and approach to attaining long-term growth (WTO, 2019). For context, 32% of Sweden's exports consisted of services in 2016 – a quarter of which had the Nordic countries as recipients (SCB, 2017).

The question is answered through a difference-in-differences (DID) model that compares Sweden's trade with Denmark to Sweden's trade with Norway and Finland, before and during the border measures. Since services can be supplied in different ways (or "modes"), the effect is estimated separately through the modes of supply described in the General Agreement on Trade in Services (GATS), excluding trade through foreign commercial presence (Mode 3).

After performing several robustness checks, the study's main results do not find that the border measures hurt trade in services between Sweden and Denmark. On the contrary, the results surprisingly indicate a positive effect on trade through consumption abroad (Mode 2).

The contribution of this paper can be summarized in four points. First, it provides an economic evaluation of the governing of the European refugee crisis. Second, it describes the theoretical basis and empirical limitations to how the GATS modes of supply can be used to make policy evaluations on trade in services. Third, it gives examples of how the difference-in-differences model can be applied to sudden disturbances in international trade. Fourth, it adds further confidence to the durability and sturdiness of the economic integration project in the Greater Copenhagen Area.

The paper is organized as follows. Following this introduction, section 2 further explains international trade in services and provides an overview of the border measures. The third section puts forward the theoretical framework. Following this, section 4 outlines previous research. Section 5 explains the empirical strategy with the DID model. After that, section 6 presents, discusses, and performs robustness tests on the results. Lastly, in section 7, the paper is summarized and concluded.

2. Background

2.1. Trade in Services

The Economist describes an informal definition of services as economic transactions of products that "you cannot drop on your foot" (Hoekman & Kostecki, 2009, p.319). Examples include hairdressing, phone calls, construction, education, and transportation. While there are several formal definitions of services in the context of international trade (e.g., Bhagwati, 1987; Hill, 1977), services are in general defined by their unique characteristics of **intangibility**, **nonstorability**, **heterogeneity**, and **joint production** (Hoekman & Kostecki, 2009). Meaning that services are typically difficult to touch, produced and consumed simultaneously, nonstandardized, and require some consumer input (Hoekman & Kostecki, 2009). For a long time, many thought that the distinct nature of services implies nontradability – which has never been true (Hoekman & Braga, 1997). Nevertheless, the characteristics carry some important implications on how services are supplied internationally and barriers to trade in services.

2.1.1. The Modes of Supply

In contrast to trade in goods – where transportation of a product can link a domestic producer to a foreign consumer – services cannot be sent away in a truck nor stored in a quay. Instead, there are other ways to supply services internationally. With the adoption of GATS in 1995, the WTO identifies four different modes of supply by focusing on the physical locations of the consumer and provider (Hoekman & Kostecki, 2009).[1] Several other organizations recognize this classification (UN, Eurostat, IMF, OECD, UNCTAD, UNWTO & WTO, 2012).

Cross-border trade (Mode 1) are services provided when the consumer and provider are located in different countries. The most intuitive example of this is perhaps services provided via the internet, such as video call consultancy services. Other important examples are transnational freight and passenger transport, distance education, and cross-border distribution services (UN et al., 2012). Trade through Mode 1 is increasing in various service sectors due to technological advancements in internet accessibility, electronic payments, and digital communication software – enhancing the cross-border tradability of many services (WTO, 2019).[2]

[1] Cernat and Kutlina-Dimitrova (2014) suggest a fifth mode of supply, defined as the added value of the services input to export goods. By accounting for added value, it can be shown that services' share of international trade might be underestimated (WTO, 2019).

[2] E.g., the COVID-19 pandemic has increased the online provision of services (WTO, 2020).

Consumption abroad (Mode 2) involves the consumer traveling abroad to buy a service (UN et al., 2012). It is one of two modes relying on physical proximity between the buyer and the seller, and thus cross-border travel (WTO, 2019). Examples include tourism activities (which account for most of the trade through Mode 2), students studying abroad, and travel to receive medical treatment (UN et al., 2012; WTO, 2019). This implies that transportation is not only a service in and of itself but also a means to supply other services. Also covered by mode 2 are the consumption of certain goods not intended for resale by non-resident citizens in foreign economies that they visit temporary (UN et al., 2012).

Trade through commercial presence (Mode 3) is when services are locally provided by a foreign affiliate, foreign subsidiary, or any other type of professional establishment by a foreign company (UN et al., 2012). [3] This often requires foreign direct investments (FDI) (UN et al., 2012). As seen in figure 1, Mode 3 is by far the most common mode of supply worldwide. Kox and Nordås (2007) conclude that Mode 1 and Mode 3 are complementary to each other and that an increase in one of the modes can positively affect the other one, and vice versa.

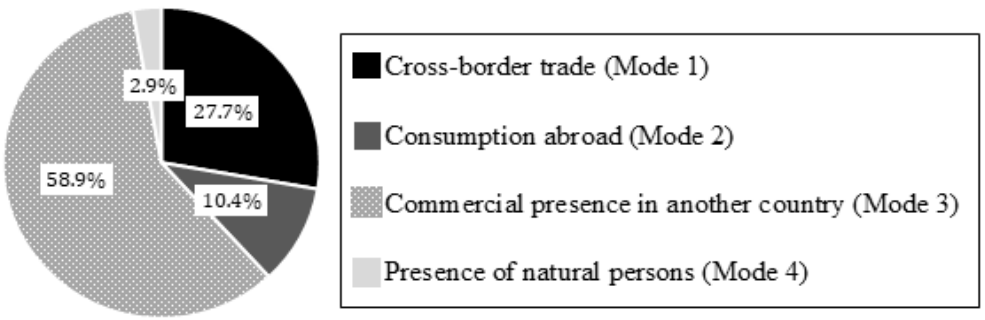


Figure 1: World trade in services by mode of supply, 2017

Adapted from WTO (2019, p.24)

Presence of natural persons (Mode 4) is the second mode of supply that relies on cross-border travel. In contrast to Mode 2, where the consumer traveled abroad, Mode 4 involves the provider *temporarily* traveling abroad (Hoekman & Kostecki, 2009). Examples of services sometimes traded through the presence of natural persons are consultancy services and construction (WTO, 2019). Note that neither GATS nor associated statistical frameworks cover permanent migration, foreign employees employed by domestic companies, or persons who seek access to the employment market (UN et al., 2012). In other words, Mode 4 does not cover cross-border commuters that seek access to the foreign employment market.

[3] Due to data limitations discussed later in the paper, trade through Mode 3 is not included in the empirical analysis.

2.1.2. Barriers to Trade in Services

Because of the intangible and nonstorable nature of services, services are difficult to monitor and measure as they pass a border, making it difficult to use trade barriers, but even more difficult to use import tariffs (Hoekman & Braga, 1997). Different forms of tariffs are still being used (e.g. entry fees placed on foreign service providers to enter the country), but more commonly used policy barriers tend to be in the form of non-tariff measures and by using domestic regulation as barriers (Hoekman & Braga, 1997). Examples of these are quantitative restrictions on the number of foreign service providers permitted in a country, prohibitions in certain sectors for foreign suppliers, and requirements of product standards or licenses on domestic markets, which creates a competitive disadvantage for foreign suppliers (Hoekman & Braga, 1997; Hoekman & Kostecki, 2009).

The inherent characteristics of services also create natural difficulties in trading services across both space and time (Hoekman & Kostecki, 2009). For example, many services still suffer from a "proximity burden" (WTO, 2019, p.53) – i.e., the necessity of close physical proximity between the producer and consumer (Mode 1, 2, and 4). Christen and Francois (2010) stress that this proximity burden places a trade cost linked to transportation and the coordination of providers and consumers, thus complicating certain modes of supply.

2.2. Integration of Sweden and Denmark in Trade in Services

The economies of Sweden and Denmark are highly integrated. There is a large amount of services trade between the countries, where the pre-eminent amount consists of Swedes traveling to Denmark to work or consume (SCB, 2018). The geographically close regions of southern Sweden and eastern Denmark share a special relationship and form the Greater Copenhagen Area (Greater Copenhagen, 2021). For example, the Öresund bridge (inaugurated in 2000) connects the two regions and marks an important milestone for the deep integration between Sweden and Denmark (Øresundsinstituttet, 2015). The bridge has contributed to a fivefold increase in traffic over the southern part of the strait between Copenhagen and the Swedish city of Malmö, i.e., Öresund (Øresundsinstituttet, 2021).

One of the early achievements for the increased integration of Sweden and Denmark is the establishment of The Nordic Passport Union (Rood & Victor, 2019). When the passport control agreement came into effect in 1958, the border controls disappeared between the signatories, and working in and traveling to the other countries became easier (Rood & Victor, 2019).

An essential integration achievement between Denmark and Sweden is their accession to EU and especially the European single market and the services directive adopted in 2006 (European Commission, 2021). Covering services activities accounting for 46% of EU GDP, the single market for services lowers trade barriers by guaranteeing EU citizens the freedom to provide services, consume services, and establish companies in any other member state (European Commission, 2021). More specifically, it strengthens the consumers' rights, ensures easier access to services, simplifies cross-border supply, and much more (European Commission, 2021).

