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20 years with the Schengen Area

- Does it boost trade?

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Abstract

The Schengen Agreement was implemented 1995 between seven nations, making it easier for Europeans to travel and work by removing internal borders. The area has expanded since its inception and today includes 26 nations. Internal borders have, however, been reintroduced in the aftermath of the refugee crisis. An interesting question is therefore whether the Schengen Agreement brought any benefits to the trade with goods. This thesis investigates if the Schengen Agreement has increased bilateral trade with goods. The author uses a gravity model and estimates it with a Poisson pseudomaximum-likelihood estimator. The results suggest that import value increases with 3.6 percent if the both countries are a part of the Schengen area.

Key words: Schengen, Trade, SITC, Border Controls, Gravity Model

Table of Contents

1. Introduction

As a consequence of the current refugee crisis and terrorist attacks in Europe, Schengen members have reintroduced border controls and in some cases even fences to their neighboring countries. The external borders have proved to be insufficient due to the massive number of refugees and migrants that have arrived to Europe. This has led to countries reintroducing internal border controls within the Schengen area. One of the core principles of the Schengen Agreement is to have no internal border within the Schengen Area, while having a common external border instead before entering the area (European Commission, 2016:b).

'The Schengen area and cooperation are founded on the Schengen Agreement of 1985. The Schengen area represents a territory where the free movement of persons is guaranteed. The signatory states to the agreement have abolished all internal borders in lieu of a single external border.' (EUR-Lex, 2016).

The main purpose of the Schengen Agreement was to allow European citizens to travel, work and move across Europe without being subject to border controls. The agreement was signed in 1985 and the Schengen area was introduced in 1995. The Schengen area has been expanded during the years by including more nations; in the beginning it only involved seven EU-countries (European Commission, 2016:a). The removal of border controls (i.e. creating a passport free zone) would make it easier for both goods and people to flow freely across the borders (European Commission, 2016:b).

As Europe is now facing the reintroduction of border controls one might wonder what the Schengen area actually has accomplished in terms of trade with goods. Did countries that signed the Schengen Agreement accomplish more cross-country trade with other Schengen members? Might this effect differ by sector?

In this paper I aim to contribute to the relatively limited literature on this topic with new insights on how trade with goods are affected by an area without internal borders

but also contribute to the discussion about a Europe without Schengen. Therefore, this study aims at answering the research question:

What impact does the Schengen Agreement have on bilateral trade with goods and what sectors are affected by the Schengen Agreement?

In order to answer the question I use a gravity model, which is established in previous research as one of the most effective models in the discipline of international economics and economic integration see for example: Felbermayr et al. (2016), Davis and Gift (2014), Bourdet and Persson (2014). When using the gravity model as a tool I then study the bilateral trade flows with goods among the European countries to be able to evaluate if being a member of the Schengen area leads to an increase in the members import value. As a further contribution this paper also studies trade patterns to find out if the Schengen Agreement affects any sectors specifically. In order to conduct this study data on disaggregated level on import values is used. Just as previous studies in the field of trade and economic integration, this thesis use a Pseudo Poisson maximum-likelihood estimator with fixed effects. An advantage with the Poisson estimator is that it solves the problem with zeros in trade data, which otherwise would be major estimation problem (WTO and UNCTAD 2012).

The main findings in this paper after performing the baseline estimation and several robustness checks is that being a member of the Schengen area indeed does have a positive impact on trade.

The disposition of this thesis is as following: The second section is designed to give the reader a deeper knowledge about the Schengen Agreement. That is followed by a theoretical section, which discusses through what mechanisms the Schengen Agreement may affect trade. The fourth section reviews the previous research on the topic. The fifth section outlines the methodology, data and the econometric setup. The sixth section discusses and analyzes the empirical findings. The last section summarizes the thesis and also discusses what further research should focus on.

2. Schengen

This section discusses background and history of Schengen. It gives an overview of what the Schengen Agreement includes and when the countries signed the agreement, since it has been extended during the years involving more nations. It also discusses the problems the Schengen Agreement faces today in the aftermath of the refugee crisis.

2.1 Background on Schengen

The Schengen Agreement, named after a small village in Luxemburg, was first introduced in 1985 involving five countries: Belgium, France, West Germany, Luxemburg and the Netherlands. The main purpose with the Schengen Agreement was to make it easier for European citizens to travel across the European countries to work or live i.e. the creation of an area without internal borders. Even if the principle of free movement of people had been discussed before, the signing of the Schengen agreement made it possible to later on abolish internal border controls (European Commission, 2016:a).

It took ten years before the actual Schengen Area was fully in action. During that time a convention involving a set of regulations on how to implement the Schengen Agreement was signed in 1990. The agreement was fully applied in 1995 with then only seven member states from the European Union. During the time before the implementation of the agreement in 1995 both Spain and Portugal had also decided join (Schengen Visa Info, 2016). Table 1 presents the European countries that have signed and implemented the Schengen Agreement. One thing to observe is that the European countries that have implemented the Schengen Agreement are not all members of EU.

The Schengen Agreement involves a set of rules that nations, which have signed the agreement, should follow. First, there should be no internal borders across the countries to make it easy for both goods and people to cross borders. Instead there are external borders that have strict rules on how to enter the Schengen area, such as visas required depending on how long the stay is for a non EU-member and what documents

that are needed. There are also rules regarding how border controls are administrated. There is also collaboration across the borders with the police and the judicial authorities. The members also have a common information system called the Schengen Information System (SIS) (European Commission, 2016:a).

Table 1. Countries that have signed and implemented the Schengen Agreement. Source: European Commission, 2016:c.

Countries that have signed the Schengen Agreement	Implementation of Schengen Agreement
Austria	1997
Belgium	1995
Czech Republic	2007
Denmark	2001
Estonia	2007
Finland	2001
France	1995
Germany	1995
Greece	2000
Hungary	2007
Iceland	2001
Italy	1997
Latvia	2007
Liechtenstein	2011
Lithuania	2007
Luxemburg	1995
Malta	2007
Netherlands	1995
Norway	2001
Poland	2007
Portugal	1995
Slovakia	2007
Slovenia	2007
Spain	1995
Sweden	2001
Switzerland	2008

The Schengen Agreement is implemented by 26 nations in Europe today. As previously mentioned, the purpose of the Schengen Agreement was to make it easier for European citizens to travel and work across countries. The Schengen area is 4.3 million square kilometers and includes more than 400 million people (Davis and Gift,

2014). Figure 1 is a map of Europe illustrating the nations that are members of the European Union and have implemented the Schengen Agreement, nations that are not members of the European Union and have implemented the Schengen Agreement, nations that are members of the European Union and have not implemented the Schengen Agreement and nations that candidates to join the Schengen Area.