Another central part of European integration the Schengen agreement. The Nordic countries entered the Schengen Area in 2001 (Official Journal of the European Communities, 2000a), which meant that the European border control cooperation replaced most parts of the Nordic border control cooperation. However, the Nordic Passport Union still applies and reaches even further than the Schengen agreement (Utrikesministeriet, 2020).[4] The Schengen agreement's main idea is to facilitate the free movement of people within the partner countries and strengthen the external borders against non-participating countries (Official Journal of the European Communities, 2000b). However, signatories have the right to impose temporary border controls motivated by threats to public order or internal security (European Commission, 2020b). The European Commission (2020b) emphasizes though how important it is that the scope and duration of the temporary border controls at the internal borders must not exceed what is necessary to respond to the serious threat. Depending on what type of circumstances the border controls are motivated by, they may be implemented on different bases, reaching from 10 days to 6 months (European Commission, 2020b).[5] As seen below however, some border controls last far longer than that

[4] Unlike citizens of other Schengen countries, citizens of Nordic countries are not forced to bring any identification document when traveling to another Nordic country, not even a national ID-card or driver's license (Utrikesministeriet, 2020).
[5] The European Commission (2020b) further explains the legal requirements of reintroducing the border controls, and the European Commission (2020a) list all notifications of Schengen signatories since 2006.

2.3. The Border Measures

During the European refugee crisis (2015-2019) (Ranking, 2019), several EU countries exercised the right suspend parts of the Schengen commitments. Among these were Sweden, Norway and Denmark. The implementation of the border measures in the Nordics and their consequences are described below.

2.3.1. Sweden's Border Measures: Implementation

Sweden implemented three different laws that sought to restrict the mobility of asylum seekers: 1) border controls, 2) ID-controls on long-distance ferries, and 3) ID-controls on busses, trains, and short-distance ferries.[6] The border controls were conducted domestically by governmental authorities, such as the Swedish police (Riksrevisionen, 2016). In addition, ID-controls were conducted by the transport providers on foreign soil, since the law stipulated the carriers to verify that all passengers had a valid travel document *before* entering Sweden (SFS 2015:1074).

Table 1: Overview of Sweden's border measures

Date	**Event**
Nov 12, 2015	Swedish police authorities start conducting border controls at the Öresund bridge and the harbors in Gothenburg, Helsingborg, Trelleborg, and Varberg.
Nov 21, 2015	ID-controls on ferries on routes exceeding 20 nautical miles are introduced.
Jan 4, 2016	ID-controls on buses, trains, and short-distance ferries are introduces.
May 4, 2017	The ID-controls are abolished.
Mar 6, 2019	The European Commission declares the refugee crisis over. The border controls are still active.

Sources: Ranking (2019), Riksrevisionen (2016), SFS 2015:1074, Transportstyrelsen (2015), and Øresundsinstituttet (2020)

A report by Riksrevisionen's (2016) explains that the implementation of the border controls by the Swedish police authority started on November 12, 2015 and in practice took place at the Öresund bridge and the harbors of Gothenburg, Helsingborg, Trelleborg, and Varberg. Travelers crossing the Öresund bridge by car or bus were controlled at the toll station in Lernacken, and train passengers were checked when their train stopped at the train station Hyllie in Malmö (Bubenko, 2016; Riksrevisionen, 2016; Øresundsinstituttet, 2016). Riksrevisionen's (2016) report explains that even though all passengers were meant to be

[6] When writing the term "border measures" in this paper, we refer to all these three types of laws.

controlled in Region South, some train departures were sometimes skipped for practical reasons. When the police conducted the controls on ferries incoming from Denmark, they used a random selection principle, which they sometimes diverted from and conducted more frequent controls if they deemed it necessary due to an expected large influx of refugees (Bubenko, 2016; Riksrevisionen, 2016). On ferries from Germany, all travelers' travel documents were scanned and controlled against the register and could also include conversations with the traveler or calls to the countries of the travelers' visa's origin (Riksrevisionen, 2016). However, in March 2016, the controls of the ferries incoming from Germany decreased to the same extent as on the ferries incoming from Denmark (Riksrevisionen, 2016).

The first type of ID-controls was implemented on November 21, 2015 and is still in force (SFS 2015:673). It requires all passenger ship companies to check for valid travel documents on all passengers traveling to Sweden on routes exceeding 20 nautical miles (Transportstyrelsen, 2015). This includes crossings from Germany to Trelleborg and Germany to Gothenburg (Bubenko, 2016).

The second type of ID-controls – sometimes referred to as the *carrier's responsibility* (Øresundsinstituttet, 2016) – were perhaps the most burdensome of the three border measures for commercial travelers. Lasting from January 4, 2016, to May 4, 2017, carriers were required to check for valid travel documents on all passengers traveling from Denmark by train, bus, or ferries shorter than 20 nautical miles (SFS 2015:1074; Øresundsinstituttet, 2020). Skånetrafiken and DSB (southern Sweden and Danish train operators, respectively) conducted ID-controls at the train station in Copenhagen Airport (Kastrup) on all train passengers heading towards Sweden (Øresundsinstituttet, 2016). ForSea (HH Ferries) conducted ID-controls on passengers traveling from Helsingør to Helsingborg by ferry (Øresundsinstituttet, 2016). Furthermore, ferry companies operating between Rønne (Bornholm) and Ystad, and bus companies operating over the Öresund bridge, also introduced ID-controls (Øresundsinstituttet, 2016). When mentioning the ID-controls henceforth, we only refer to the second type because that was more extensive and had larger effects on travel, as explained below.

2.3.2. Sweden's Border Measures: Consequences for Cross-Border Travel

In practice, the three border measures had different consequences for cross-border travel on different routes and different modes of transport. We find no evidence for delays or severe burden put on travelers for most routes – except for transportation over the Öresund bridge.

Winter (2016) points out that during the first six months of ID-controls, the average traveling time a day for commuters traveling across the Öresund bridge increased by 5-15 minutes for motorists and 30-60 minutes for train commuters. Indeed, Øresundsinstituttet (2016) states that the border measures mostly affected travel in the Öresund region, especially the train traffic. The burden faced by train travelers crossing Öresund involved delays, longer travel times, fewer departures, more crowded trains (Øresundsinstituttet, 2016), lower reliability on traffic information, and missed connecting trains (Skånetrafiken, personal communication, 4 December 2020). Other routes, such as Helsingborg-Helsingør and Rønne-Ystad, were not impacted considerably by the border measures (Andresen, Palmehag, Wessman & Wiborg, 2016; ForSea's COO Jens Ole Hansen, personal communication, 8 December 2020).

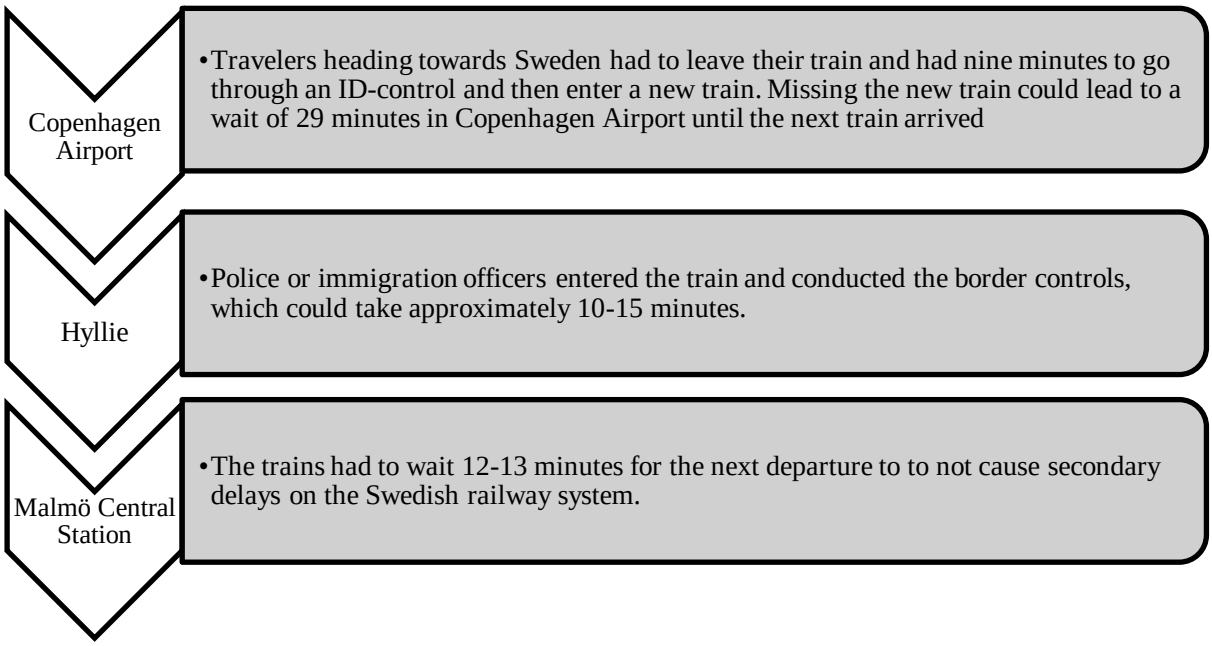


Figure 2: Crossing Öresund by train at the beginning of Sweden's border measures

Source: (Øresundsinstituttet, 2016)

The burden for train passengers crossing Öresund changed somewhat during the course of the border measures. The initial burden for train passengers started when implementing the border controls (Skånetrafiken, personal communication, 4 December 2020). Skånetrafiken made adjustments for the train traffic after the first week, which increased punctuality somewhat (Figure 3). With the introduction of ID-controls, the burden increased even more. Øresundsinstituttet (2016) reports that the Öresund trains were affected at three separate locations during the first months: the train stations in Copenhagen Airport, Hyllie, and Malmö Central Station. The implications on the separate stations are summarized in Figure 2.