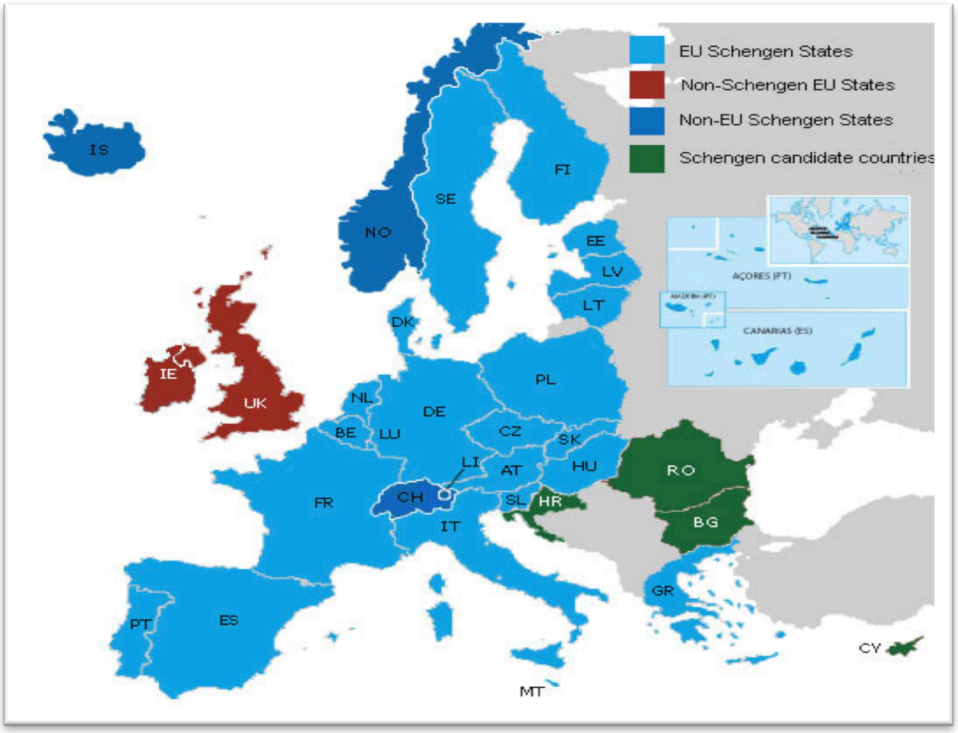

Figure 1. A European map marking the EU members that have implemented the Schengen Agreement, the Non EU-members that have implemented the Schengen Agreement, the EU-members that have not implemented the Schengen Agreement and countries that candidates to be a part of the Schengen area. Source: European Commission, 2016:a

A clarification of what the purpose of implementing the Schengen Agreement was as follows. By abolishing the internal borders the aim was to make it easier for European citizens to travel across the European countries either as tourists or to move and join the labor force. It also aimed to make it easier for goods to be transported without being subject to border controls (European Commission, 2016:b). The internal borders were to be replaced with external borders where the members have common rules regarding entry in the Schengen Area for non-European citizens and where there is cross-country collaboration with law enforcement.

2.2 Schengen Today

In the aftermath of the refugee crisis internal border controls have been reintroduced temporarily since the external borders have proven insufficient (European Commission, 2016:b). There is an exception in the Schengen Agreement, which now has been applied, that permits for a temporary reintroduction of internal borders (Aussilloux and Le Hir, 2016). Sweden, Germany, Belgium, Denmark, Hungary, Austria, Slovenia and Norway have utilized temporary border controls as of the fall of 2015. Hungary and Slovenia stopped their controls later during the fall. As a consequence of the terrorist attacks in November 2015 France also reintroduced border controls (European Commission, 2016:b).

This temporary reintroduction affects all those European citizens that commute to their jobs by crossing a border, which today are 1.7 million people (European Commission, 2016:b). It also affects the transport of goods and has led to traffic jams. The border checks cause delays both for workers and freight transports. This would also affect the tourist sector both for travelling Europeans but also for non-Europeans if the harmonized Schengen Visa rules changes, since the visa today allows for travel across the Schengen area (Aussilloux and Le Hir, 2016).

3. Theory

The purpose of this section is to find out through what mechanisms a membership in Schengen may affect trade with goods. Border controls are in this paper defined as passport and other identification controls. Three different theoretical aspects are outlined in this part. First the transport of goods through freight transports, where the driver physically crosses a border. The second is that Schengen aims to make it easier for European Citizens to settle down in another European country for either a short or a long period of time. Persons that are migrating have preferences and want to consume goods from their native country, which should have an impact on imports for the country of residence. The third is that persons who are moving across borders also tend to bring knowledge about both foreign markets and languages as well as having

already established social networks, which should have an effect on the bilateral trade flows.

3.1 Transport of Goods across Borders

There are around 57 million transports through a border with goods each year in the Schengen zone and people crossing the borders accounts for 3.5 million every day. This includes commuters and tourists (Karakas, 2016). Transporting goods across borders with passport controls is assumed to increase trade costs due to delays and time spent in queues (Gatto et al. 2016). The increasing trade costs involve paying higher wages for the drivers transporting the goods, since time is spent showing passports at borders (Luecke, 2016).