Table 2: Overview of the consequences of Swedens' border measures

Date	Event
Nov 12, 2015	Controlled trains over the Öresund bridge are delayed due to border controls.
Nov 23, 2015	Skånetrafiken makes first adjustments to decrease the delays caused by the border controls.
Jan 4, 2016	Increased delays for Öresund trains due to ID-controls. Every other train from Copenhagen Central Station to Copenhagen Airport cannot carry passengers. Passengers heading towards Sweden by train must change trains and platforms at Copenhagen Airport.
May 9, 2016	Skånetrafiken changes the train schedule over Öresund. The Öresund trains' punctuality increases as announced travel time increases.
Jan 30, 2017	Danske Statsbaner (DSB) changes the line-up system at the train station Copenhagen Airport, and passengers do not need to change platforms anymore – only trains.
Apr 24, 2017	DSB doubles the number of trains traveling between Copenhagen and Copenhagen Airport.
May 4, 2017	Sweden abolishes the ID-controls, and travelers heading towards Sweden do not need to change trains in Copenhagen Airport anymore.
Dec 10, 2017	Skånetrafiken essentially restores the timetable over Öresund.

Sources: Skånetrafiken (personal communication, 4 December 2020), Øresundsinstituttet (2016; 2020)

After the initial implementations, some notable events mitigated the effects. First, after five months of ID-controls, Skånetrafiken created a new timetable with announced longer traveling times, which resulted in enough time to make swift train changes at Copenhagen Airport, slightly better traffic information, and termination of the systematic delays from the border controls (Skånetrafiken, personal communication, 4 December 2020). Second, in January 2017, DSB changed the line-up system at Copenhagen Airport, which ended the need to change platforms (Skånetrafiken, personal communication, 4 December 2020). In May 2017, the second type of ID-controls was suspended, and passengers no longer had to change trains at Copenhagen Airport (Skånetrafiken, personal communication, 4 December 2020). Lastly, in December 2017, Skånetrafiken restored the timetable, except for a six-minute stop at Hyllie to allow for possible border controls (Skånetrafiken, personal communication, 4 December 2020), which became intensified when the carrier's responsibility ID-controls were suspended (Øresundsinstituttet, 2020).

Figure 3 depicts the monthly punctuality – defined as the share of trains that are delayed at a maximum of 6 minutes – of passenger trains over the Öresund bridge when arriving in Malmö (Sweden) and Peberholm (Denmark, halfway over the Öresund bridge). In February, Mars, and April of 2016, the punctuality was below 70%. For the passengers, this meant that almost every third train were more than six minutes late. In a survey conducted by Winter (2016) during the first month of the border measures, 69 % of the train commuters across Öresund stated that they were very affected by the increased uncertainty in travel times as well that 64% of them felt increased levels of stress due to this.

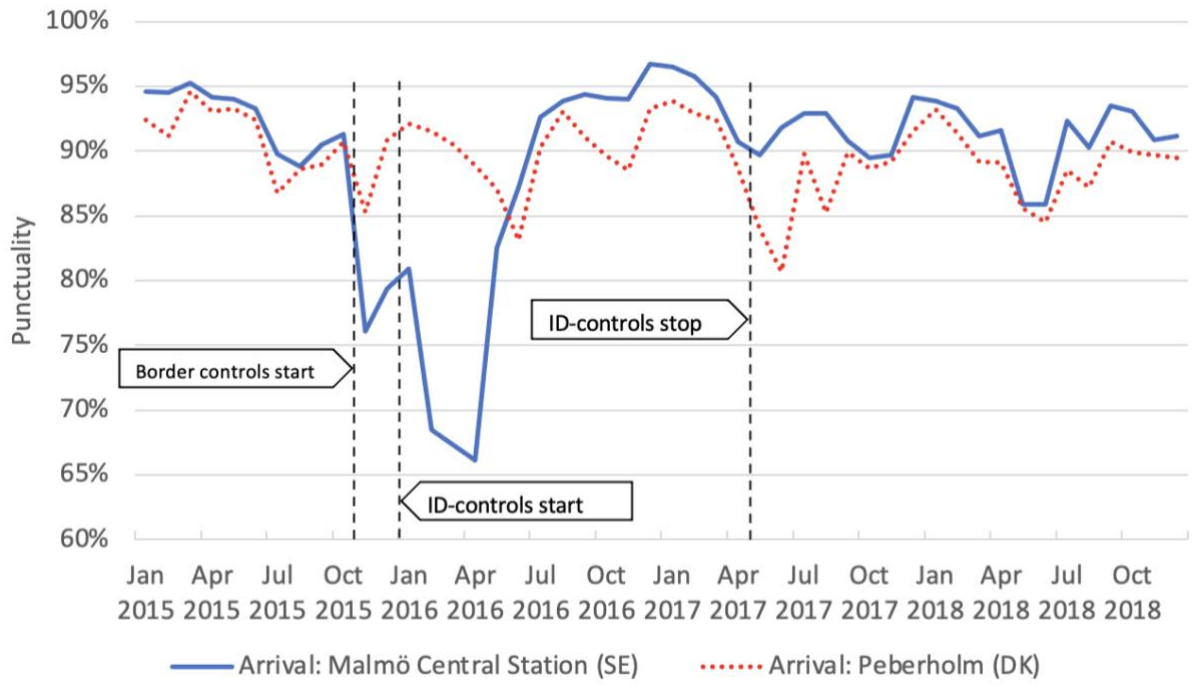


Figure 3: Punctuality for passenger trains over the Öresund bridge (monthly)

Source: Trafikverket (personal communication, 9 December 2020)

In conclusion, Sweden's border measures made train travel from Sweden to Denmark much more troublesome. The train operators tried to adapt to the new situation by making adjustments to increase punctuality and solve the trouble of changing platforms and trains at Copenhagen Airport.

2.3.3. Denmark's, Finland's and Norway's Border Measures

In response to Sweden's border measures, Finland, Norway and Denmark established similar legislation. Denmark mainly implemented border controls at the German border on January 4, 2016 (Øresundsinstituttet, 2016). Persons traveling from Sweden to Denmark were not subject to border controls.

Finland implemented small border measures during this time. For example, the border to Sweden by Haparanda-Torneå got increased custom control until February 2016, and ferry companies with ferries arriving in Helsinki voluntarily implemented visa control, which both reportedly had no known effect for the passengers (Andresen, Palmehag, Wessman & Wiborg, 2016).

Norway implemented border controls on ferries that departed from Denmark, Germany, and Sweden on November 26, 2015 (Justis- og beredskapsdepartementet, 2015). Like in Sweden and Denmark, Norway's border controls were extended continuously until 2020 and beyond (European Commission, 2020a). Additionally, the validation of travel documents became mandatory for ferry operators on routes from Denmark, Germany, and Sweden (Justis- og beredskapsdepartementet, 2015), which reportedly had minimal effects for the passengers with valid travel documents (Andresen et al., 2016). Note that Norway did not implement border controls on the land border to Sweden (Andresen et al., 2016). They did however intensify the territorial control in border areas, which meant that the police were conducting more checks for travel documents when there was reason to suspect that a person was a foreign citizen (Andresen et al., 2016). Andresen et al. (2016) states that the territorial controls were implemented on a "very small scale" (p.43) and had "no known effect" (p.43) on travel.

In conclusion, we find no evidence that neither Denmark's, Finland's or Norway's border measures had any considerable effect on cross-border travel to or from Sweden.

3. Theoretical Framework

This section aims to find out through what mechanisms the border measures between Sweden and Denmark might affect trade in services. The main theoretical basis for this paper is that the border measures implemented between Sweden and Denmark made it more troublesome to travel and increased the travel time between the countries. Our main hypothesis is that the border measures increased the proximity burden and raised the trade costs, which should decrease trade in services. However, by keeping the different modes of supply in mind, it is not obvious that all services activities would be negatively affected. Some activates do not require cross-border travel, and others can use alternative modes of supply. Below, we put forward our hypotheses on how the border measures are expected to affect services trade through the four modes of supply.

3.1. Cross-Border Trade (Mode 1)

The main hypothesis for the border measures' effect on traded services supplied through Mode 1 is that it should not be affected. Services provided through cross-border trade generally overcomes the proximity burden by linking consumers and providers via information and communication technology. In other words, it does not rely on any form of traveling or cross-border movement. However, two factors might affect Mode 1 in opposite directions: passenger train traffic and mode substitution.

Indeed, trade through Mode 1 does not require people to first travel to another country. However, when people travel to other countries, they often "consume" transportation, which is listed under Mode 1. The border measures reduced the number of passengers on cross-border trains connecting Sweden and Denmark (Øresundsinstituttet, 2018). The reduction of commuters by train implies a reduction of traded transportation.

On the other hand, border restricting measures may be drivers of mode substitution. For example, when traveling becomes burdensome, service providers who prefer traveling to the consumer might choose to provide the service digitally instead. For example, a legal counselor might attend video conferences instead of traveling to the customer. During the COVID-19 pandemic, this mode substitution has been considerable (WTO, 2020). Providers' and consumers' adaptation can indicate that services usually supplied through cross-border movement (Mode 2 or Mode 4) may be substituted with cross-border trade (Mode 1).

3.2. Consumption Abroad and Presence of Natural Persons (Mode 2 & 4)

Mode 2 and Mode 4 should be affected negatively by the border measures since it requires physical movement across borders, which the Swedish border measure evidently complicated. Böhmer, Limbers, Pivac, and Weinlt (2016) explains that border measures are expected to increase the waiting times and associated uncertainty at borders for lorries, tourists, and cross-border commuters, which lowers the incentives for trade.

It is possible that many service providers substituted public transportation for personal vehicles, such as cars which was not as negatively affected. The possibility of easily substituting modes of transport could reduce the border measures' negative effect since all modes of transport were

not equally affected. During the first months of the ID-controls, the train travel across Öresund decreased by 12% while the car travel increased (Winter, 2016). Winter (2016) confirms these trends by conducting a survey on cross-border commuters, partly supporting the expectations on mode of transport substitution. The survey shows that 15% of all commuters switched from commuting by train to commuting by car, 23 % stated that they take the car more often, and 12% started to commute by using a car-pool. Although commuters are not service providers, their behavior can serve as a proxy for actual service providers as they presumably behave in a similar fashion. N.B., the survey only indicates services providers' decision-making and does not provide clear-cut evidence for mode of transport substitution for people involved in trade through Mode 4.

Lastly, if employees employed abroad (permanent or temporary) quit their jobs, some indirect effects on services trade can be expected. The presence of an employee abroad also enables them to consume abroad. Since termination will lead to less presence in the foreign country, fewer people can consume abroad, and trade through Mode 2 decreases.

3.3. Commercial Presence (Mode 3)

The expected effect of the border measures on Mode 3 is uncertain. However, extrapolating the effects of the border measures during COVID-19 indicates that trade through Mode 3 should decrease (WTO, 2020). Trade barriers might hurt services' suppliers with foreign affiliates and affect their future decision making on potential new business locations (WTO, 2020). For a firm to establish a commercial presence abroad, the management is often required to travel to the new country to finish the business venture (WTO, 2020). On the other hand, these business trips might not be frequent enough for the border measures to be a problem for the management. Alternatively, the increased difficulty of traveling may create incentives for businesses to increase their commercial presence abroad. If the company expects the burden of traveling to make consumers less prone to consuming their services abroad, the company may want to compensate for this loss in sales by increasing its commercial presence abroad.

4. Previous Research

Research on international trade has only recently started to distinguish between goods and services. Thus, literature relating to shocks on trade in services is quite limited. However, previous research papers related to this paper does exist, with topics covering barriers to trade in services, the economic importance of the Schengen agreement, and the effects of the partial suspension of Schengen during the refugee crisis.

4.1. Barriers to Trade in Services

Walmsley & Winters (2005) discuss the importance of liberating restrictions on the temporary movement of people and how it increases trade in services. They focus on Mode 4 and estimate the effects of an increase in the quotas on the number of temporary workers permitted into the world's developed economies. The study shows that raise in quotas benefit the global welfare, both the sending and receiving countries of the temporary labor force and, at the same time, the developed and the developing countries.

Borchert, Gootiiz & Mattoo (2012) present the Services Trade Restrictions Database, a collection of information on and the effects of service trade policies for 103 countries in five different service sectors. They conclude that as far as their data extends, the world's poorest countries are the ones with the most liberal services trade restrictions while the fastest growing countries in East Asia and among the gulf states in the middle east are the most restrictive. On the other hand, the wealthiest OECD countries are relatively open but somewhat restrictive in certain sectors, such as transportation and movement of natural persons as services suppliers (Borchert, Gootiiz & Mattoo, 2012).

A publication by the OECD (2020) describing policy trends on trade in services shows that barriers to service trade are increasing worldwide. They describe that Mode 3 and Mode 4 are affected due to new policies that influence the movement of people and an increasingly demanding jurisdiction, which complicates commercial presence abroad. There is also an effect on Mode 1 because of growing restrictions on digital trade and its changing requirements on downloading and streaming between countries (OECD, 2020). Hence, although trade costs are declining due to technological improvement and multilateral trade negotiations, they remain conspicuously high (WTO, 2019). The WTO (2019) estimates the worldwide trade costs in services (e.g., policy barriers, travel costs, and transaction costs) in 2017 to be about 4.3 times costlier than domestic trade – roughly equivalent to a tariff of 330%.

4.2. Schengen and Trade in Services

Recent research has analyzed the relationship between services trade and border measures by studying one of the largest efforts to ease the free movement of people: the Schengen Agreement. It turns out that the elimination of border measures facilitates not only the flow of persons but also the internal flow of trade in services (Davis & Gift, 2014; Felbermayr, Gröschl & Steinwachs, 2018; Aussilloux & Le Hir, 2016). Felbermayr, Gröschl, and Steinwachs estimate an average 4.1% increase in trade in services that cross a single border due to Schengen, using a gravity model containing annual data between 1995 and 2011. They also point out that Schengen has had larger effects on trade in services than the trade in goods since many services require border crossings of persons to become tradable. However, this result should not be interpreted as a forecast for this study since it is based on the average trade between all European countries and measures the Schengen Area's long-term effect – not a suspension of it (Felbermayr, Gröschl & Steinwachs, 2018).

Research has also been conducted on the more specific effects of the re-implemented border measures in the Schengen Area during the refugee crisis. Aussilloux and Le Hir (2016) examine the cost of increasing travel time for French commuters if the Schengen agreement were to be revoked. They use a methodology that converts the delays into a monetary valuation of time and estimate an annual loss of 250 million euros in socio-economic costs. Andresen (2016) uses a similar approach to calculate the cost for Swedish and Danish commuters after implementing the border measures in 2015. She estimates an annual cost of 296 million SEK if the border measures were maintained. Tryding (2016) also uses a similar methodology but estimates a yearly cost of 1.5 billion SEK for the commuters in the Öresund area. Andresen (2016) also researches the effects of implementing the border measures on the Swedish workforce, where approximately 322 000 fewer jobs could be reached within one hour from Malmö.

In conclusion, previous research shows that barriers to trade in services are huge. This creates challenges for further economic integration, which prevents countries from reaping the benefits of increased trade in services. Luckily, it seems to be possible to lower the barriers. Several research papers find a positive relationship between the facilitation of cross-border travel and services trade. Conversely, if border controls were to be re-implemented in the Schengen however, trade barriers would rise.

5. Empirical Strategy

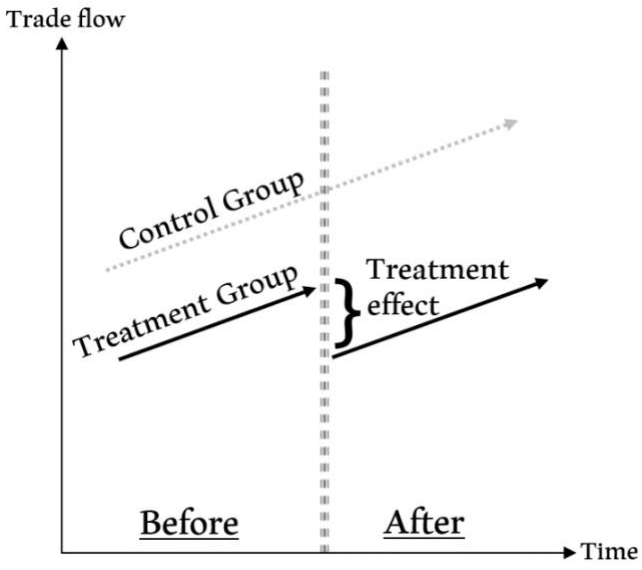
The effects of the border measures are assessed using a difference-in-difference (DID) model, popularized by Card and Krueger's seminal paper in 1994. The DID model uses panel data to measure the effects of a group-specific exogenous shock by comparing the group-difference before the shock with the group-difference after the shock. By assuming that the groups follow an equal trend in the absence of the shock, the causal effects can be estimated. This study utilizes the Nordic countries' similar characteristics: Sweden's trade flows with Denmark are compared to Sweden's trade flows with Norway and Finland.

First, the general DID model is explained, followed by an application to trade flows. After that, the assumptions and robustness of the models are discussed. Lastly, the dataset's origin and classifications are explained.

5.1. The General DID model

The intuition of the DID model is outlined by Angrist and Pischke (2009) as follows. The model's idea is to examine the effects of an exogenous shock (such as a natural experiment) by controlling for other, time-specific variables. This is conducted using panel data of real observations for a minimum of two periods and two groups. An exogenous binary source of variation, referred to as the *treatment,* is inflicted on the *treatment group*. Furthermore, a *control group* is used, which is very similar to the treatment group but is entirely unaffected by the treatment.

Figure 4: Graphical illustration of the DID model



In the absence of a group-specific disturbance, both groups' expected outcome *y* can be described as:

$$E(y_{igt}|i,g,t) = \alpha_g + \beta_t \qquad (1)$$

where y_{igt} is the outcome y for individual *i*, in group *g* at time *t*. α is a vector of group-specific effects and represents the intercepts in Figure 4. β is a vector of time-specific effects and represents the slopes in Figure 4. In other words, the expected outcome depends on a group-specific effect and a time trend that is common across all groups. Below, we use the simplest of DID models (2x2) containing two groups (the control group and the treatment group) and two time periods (pre and post).