Road transport delays would also affect businesses and retailers. For example in some businesses just-in-time deliveries are essential and stores might need to fill warehouses to fulfill the demand for certain goods (Böhmer et al. 2016). Research on Schengen argues that border controls affects trade with goods negatively through delayed road transports. The European Commission (2016:b) suggests that the extra costs due to delays in transports will be between €1.7 to € 7.5 billion each year. A conclusion made is then that an area without border controls has a positive impact on trade.

That time delays affect trade in a negative way is established in previous studies regarding trade procedures. Delays might make goods inferior and might also bring uncertainty on when the goods will be in stock. These arguments primarily refer to that trade procedures such as transporting goods through customs where the freight is searched create delays when trading (Bourdet and Persson, 2012). Due to temporary border controls the drivers of the cargo must show personal identification as compared to before when only the freight was checked. Even if showing a passport is assumed to be a quicker procedure than searching a cargo, this still results in time delays. This will likely affect the value of goods being transported and have an impact on trade.

3.2 Preferences

When settling down in another country immigrants tend to increase the imports for the country of residence due to preferences for goods from their native country. This is especially the case for differentiated goods (Law et al., 2013). Some products might be geographically special such as Bordeaux wine and Italian ice cream. A French settling down for work in Italy will still demand wine from France and an Italian will still demand ice cream from Italy. Even if Italy produces wine, the cultural or historical context makes the French want to drink Bordeaux wine. This could also lead to people seizing business opportunities and start selling Bordeaux wine in Italy. A French workers taste might in that way influence the Italian populations preferences as well (Davis and Gift, 2014).

3.3 Information

The person that is settling down in another country possesses a lot of information about its native country. That information might be in regulations, institutions or language that could reduce a non-tariff barrier. The immigrant would also possess knowledge about the native country's markets and business practices, which is important when trading with differentiated goods. The information would reduce the transaction costs, which could have a positive impact on both import and exports for both countries i.e. increasing the bilateral trade. Furthermore, immigrants may also have great social networks that possess both information and contacts that also could reduce transaction costs (Law et al., 2013).

The person migrating to another country for example to work might also acquire information about efficient production methods from the country of origin. This could decrease the production costs for companies and retailers by importing components or products and exploring the markets in the country of residence. It could also be the opposite, meaning that if there are more efficient production procedures in the country of residence than in the native country, this could lead to an entry on the export market to seize opportunities in the country of origin (Davis and Gift, 2014). Another aspect is that trade negotiation costs might be reduced through social networks by establishing a trust between the trading parties i.e. knowing when the goods are being delivered and

when the payment is going to be received. Building relationships between countries through information and knowledge is likely to have a positive impact on both imports and exports (Gould, 1994). Wagner et al. (2002) suggests that nations might find new trading opportunities by establishing a relationship through migrants.

3.4 Main Theoretical Hypotheses

The main theoretical hypotheses are that being a member of Schengen should have an impact on trade through three different mechanisms, all connected to movement of persons across borders. Primarily, road transporters of goods not needing to show a passport when crossing a border would imply a decrease in trade costs since the goods will be delivered faster. The buyers would also have more certainty in knowing when the goods will be in stock. The second implication refers to the benefits from a working person migrating for a short or a long period of time. The taste for country specific products might increases imports for the country of residence. Furthermore, having knowledge and a social network might establish new trading relationships.

4. Previous Research

This section outlines previous research on Schengen and discusses the results. The studies are presented in chronological order. One thing to point out is that most studies have been conducted in the aftermath of the reintroduction of internal borders. This section also briefly discusses previous research on the linkage between migration and trade.