Table 3 shows the expected outcome for a variable y when allowing for the treatment. The observations are divided into four boxes depending on which group they belong to and what time period they are observed. An additional variable δ (the treatment effect) appears for treated observations when allowing for the treatment. I.e., observations in the treatment group after the intervention. The treatment effect represents the shift in the solid line in Figure 4. Now, differentiating the post-intervention observations with the pre-intervention observations gives the bottom row. If only data from the treatment group is used, the change in time-specific effects ($\beta_{post} - \beta_{pre}$) will be indistinguishable from the treatment effect (δ). However, since the time-specific effects are identical between the groups, we simply subtract the two differentials in the bottom row, which give δ – the causal effect of the treatment. That the groups have identical time-specific effects is a crucial assumption and will henceforth be referred to as the *equal trend* assumption.

Table 3: Finding the difference-in-differences

$E(y_{igt} \mid i, g, t)$	**g = Treatment group**	**g = Control group**	**Treatment group – Control group (difference)**
t = Pre-treatment	$\alpha_{\text{treat group}} + \beta_{pre}$	$\alpha_{\text{cont group}} + \beta_{pre}$	$\alpha_{\text{treat group}} - \alpha_{\text{cont group}}$
t = Post-treatment	$\alpha_{\text{treat group}} + \beta_{post} + \delta$	$\alpha_{\text{cont group}} + \beta_{post}$	$\alpha_{\text{treat group}} - \alpha_{\text{cont group}} + \delta$
Post-treatment – pre-treatment (difference)	$\beta_{post} - \beta_{pre} + \delta$	$\beta_{post} - \beta_{pre}$	δ *(Difference-in-difference)*

Now, we can create the complete model. First, we use the model in equation (1), which only has group effects and time effects. Then, we create two dummy variables: D^{POST} that takes on the value 1 for observations during the treatment, and $D^{\text{TREATMENT GROUP}}$ that takes on the value 1 for observations in the treatment group. Multiplying the two dummies gives an interactive

dummy variable that activates for treated observations. Lastly, we assume that all dependent variables are exogenous, $E(\varepsilon_{igt}|i, g, t) = 0$. This gives us the following model:

$$y_{igt} = \alpha D^{\text{TREATMENT GROUP}} + \beta D^{\text{POST}} + \delta^{M}(D^{\text{TREATMENT GROUP}} \times D^{\text{POST}}) + \varepsilon_{i} \quad (2)$$

If the assumptions are fulfilled, the treatment effect can be estimated (called the DID estimator).

5.2. DID Model with Trade Flows

The general DID model needs to be tweaked to suit an international trade analysis better. Usually, DID-models are based on data on an individual level. For example, Card and Krueger (1994) estimate the treatment effect from individual data with a known distribution within the sample. This study's data defines the statistical population as all economic services transactions between residents and non-residents in the Nordic countries. However, the available data are merely estimations of the total annual bilateral trade value categorized by service categories (Eurostat, 2019) and modes of supply (Eurostat, 2020a). Below, we present three different DID models: the 2x2 DID model, the expanded DID model, and the gravity augmented DID model.

Thus, the outcome variable is the annual value of imported services within a given mode of supply for each importing country, exporting country, and service category. The basic 2x2 DID model is

$$\ln(y_{cijt}) = \alpha D^{\text{TREATMENT GROUP}} + \beta D^{\text{POST}} + \delta(D^{\text{TREATMENT GROUP}} \times D^{\text{POST}}) + \varepsilon_{cijt} \quad (3)$$

where $\ln(y_{cijt})$ the natural logarithm of the value of services imports for service category *c*, importing country *i*, and exporting country *j*, at time *t*. Following the style *importing country(i)-exporting country(j)*, six country pairs (bilateral groups) are created: Sweden-Denmark, Denmark-Sweden, Sweden-Finland, Finland-Sweden, Sweden-Norway, and Norway-Sweden. The treatment groups are Sweden-Denmark and Denmark-Sweden. The other four country pairs form the control groups. Because of the data availability and since the most extensive border measures were implemented in November 2015 and January 2016, the treatment is set to start by the first day of 2016. ($D^{\text{TREATMENT GROUP}} \times D^{\text{POST}}$) is the treatment dummy variable that takes on the value 1 for Sweden-Denmark and Denmark-Sweden in the years 2016, 2017, and 2018. Lastly, δ captures the effects from the border measures, and ε_{cijt} is an error term. To allow for differences between the modes of supply, separate regressions are run for every mode where the data are divided after the allocation of service categories by Eurostat (2020a).

Expanding the 2x2 DID model with fixed effects for country pairs, years, and service categories allows for additional controls. The *expanded DID model* drops the stand-alone dummy variables and can be described as

$$\ln(y_{cijt}) = \alpha_{ij} + \beta_t + \delta(D^{\text{TREATMENT GROUP}} \times D^{\text{POST}}) + \gamma_c + \varepsilon_{cijt} \quad (4)$$

where α_{ij} is a fixed effect for every country pair with respect to direction (i.e., Sweden-Denmark and Denmark-Sweden are two separate pairs), that captures all pair-specific characteristics that are constant across time. β_t is a time fixed effect that captures all year-varying factors that are common across the country pairs, such as business cycles and inflation. γ_c is a fixed effect for every service category, which is important to include because of the large differences in traded value among the service categories. Standard errors are clustered for services categories in all models for the same reason.

The DID model assumes that the only country-pair-and-time-specific effect is the treatment. This implies that other time-varying variables affect all groups identically. However, even though the Nordic countries are highly integrated, some other time-specific variables could affect one country more than others. Some of these differences can be accounted for by adding time-varying gravity variables. The gravity variables included are the mean annual exchange rate (EX) from the importing country's perspective, the natural logarithm of the importer's and exporter's populations (POP), and the natural logarithm of the annual gross domestic product (GDP) for the importing and exporting countries in nominal US dollars. This *gravity augmented DID model* is shown in equation (5) and is the preferred model of this paper.

$$\ln(y_{cijt}) = \alpha_{ij} + \beta_t + \delta(D^{\text{TREATMENT GROUP}} \times D^{\text{POST}}) + \gamma_c + \theta_1 EX_{tij} +$$

$$\theta_1 \ln(POP_{ti}) + \theta_3 \ln(POP_{tj}) + \theta_4 \ln(GDP_{ti}) + \theta_5 \ln(GDP_{tj}) + \varepsilon_{cijt} \quad (5)$$

5.3. Estimation Questions

For the DID-model to hold, it is assumed that all groups follow an *equal trend* before the treatment, which would continue in the absence of the treatment (Gertler, Martinez, Premand, Rawlings & Vermeersch, 2016). If it is violated, the trend will vary by partner country, and the DID estimator will be biased (Gertler et al., 2016). Although the equal trend assumption cannot be proved, its validity can still be assessed (Gertler et al., 2016). In this paper, two placebo DID tests are conducted. One in time, and one in space. If there is an equal trend, the placebo tests

should show that the fake treatment will have an insignificant impact on the outcome (Gertler et al., 2016).

The choice of control groups is made with the equal trend assumption in mind. It is reasonable to assume that Sweden's bilateral trade with Norway and Finland follow roughly the same trend as the trade with Denmark. The four Nordic countries are homogenous as they all have similar characteristics concerning the size of the economies, population, language, history, and culture. They are also all part of the Nordic Passport Union, the Schengen Area, and the EU or the European Economic Area (EEA). Additionally, by including both Norway and Finland, we acquire more observations for the control groups, which gives more data to analyze and more reliable estimations.

Also, for the DID estimator to be valid, it is vital that the border measures only affected Sweden's trade with Denmark. Therefore, some assumptions regarding the line of events must be clarified. First, Sweden's border measures were almost exclusively affecting travel to and from Denmark. Thus, the treatment can reasonably be assumed only to affect trade with Denmark. Second, Denmark, Finland and Norway did not implement any border controls to Sweden that made the travel from Sweden any more troublesome (see subsection 2.3.2). Thus, no other trade effects with Denmark, Finland or Norway are expected. Third, we assume that Sweden's border controls did not cause services trade with Denmark to be diverted to Norway or Finland. Thus, no indirect effect on trade with Norway and Finland are expected.

The regressions are performed with robust standard errors to account for possible serial correlation as recommended by Bertrand, Duflo, and Mullainathan (2004).

When log transforming data, zero-values are reported as missing. This could be a problem since values reported as zero could be small values rounded to zero (Santos Silva & Tenreyro, 2006). For our dataset, 826 observations are dropped. This drop could give inconsistent estimators (Santos Silva & Tenreyro, 2006).

5.4. Data

The empirical data are gathered from the International Trade in Services Database compiled by Eurostat (2020b), covering the period 2010-2018. The database contains repeated cross-section

data on the annual total traded value for various services categories (Eurostat, 2019). The categories follow the Extended Balance of Payment System 2010 (EBOPS 2010) described in the Manual on Statistics of International Trade in Services 2010 (MSITS 2010) (Eurostat, 2019). The data is derived from a sample based on a variety of surveys from banks, households, and enterprises that are conducted by national authorities following the methodology and accounting standards defined in the Sixth Edition of the International Monetary Fund's Balance of Payments and International Investment Position Manual (BPM6) (Eurostat, 2019). Nevertheless, the exact methods might differ between service categories and countries (Eurostat, 2019). There are currently difficulties in establishing a global administrative system where all traders agree to use the same standards and consistent definitions and measurement methods (UN et al., 2012). Thus, to enhance the comparability between the treatment and control groups, only data reported by Sweden is used. This data is gathered, processed, and published to Eurostat by Statistics Sweden (SCB) on behalf of the Riksbank (Sweden's central bank) as part of the national balance of payment account (Sveriges Riksbank, 2020).

There is a risk for measurement errors to be found due to the intrinsic characteristics of services. Services are more challenging to measure than trade in goods since services are not physical entities and thus more challenging to define and quantify (UN et al., 2012). For example, services can be embodied in goods (e.g., a DVD movie) or bundled with a good (e.g., a machine with after-sale service) (WTO, 2019). Additionally, several services are sometimes not distinguishable from goods. For example, distribution services are included in statistics on merchandise trade, not in services trade (UN et al., 2012). Therefore, the results in the analysis will be interpreted with extra caution. Note, however, that Eurostat checks for eventual inconsistencies and accuracy in the data by, for example, conducting asymmetry analysis (mirror statistics) on the trade flows from a reporting country and those of the partner countries (Eurostat, 2019).

The analyses are made separately for every mode of supply. All service categories are allocated to the modes following the Simplified Eurostat Model, which is based on recommendations from MSITS 2010 (Eurostat, 2020a). The Simplified Eurostat Model makes assessments for different EBOPS 2010 items and assigns them to one single or two weighted modes of supply (Eurostat, 2020a). Eurostat's assessments are made using assumptions based on expert opinion and evidence, and data from some EU countries (Eurostat, 2020a). All the analyzed service categories and their corresponding mode of supply are found in table A1 in the appendix. Some

subcategories in the Simplified Eurostat Model are not explicitly allocated to a mode of supply. For these items, we use the modes of supply assigned to the corresponding supercategory (the parent category containing the subcategory). Also, to not double-count, EBOPS 2010 items with available data in their subcategories are excluded. After clearing for superfluous data, we have 51 categories for Mode 1, 18 categories for Mode 2, and 23 categories for Mode 4. Note that the allocation does not allow for mode substitution. If a service category completely shifts its mode of supply, this would not be visible in the results. Mode substitution requires data on which mode of supply that all service activities are traded through, which is not available at this time.

In contrast to the other GATS modes of supply, data on commercial presence (Mode 3) are not included in countries' balance of payment systems as it is supplied locally by foreign affiliates (UN et al., 2012). Instead, trade through Mode 3 is measured differently and with the use of another statistical framework: Foreign Affiliates Trade Statistics (FATS), which can be complemented by statistics on FDI (UN et al., 2012). However, using a second statistical framework goes beyond what can fit in this paper. Furthermore, due to non-published and confidential data, relevant FATS statistics for this paper only include less than 200 observations (Eurostat, 2020c). Mode 3 is therefore excluded in the estimations and results.

The exchange rate data is collected from Sveriges Riksbank (2021). The data that constructs the population and GDP per capita variables are collected from the World Bank's World Development Indicators databank (World Bank, 2020).

6. Empirical Results

The empirical results are firstly presented and interpreted with the baseline estimations for the effects of the border measures. This is followed by placebo tests that assess the equal trend assumption, robustness tests that seek to evaluate the validity of the baseline results and lastly a test to explore heterogeneity in the data.

6.1. Baseline Estimations Per Mode of Supply

The econometric analysis' baseline estimation results are presented in tables 3-5 for each mode of supply.[7] The estimation results from the 2x2 DID are presented in column (a). The model is

[7] The regressions of the models are run in Stata/SE 16.1 for Mac (64-bit Intel)

expanded for each column moving to the right until column (d): the expanded DID model. Further estimations are also included in columns (e) to (g), where separate gravity variables are added. Finally, column (h) shows results from the gravity augmented DID model, which is this papers' preferred model and the only model used in the placebo tests, robustness tests and heterogeneity analysis. The estimated treatment effect (the DID estimator) is the coefficients on row $D^{\text{TREATMENT GROUP}} \times D^{\text{POST}}$.

Table 4: Baseline estimation Mode 1

Dependent variable: Value of imported services (natural logarithm)

Model:	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**
$\mathbf{D^{TREATMENT\ GROUP} \times D^{POST}}$	-0.077	-0.006	-0.008	-0.005	-0.006	0.007	0.027	0.017
	(0.436)	(0.923)	(0.911)	(0.943)	(0.934)	(0.917)	(0.690)	(0.820)
$\mathbf{D^{TREATMENT\ GROUP}}$	-0.011	-0.031	0.031					
	(0.922)	(0.723)	(0.717)					
$\mathbf{D^{POST}}$	0.057	0.201**						
	(0.593)	(0.017)						
Exchange rate					-0.007			0.109
					(0.931)			(0.292)
ln(POP Importer)						4.696		5.136
						(0.170)		(0.200)
ln(POP Exporter)						4.249		6.344
						(0.202)		(0.166)
ln(GDP Importer)							-0.269	0.312
							(0.631)	(0.637)
ln(GDP Exporter)							-0.438	-0.069
							(0.409)	(0.166)
Observations	2,275	2,275	2,275	2,275	2,275	2,275	2,275	2,275
R-squared	0.000	0.000	0.000	0.005	0.005	0.005	0.005	0.005
Category fixed effects	NO	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES	YES	YES
Bilateral fixed effects	NO	NO	NO	YES	YES	YES	YES	YES

p-values in parenthesis; * p<0.1, ** p<0.05, *** p<0.01; Service categories: 51

Table 4 shows the baseline estimations for Mode 1. In the 2x2 DID model (model a), we find an insignificant negative treatment effect. The post-treatment dummy is positive but insignificant, which means that we cannot find a difference in trade before and during the treatment. The treatment group dummy is insignificantly negative, showing that the difference in the trade value between the treatment and control groups is insignificant. Moving on, model (b) adds fixed effects for every service category. The post-treatment variable significantly indicates that all groups increased their trade with 22% in the post-treatment period.[8] This is

[8] Non-log variables' coefficients are recalculated by the formula $e^{\text{coefficient}} - 1$ when interpreted as a percentage impact on the outcome variable. For a 1% increase in the logarithmic gravity variables, outcome variable's expected increase is [coefficient × ln(1.01)].

probably due to an omitted variable positively correlated with time, such as GDP or inflation. Model (c) replaces the post-treatment dummy with year fixed effects. The expanded DID model (model d) adds fixed effects for every country pair. Building up to the gravity augmented DID model, model (e) also includes control for exchange rates with an insignificant negative value, model (f) includes control for population with insignificant positive values, and model (g) includes control for GDP with insignificant negative variables. Model (h) uses all gravity variables. Neither gravity variables can be proved to explain trade. In conclusion, we do not find that the border measures have influenced trade through Mode 1.

Table 5: Baseline estimation Mode 2

Dependent variable: Natural logarithm of value of imported services

Model:	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**
$D^{TREATMENT\ GROUP} \times D^{POST}$	0.305**	0.314**	0.314**	0.319**	0.283**	0.311**	0.238**	0.180
	(0.031)	(0.013)	(0.013)	(0.013)	(0.031)	(0.012)	(0.035)	(0.162)
$D^{TREATMENT\ GROUP}$	0.069	0.059	0.059					
	(0.629)	(0.672)	(0.676)					
D^{POST}	-0.037	0.035						
	(0.770)	(0.771)						
Exchange rate					-0.215			-0.223
					(0.196)			(0.162)
ln(POP Importer)						-6.627		0.993
						(0.227)		(0.218)
ln(POP Exporter)						1.907		1.906
						(0.757)		(0.796)
ln(GDP Importer)							0.938	0.993
							(0.187)	(0.129)
ln(GDP Exporter)							0.634	1.216
							(0.551)	(0.320)
Observations	794	794	794	794	794	794	794	794
R-squared	0.003	0.003	0.005	0.028	0.029	0.029	0.028	0.030
Category fixed effects	NO	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES	YES	YES
Bilateral fixed effects	NO	NO	NO	YES	YES	YES	YES	YES

p-values in parenthesis; * p<0.1, ** p<0.05, *** p<0.01; Service categories: 16

Table 5 shows the baseline estimations for Mode 2. In model (a), the DID estimator suggests that the border measures increased trade between Sweden and Denmark by 36%. The treatment-group dummy is insignificantly positive, and the post-treatment dummy is insignificantly negative. When adding fixed effects for service categories and years, the DID estimator increases to +37% (model b and c). The expanded DID model (model d) shows the highest estimated effect from the border measures: +38%. The exchange rate (model e) has an insignificant negative value. Population (model f) has an insignificantly negative value for the importing country and a positive value for the exporting country. The GDP variable (model g) shows an insignificant negative estimate. Compared to model (d), the inclusion of controls for

exchange rates, population, and GDP decreases the estimated effect from the border measures to +33%, +36%, and +27% respectively. N.B., gravity augmented DID model (model h) – the preferred and most advanced model – is the only model where the DID estimator is insignificant, with a p-value of 16.2%. In conclusion, the result indicates that the border measures had a positive impact on trade through consumption abroad.