Davis and Gift (2014) examines if the Schengen agreement has had any positive trade effects on European trade due to the labor mobility associated with Schengen. The main purpose is to see how and if cross-country trade has changed as a consequence of implementing the Schengen Agreement. The data set spans over 31 years (1980-2011) and includes 36 nations of EU-members, countries that have signed the Schengen Agreement and countries that might be joining the EU. When the authors studied the country pairs they used bilateral trade flow as a dependent variable. The two independent variables of interest are a Schengen dummy, which assumes the value 1 if

both countries have implemented the Schengen Agreement and 0 otherwise, and a variable defining total migration. The second variable is designed to capture how many individuals that actually are migrating by observing their citizenship and what nation they are settling down in. Davis and Gift (2014) use a gravity model and a Poisson pseudomaximum-likelihood (PPML) estimator. Their results show that being a member of Schengen boosts trade through labor mobility. Furthermore, the authors find that when both parties have implemented the Schengen Agreement, the bilateral trade increases yearly with 10 percent. When only studying imports, their results suggest that if both countries have implemented Schengen, this will have a positive effect on imports with approximately 15 percent.

A report by Aussilloux and Le Hir (2016) studies the short-term potential effects of imposing internal border controls within the Schengen zone with an emphasis on France. They use a best- and worst-case scenario simulating the extra costs due to reintroduced borders. This includes checking truck drivers' identification and checking the freight. The best-case scenario is additional waiting time at the border assumed to be 30 minutes while the worst-case scenario is additional waiting at the border assumed to be 60 minutes. The authors use data on volumes of goods transported by lorries to France by other Schengen countries and volumes of goods transported by lorries to other Schengen countries from France. They do also use data on value of time both in goods and for hauler. Their forecasting simulation results suggest that for both imports and exports internal border controls would yield in the best case scenario additional costs of €62 million and in the worst-case scenario €124 million assuming that the same number of trucks are incoming and outgoing.

Böhmer et al. (2016) investigate the macroeconomic effects of a collapsed Schengen, by assuming that the reintroduced border controls leads to an increase in import prices. The basis for their argument is that the additional time it takes to deliver the goods due to border controls implies an additional cost. They use two different scenarios to study what the effects might be in 2025 by using the global simulation and forecasting model VIEW with data from 2016. The study focuses primarily on Germany but also at the European Union as a whole. The two scenarios are an increase in import prices with 1 percent versus an increase with 3 percent in intra-industry European trade. Both scenarios would yield an economic loss for Germany and the rest of the European

countries. As one can imagine, GDP growth would be affected negatively but the authors also emphasize that some stores that are depending on just-in-time delivers would also be affected. The paper written by Böhmer et al. (2016) focuses primarily on the macroeconomic effects by assuming that import prices increases due to reintroduced borders. But since research focusing solely on Schengen and trade effects is limited there might still be some valid points on how the whole economy would be affected by introducing borders

Felbermayr et al. (2016) investigates if the Schengen agreement has had any effect on trade flows, if the removal of internal border controls has increased trade. The authors use a gravity model and Poisson Pseudo Maximum Likelihood as an estimation method. Their sample consists of 40 countries during the time period 1995-2011. Felbermayr et al. (2016) use data on both goods and services when studying the bilateral trade flows. They do also use expenditure data and sectorial output data. A big difference compared to the study done in this thesis and the one done by Davis and Gift (2014) is that Schengen, the main independent variable, is not defined by being a dummy. It is rather defined as count variable involving how many Schengen borders that are crossed when different country pairs trade. The authors argue that countries that are not members of Schengen may still find Schengen valuable due to lower transit costs. The results obtained shows that Schengen has a positive impact on trade; the greatest effect in goods and on average Schengen increases trade with 3 percent. As the authors predicted Schengen do also have a positive impact on non-Schengen countries Russia and Turkey.