Table 6: Baseline estimation Mode 4

Dependent variable: Value of imported services (natural logarithm)

Model:	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**
$D^{TREATMENT\ GROUP} \times D^{POST}$	-0.093 (0.584)	0.070 (0.410)	0.071 (0.407)	0.079 (0.365)	0.081 (0.394)	0.077 (0.369)	0.062 (0.542)	0.088 (0.501)
$D^{TREATMENT\ GROUP}$	0.120 (0.400)	0.056 (0.597)	0.055 (0.605)					
D^{POST}	-0.007 (0.965)	0.225** (0.042)						
Exchange rate					0.013 (0.913)			0.078 (0.647)
ln(POP Importer)						-2.333 (0.662)		-2.235 (0.718)
ln(POP Exporter)						0.473 (0.928)		1.945 (0.749)
ln(GDP Importer)							-0.019 (0.982)	-0.118 (0.893)
ln(GDP Exporter)							0.402 (0.598)	0.200 (0.816)
Observations	1,055	1,055	1,055	1,055	1,055	1,055	1,055	1,055
R-squared	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001
Category fixed effects	NO	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES	YES	YES
Bilateral fixed effects	NO	NO	NO	YES	YES	YES	YES	YES

p-values in parenthesis; * p<0.1, ** p<0.05, *** p<0.01; Service categories: 23

Table 6 shows the baseline estimations for Mode 4. Model (a) shows an insignificant negative effect from the border measures on trade through Mode 4. The treatment-group dummy is insignificantly positive, and the post-treatment dummy is insignificant negative. In model (b), the DID estimator turns positive, and the post-treatment dummy becomes significant with an estimated effect of 25% – meaning that all groups' trade is expected to increase during the treatment period. Again, this is probably due to an omitted variable positively correlated with time, such as GDP or inflation. Further controls are added for exchange rates (model e) with an insignificant positive value; population (model f) with an insignificant negative value for the importing country and an insignificant positive value for the exporting country; and GDP (model g) with an insignificant negative value for the importing country and an insignificant positive value for the exporting country. In conclusion, we do not find that the border measures caused enough disturbance for movement of natural persons to be affected.

6.1. Placebo Tests

To test the equal trend assumption, we conduct a placebo test in time where the post-treatment dummy activates in years prior to the border measures using the gravity augmented DID model. Data on the actual post-treatment period (2016-2018) are excluded so that the treated observations do not affect the regressions. Table 7 shows the DID estimators for nine regressions: three per mode of supply and three per the placebo treatment years 2011, 2013, and 2015. The insignificant placebo DID estimators supports the equal trend assumption, which strengthens the baseline results.

Table 7: DID estimations with placebo in time

Dependent variable: Value of imported services (natural logarithm)

Placebo year	**2011**			**2013**			**2015**		
Mode	**1**	**2**	**4**	**1**	**2**	**4**	**1**	**2**	**4**
$D^{TREATMENT\ GROUP} \times D^{POST}$	-0.162 (0.164)	0.226 (0.330)	0.024 (0.922)	-0.091 (0.360)	0.131 (0.503)	0.033 (0.858)	-0.064 (0.477)	0.198 (0.213)	0.110 (0.503)
Observations	2,275	794	1,055	2,275	794	1,055	2,275	794	1,055
R-squared	0.005	0.030	0.001	0.005	0.030	0.001	0.005	0.030	0.001

p-values in parenthesis; * p<0.1, ** p<0.05, *** p<0.01

To further test the equal trend assumption, we conduct a placebo test in space where we change and the treatment and control groups: Sweden-Finland and Finland-Sweden are the treatment groups, Sweden-Norway and Norway-Sweden are the control group. Sweden-Denmark and Denmark-Sweden are excluded. Table 8 shows the DID estimators for each of the mode of supply. Once again, the insignificant placebo estimations support the equal trend assumption. However, Mode 1 shows a "borderline" significant placebo DID estimator. This implies that the results for Mode 1 could be biased, but since the baseline regressions for Mode 1 find no surprising results, this is not analyzed further.

Table 8: DID estimations with placebo in space

Dependent variable: Value of imported services (natural logarithm)

Mode	**1**	**2**	**4**
$D^{TREATMENT\ GROUP} \times D^{POST}$	0.216 (0.106)	0.066 (0.768)	0.247 (0.189)
Observations	1,508	529	703
R-squared	0.010	0.035	0.003

p-values in parenthesis; * p<0.1, ** p<0.05, *** p<0.01

6.2. Robustness Tests

An alternative approach to the baseline estimation is to include all data simultaneously in the gravity augmented DID model, by adding mode fixed effects and interacting the DID estimator with the modes of supply. This version is beneficial since it makes use of all data and further examines the baseline estimations. There are no major changes in the estimation results for Mode 1 and Mode 4. For Mode 2, we now find an effect for the gravity augmented DID model as well, which is slightly smaller than the significant effects in the baseline estimations (+23%).

Table 9: Simultaneous DID estimations per mode of supply using all data

Dependent variable: Value of imported services (natural logarithm)

Mode 1 $\times \mathbf{D}^{\text{TREATMENT GROUP}} \times \mathbf{D}^{\text{POST}}$	-0.006 (0.943)
Mode 2 $\times \mathbf{D}^{\text{TREATMENT GROUP}} \times \mathbf{D}^{\text{POST}}$	0.207* (0.083)
Mode 4 $\times \mathbf{D}^{\text{TREATMENT GROUP}} \times \mathbf{D}^{\text{POST}}$	0.113 (0.185)

p-values in parenthesis; * p<0.1, ** p<0.05, *** p<0.01
Service categories: 69; Observations: 4,124; R-squared: 0.070

The border measures varied in extent during 2016-2018. Most notably, the ID-controls stopped in May 2017, and the efficiency in the conduction of both the border controls and ID-controls improved gradually over time. Therefore, by using separate DID estimators that activate in 2016, 2017, and 2018, it is possible to capture the border measures' effect in every year. Table 11 displays the regression results from the gravity augmented DID model with three DID estimators. Like the baseline estimations, no effect is found for Mode 1 and Mode 4. For Mode 2, a positive treatment effect is found for services trade in 2016 but not in 2017 and 2018. This implies that the treatment effect on Mode 2 occurred in 2016, and it did not change significantly in 2017 or 2018.

Table 10: DID estimations with separate treatment years

Dependent variable: Value of imported services (natural logarithm)

Mode	**1**	**2**	**4**
$\mathbf{D}^{\text{TREATMENT GROUP}} \times \mathbf{D}^{2016}$	-0.061 (0.480)	0.322** (0.022)	0.105 (0.416)
$\mathbf{D}^{\text{TREATMENT GROUP}} \times \mathbf{D}^{2017}$	0.204 (0.809)	0.189 (0.274)	0.008 (0.953)
$\mathbf{D}^{\text{TREATMENT GROUP}} \times \mathbf{D}^{2018}$	0.095 (0.421)	0.140 (0.905)	0.164 (0.297)
Observations	2,275	794	1,055
R-squared	0.005	0.030	0.001

p-values in parenthesis; * p<0.1, ** p<0.05, *** p<0.01

6.3. Heterogeneity Analysis

By using twelve DID estimators that activate in each service category, it is possible to capture the border measures' effect on the specific categories. This allows us to explore possible heterogeneity in the data and provide explanations for the baseline results. Since there are only a few data points per service category, the estimations are conducted on the twelve most aggregated supercategories. Table 5 shows the regression results from the gravity augmented DID model for the different service categories.

Table 11: Estimations for service categories

Dependent variable: Value of imported services (natural logarithm)

Service category	$D^{TREAT\ GROUP} \times D^{POST}$	Service category	$D^{TREAT\ GROUP} \times D^{POST}$
Manufacturing services on physical inputs owned by others	0.182** (0.028)	**Telecommunications, computers, and information services**	0.140 (0.262)
Maintenance and repair services n.i.e.	0.053 (0.510)	**Charges for the use of intellectual property n.i.e.**	-0.423 (0.620)
Transport	0.049 (0.733)	**Financial services**	0.488** (0.000)
Travel	0.142 (0.131)	**Other business services**	0.115 (0.258)
Construction	-0.154 (0.495)	**Personal, cultural, and recreational services**	0.173 (0.211)
Insurance and pension services	-0.235 (0.179)	**Government goods and services n.i.e.**	0.355*** (0.000)

p-values in parenthesis, * p<0.1, ** p<0.05, *** p<0.01; R-squared: 0.009; Observations: 3,177

We find no effect for nine of the twelve groups. A positive impact is found for *Manufacturing services on physical inputs owned by others*. Since this is completely allocated to Mode 2, it is in line with the baseline estimations and suggests no further heterogeneity in data. A substantial positive impact is found in *Financial services*, which is noteworthy since the category is fully allocated to Mode 1. This could be explained by an omitted variable: the Brexit referendum. Since the United Kingdom's dominant financial sector may have been hurt by the promise to leave the EU, a lot of trade in financial services could have been diverted to other countries (Thomas, Morris & Walker, 2021). Lastly, the positive impact for *Government goods and services n.i.e* is notable as it is allocated 75% in mode 1 and 25% in mode 4. The positive effect on trade in this category can perhaps be explained by increased collaboration between Sweden and Denmark in governmental matters when the border measures were implemented.

7. Conclusion

The purpose of this paper was to analyze how Sweden's border measures during the European refugee crisis affected trade in services between Sweden and Denmark. By using a difference-in-differences model, the empirical results do not show that the border measures affected trade through cross-border supply (Mode 1) nor presence of natural persons (Mode 4), but a positive effect on trade through consumption abroad (Mode 2).