Parsons (2005) studies if EU-expansion countries migration to EU-15 countries has any effect on EU-15 countries bilateral trade flows. The time period is 1994 to 2001 involving 15 EU-expansion countries and the EU-15 countries, which results in 225 country pairs. The variable of interest is the immigration stock, which is data on individuals migrating from a EU-expansion country to a EU-15 country. The author uses a gravity model studying the imports and exports of goods to and from EU-15 countries. The author conducted pooled OLS estimations to find out if there are any trade effects. The results suggest that immigration from 15 EU-expansion countries to EU-15 countries positively affect both imports and exports in EU-15 countries.

Law et al. (2013) article studies the relationship between trade and migration in New Zeeland. This was done to find out if New Zeeland would benefit from increased trade by people migrating in and out of the country. The authors used a gravity model in their study and a panel data set of 190 countries during 1981 to 2006. The authors use a Heckman selection model to deal with the zero trade values in the data. The results obtained suggest that migration increases trade and might also establish new trade relationships. The greatest effect is on imports; meaning that migrants preferences for specific goods from their native countries have a great impact and even establishes new trading. Furthermore, differentiated goods tend to be traded more. The authors argue that immigration increases trade through two different channels: 'immigrant preferences effect' and 'transactions costs'.

Overall, previous research suggests that Schengen has a positive effect on trade (see for example Davis and Gift (2014) and Felbermayr et al. (2016)). Furthermore, the trade and migration literature suggest that migration has a positive effect on both imports and exports due to preferences but also through information, that may reduce trade costs.

5. Methodology

This section presents the methodology. The first chapter describes the empirical model and the variables. An explanation of the variables and their definition is outlined in the first part. The second part discusses the estimation and estimation issues. The last part describes the data and sample used in this paper.

5.1 Empirical Model

The gravity equation, which is used in the gravity model, helps explaining the volume of bilateral trade flows. Jan Tinbergen discovered this phenomenon between trade, distance and wealth in 1962, which is related to Newton's gravity theory. This means that wealthy countries trade more, especially with the countries nearby. The reason is that countries trade in proportion to their wealth but also with countries that are

geographically close. The gravity model is the so-called workhorse in the international economic discipline (WTO and UNCTAD 2012).

The gravity model in its multiplicative form is represented in equation (1) where T_{ij} represents trade flow from country *i* and to country *j*, *Y* is the countries GDP and *D* is the distance and $\beta_0, \beta_1, \beta_2$ and β_3 as unknown parameters. Equation (1) states that T_{ij} is proportional to *Y* and inversely proportional to *D* (Santos Silva and Tenreyro, 2006).

$$T_{ij} = \beta_0 Y_i^{\beta 1} Y_j^{\beta 2} D_{ij}^{\beta 3} \quad (1)$$

$$lnT_{ij} = ln\beta_0 + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 lnD_{ij} + \varepsilon_{ij} \quad (2)$$

A log-linearized version of the gravity equation is represented in equation (2) where ε_{ij} is the error term. The gravity equation needs to be log-linearized in order to be able to conduct a OLS estimation. The model has been extended with more variables such as multilateral resistance terms to better reflect the economic theory (Santos Silva and Tenreyro, 2006) (Shepherd, p.29 2013).

$$lnIM_{ijtd} = \beta_1 + \beta_2 lnGDPcap_{it} + \beta_3 lnGDPcap_{jt} + \beta_4 lnGDP_{it} + \beta_5 lnGDP_{jt} + \beta_6 lnDistance_{ij} + \beta_7 ComBorder_{ij} + \beta_8 ComLanguage_{ij} + \beta_9 Schengen_{ijt} + \tau_t + \gamma_{ij} + \varepsilon_{ijtd} \quad (3)$$

Equation (3) represents the specification of the augmented gravity model log linearized[1]. To do a correct interpretation of the dummy variables they need to be recalculated as suggested[2]. 'It follows that $\frac{X_{ij}(1)}{X_{ij}(0)} = \exp(a)$ which in turn implies that the percentage change in trade value due to the dummy switching from 0 to 1 is:

[1] The multiplicative form of equation (3) is used when the specification is estimated with the Poisson Estimator.

[2] In this thesis it is calculated as exp(b)-1 since parameter β is used instead of α.

$X_{ij}(1) - \frac{X_{ij}(0)}{X_{ij}(0)} = \exp(a) - 1$ '(WTO and UNCTAD 2012, p.134). The other coefficients are viewed as elasticities. One example on how to analyze the coefficients might be to study how much the import value is affected with a one percent increase in distance. Imagine that distance has the value -0.35, which will implies that a one percent increase in the distance will have a diminishing effect on the import value with 0.35 percent (WTO and UNCTAD 2012). The augmented gravity model used in this study has its inspiration from Davis and Gift (2014). There are some variables that differ between this study and the study conducted by them, one example being that this study has import value as the main dependent variable and do not include immigration. Furthermore, this study also includes GDP per capita, which Davis and Gift (2014) choose not to include.

As another extension of the study conducted by Davis and Gift (2014) disaggregated data is used in this thesis on imports with 1-digit SITC codes to examine if any commodity group is more affected through the Schengen area. The Standard International Trade Classification (SITC) is a system designed for trade data at a disaggregated level. It involves five levels with different categories of commodities. There are 1-digit SITC codes that have 10 lines; this type of disaggregated data categorizes products into 10 different sections[3]. The other levels of detailed data are divisions with 2-digit SITC codes, groups with 3-digit SITC codes, subgroups with 4-digit SITC codes and down to basic headings with 5-digit SITC codes. An example of a 1-digit section is section 1: 'Beverages and Tobacco' which have two divisions 'Beverages'(11) and 'Tobacco and tobacco manufactures'(12). 'Beverages' (11) is then divided to groups including 'Alcoholic Beverages' (112) which then have subgroups that is divided into basic headings (WTO and UNCTAD 2012).

The main dependent variable is the import value, which is represented as IM_{ijtd}, where *d* represents import in 1-digit SITC codes between country *i* that imports and country *j* that exports in the country pair and *t* is a subscript for each time period during the bilateral trade.

The main independent variable in this study is the *Schengen Dummy*. The dummy is defined as such it assumes the value 1 if both countries are part of the Schengen area

[3] See Table 2 for the products categorized in 1-digit SITC codes.

in year *t*, otherwise the dummy assumes the value 0. A prediction of the result with the basis of previous research is that the Schengen dummy will yield a positive coefficient[4].

Furthermore, GDP_{it} and GDP_{jt} are other independent variables included in the augmented gravity model. GDP_{it} is the GDP for the importing country at a certain time period while GDP_{jt} is the GDP for the exporting country at a certain time period. The economic intuition behind including them in the model is that rich countries tend to trade more, meaning that a high GDP has a positive impact on trade. In other words, the importing countries GDP can be seen as demand while the exporting countries GDP might be seen as supply (WTO and UNCTAD 2012).

$GDPcap_{it}$ and $GDPcap_{jt}$, where i denotes the importing country and j denotes the exporting country at year *t*, are associated with the economic standard a country have but also depending on how big the population. '…two countries with considerably different populations may have similar GDPs but totally different economic development' (Kepaptsoglou et al., p.3, 2010). This statement summarizes the need to include GDP per Capita, since it is a good indicator of consumption level in the countries (Kepaptsoglou et al., 2010).

The independent variable distance, $Distance_{ij}$, is the distance in kilometers between each country in the country pair. Since a great distance between two countries often implies higher trade costs, the variable is assumed to have a negative impact on trade, showing a negative coefficient (Shepherd, pp.10, 29-30, 2013) (WTO and UNCTAD 2012).

Another independent variable is common language, $ComLanguage_{ij}$, which assumes the value 1 if the countries in the country pair share a common language, otherwise it assumes the value 0. This dummy is a good proxy on what or if there are any information costs. Two countries that share a common language and trade with each other are assumed to face lower trade costs, due to a reduced language barrier (WTO and UNCTAD 2012).