The positive impact on Mode 2 is the most notable. Although we do not find a significant result with the preferred model in the baseline estimation, we do so in the robustness tests. This shows – contrary to the expectations from the theoretical framework and existing literature – that the border measures positively affected trade in services through consumption abroad. A possible explanation for this is that the border measures shed light on the possibility to consume on the other side of Öresund. Newspaper headlines and images depicting the border measures on the Öresund bridge might perhaps have worked as a reminder of the consumption possibilities in the neighboring country. As the border between the countries became more mentally present, people might have realized that they had taken the freedom of movement for granted and decided to utilize it. This "all attention is good attention"-explanation is something worth exploring for behavioral economists.

Alternatively, the positive effect found for trade through Mode 2 could the cause of some other, unknown, and simultaneous event. If this is the case, the models suffer from an omitted variable bias, which impacts the results' reliability. However, what this event could be is beyond the knowledge of the authors.

We conclude that there is no evidence for *less* trade in services because of the border measures – unlike the results from existing literature that cover bigger regions. This could be due to the deep economic integration in the Greater Copenhagen Area. Sweden and Denmark have signed multiple agreements to facilitate trade and the movement of people, the Öresund bridge has been built, and people have become accustomed to traveling between the countries. Because of this, more troublesome travels might not have sufficed to alter peoples' behavior. This implies that trade between Sweden and Denmark is more endurable to exogenous shocks than less integrated cross-border regions. Alternatively, the dissimilarity to the results in previous research – covering permanent introduction or removal of border controls – could stem from

the temporary character of Sweden's border measures. When promised that the border measures were temporary, cross-border travelers were perhaps willing to tolerate more cumbersome traveling procedures, and businesses might not have found it profitable to alter their operations. This implies that if people start perceiving the border controls as permanent, it could influence trade in the future.

Another interpretation of the results is that the border measures did hurt trade in services, but the data cannot capture it. The time-invariant allocation of service categories to modes of supply described by Eurostat's Simplified Model does not allow for mode substitution. A shift to e.g. video conferencing for Legal Services (EBOPS item SJ211; 75% allocated to Mode 1) – as suggested in the theoretical framework – is impossible to capture. This affects the results of all modes. Thus, even though Eurostat's Simplified Model seems to be the most sophisticated allocation model, it might not be replicating reality well enough. Moreover, the data could be insufficiently detailed to capture the effect on trade in services. The challenges in creating statistics on services might lead to some aspects being bypassed by researchers. For example, much variation is lost since the data is on an annual level only.

Data limitation is also the reason for the delimitation of trade through commercial presence (Mode 3) in the empirical analysis. If developments are made on datasets measuring FATS, studies on Mode 3 could prove unveiling – especially considering it is the dominant mode of supply.

Fortunately, projects to increase data availability have already been launched. For example, the WTO (2019) has created an analytical and experimental dataset for trade in services categorized by all four GATS modes of supply, named TISMOS (Trade in Services by Mode of Supply). This type of dataset allows for both empirical analysis of Mode 3 and mode substitution. Even though TISMOS is the first-ever extensive approximation on how much each of the four supplies traded, it could not be used in this study. Most importantly, it lacks bilateral trade data (WTO, 2019). Additionally, TISMOS is an "experimental" (WTO, 2019, p.24) analytical data set – not a statistical one – and is therefore not trustworthy enough to be used for econometric research. Thus, we welcome further efforts to improve statistics on trade in services and invite statistical offices to support this development. When more information becomes available, we encourage economists to analyze and develop new theories on trade in services since further research on the topic could potentially give rise to untapped welfare gains in the future.

Looking forward, restrictions of cross-border movement seem to be an increasingly recurring event. Even though the EU has declared the European refugee crisis over (Ranking, 2019), severe border measures are still in operation as this paper is written. What was initially a temporary withdrawal from the Schengen commitments in 2015 has gradually transformed into normality. Furthermore, as the COVID-19 pandemic shook the world in 2020, new border measures and severe travel restrictions have been implemented on a global scale (WTO, 2020). Hopefully, this paper provides enough incentives to encourage economists to analyze the impact of the COVID-19 travel restrictions on trade in services, and to assess whether (or to what extent) "all attention is good attention" can be used to explain the pandemic effects.

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9. Appendix

Table A1: Analyzed EBOPS 2010 Items Allocated to Mode of Supply

Level	EBOPS Item	EBOP Item Labels	Mode 1 (%)	Mode 2 (%)	Mode 4 (%)
2	**SA**	**Manufacturing services on physical inputs owned by others**		100	
2	**SB**	**Maintenance and repair services n.i.e.**		90	10
2	**SC**	**Transport**			
4	SC11	Sea transport; Passenger	100		
4	SC12	Sea transport; Freight	100		
4	SC13	Sea transport; Other than passenger and freight		100	
4	SC21	Air transport; Passenger	100		
4	SC22	Air transport; Freight	100		
4	SC23	Air transport; Other than passenger and freight		100	
4	SC31	Other modes of transport; Passenger	100		
4	SC32	Other modes of transport; Freight	100		
4	SC33	Other modes of transport; Other than passenger and freight		100	
4	SC3A	Space transport	100		
5	SC3B1	Rail transport; Passenger	100		
5	SC3B2	Rail transport; Freight	100		
5	SC3B3	Rail transport; Other than passenger and freight		100	
5	SC3C1	Road transport; Passenger	100		
5	SC3C2	Road transport; Freight	100		
5	SC3C3	Road transport; Other than passenger and freight		100	
5	SC3D1	Inland waterway transport; Passenger	100		
5	SC3D2	Inland waterway transport; Freight	100		
5	SC3D3	Inland waterway transport; Other than passenger and freight		100	
4	SC3E	Pipeline transport	100		
4	SC3F	Electricity transmission	100		
4	SC3G	Other supporting and auxiliary transport services		100	
3	SC4	Postal and courier services	100		
3	SCA	All modes of transport; Passenger	100		
3	SCB	All modes of transport; Freight	100		
4	SCC1	All modes of transport; Other than passenger and freight; Other than Postal and courier services		100	
2	**SD**	**Travel**			
3	SD1	Travel; Goods (Travel)		100	
3	SD3	Travel; Accommodation services		100	
4	SDA1	Travel; Business; Acquisition of goods and services by border, seasonal, and other short-term workers		100	
4	SDA2	Travel; Business; Other than acquisition of goods and services by border, seasonal, and other short-term workers		100	
4	SDB1	Travel; Personal; Health-related		100	
4	SDB2	Travel; Personal; Education-related		100	
4	SDB3	Travel; Personal; Other than health-related and education-related		100	
2	**SE**	**Construction**			
3	SE1	Construction abroad			90
3	SE2	Construction in the reporting economy			90
2	**SF**	**Insurance and pension services**			
4	SF11	Life insurance	100		

Level	EBOPS Item	EBOP Item Labels	Mode 1 (%)	Mode 2 (%)	Mode 4 (%)
4	SF12	Freight insurance	100		
4	SF13	Direct insurance other than life and freight insurance	100		
3	SF2	Reinsurance	100		
3	SF3	Auxiliary insurance services	100		
3	SF4	Pension and standardized guarantee services	100		
2	**SG**	**Financial services**			
3	SG1	Financial services explicitly charged and other financial services	100		
2	**SH**	**Charges for the use of intellectual property n.i.e.**			
3	SH1	Franchises and trademarks licensing fees	100		
3	SH2	Licences for the use of outcomes of research and development	100		
2	**SI**	**Telecommunications, computers, and information services**			
3	SI1	Telecommunications services	100		
3	SI2	Computer services	75		25
4	SI31	News agency services	100		
4	SI32	Information services other than news agency services	100		
2	**SJ**	**Other business services**			
5	SJ111	Provision of customized and non-customized research and development services	75		25
5	SJ112	Sale of proprietary rights arising from research and development	75		25
4	SJ12	Research and development services other than work undertaken on a systematic basis to increase the stock of knowledge	75		25
5	SJ211	Legal services	75		25
5	SJ212	Accounting, auditing, bookkeeping, and tax consulting services	75		25
5	SJ213	Business and management consulting and public relations services	75		25
4	SJ22	Advertising, market research, and public opinion polling services	75		25
5	SJ311	Architectural services	75		25
5	SJ312	Engineering services	75		25
5	SJ313	Scientific and other technical services	75		25
4	SJ32	Waste treatment and de-pollution, agricultural and mining services		50	50
4	SJ33	Operating leasing services	100		
4	SJ34	Trade-related services	100		
4	SJ35	Other business services n.i.e.	75		25
2	**SK**	**Personal, cultural, and recreational services**			
3	SK1	Audiovisual and related services	75		25
4	SK21	Personal, cultural, and recreational services other than audiovisual and related services; Health services	75		25
4	SK22	Personal, cultural, and recreational services other than audiovisual and related services; Education services	75		25
4	SK23	Personal, cultural, and recreational services other than audiovisual and related services; Heritage and recreational services	75		25
4	SK24	Personal, cultural, and recreational services other than audiovisual and related services; Personal services other than health, education and heritage and recreational services	75		25
2	**SL**	**Government goods and services n.i.e.**			
3	SL1	Embassies and consulates	75		25
3	SL3	Government goods and services n.i.e. other than embassies and consulates and military units and agencies	75		25