[4] Note that to be able to interpret the Schengen coefficient it needs to be calculated as: exp(b)-1. Without recalculating the value the sign on the coefficient may be interpreted, indicating a positive or a negative effect (WTO and UNCTAD 2012).

Another dummy that takes trade costs into account is if the trading countries share a border, $ComBorder_{ij}$. The dummy assumes the value 1 if the country pair has a common border, while it assumes the value 0 if they do not share a border. Costs to transport goods are assumed to increase with distance and this dummy is related to the variable distance. This means that a country pair that shares a common border is assumed to have low transport costs (WTO and UNCTAD 2012). Both sharing a border and sharing a language is assumed to have a positive impact on trade and should yield positive coefficients. The error term in equation (3) is represented as ε_{ijt} (Shepherd, pp.10, 29-30, 2013).

In this thesis pair fixed effects, denoted as γ_{ij} in equation (3), are used. Furthermore time-fixed effects, are also included in the estimation to account for economic and financial booms and busts. This variable is denoted as τ_t (WTO and UNCTAD 2012). As alternative approaches, both importer fixed effects and exporter fixed effects are used to account for unobserved heterogeneity across exporters and importers (Shepherd, p.33, 2013).

5.2 Estimation Issues and Estimation

By estimating a gravity model one must also be aware of the possible issues that may arise. The first estimation issue to be aware of is zero trade flows, i.e. zeros in trade data. This means that there is no recorder bilateral trade during one time period and the import value is then zero. Log linearizing a gravity model will then be a problem since the log of 0 is not defined and observations will be dropped. The results obtained when estimating a log linearized gravity model will then be inconsistent. The problem with dropping zero values is that the zeros might be small values rounded to zero, meaning that there might exist bilateral trade but it is small or there is actually no trade between the countries. Furthermore, zeros could also be incorrectly reported as missing observations (Santos Silva and Tenreyro, 2006) (WTO and UNCTAD 2012).

Another difficulty that may occur when studying trade relationships is that all variables in the gravity model might not be exogenous. Using country pair fixed effects can solve the endogeneity problem. To further explain, countries that join the Schengen area might already have an established trade relationship, which makes it

more likely for them to implement the Schengen Agreement since their trading partners have implemented it. This could indicate that there exists a correlation between the disturbance term and the Schengen dummy, meaning that there are some unobserved characteristics describing the country pairs trade relationship and the incentive to join the Schengen area. The countries might have other things in common that increases trade such as similar regulations (WTO and UNCTAD 2012). 'In a panel the use of (country-pair) fixed effects can help to overcome part of the endogeneity problem due to the omitted variable bias, although time-varying omitted variables remain a problem.' (WTO and UNCTAD, p.118 2012).

Heteroskedasticity is a usual problem when dealing with trade data and estimating the gravity model. The disturbance term being heteroskedastic might lead to biased and inconsistent results when using OLS as estimation method, violating one of the assumptions that need to be fulfilled when using OLS (Shepherd, p. 51, 2013). '…then the expected value of the error term depends on one or more of the explanatory variables because it includes the variance term.' (Shepherd, p. 51, 2013). Estimating the gravity model with different estimation methods in the presence of heteroskedasticity will yield diverse results (Santos Silva and Tenreyro, 2006).

Another estimation issue when estimating gravity models is unobserved heterogeneity, meaning that there are some unobserved characteristics in the country pair which is not accounted for in the model. Both the estimates and the standard errors will not be correct when using OLS. A common approach to tackle the problem when having panel data is to use fixed effects. This comes at a cost, since degrees of freedom will be lost (Dougherty, pp. 411-413, 2007).

The main estimation method used in this thesis is a Pseudo Poisson maximum likelihood estimator. The argument for using that estimation is threefold; first of all it is a well established estimation method in the academics of international economics. Secondly, it deals with zero trade flows since the gravity model is used in its multiplicative form i.e. the main problem with log of 0 not being defined disappear. Lastly, the problem with heteroskedasticity is also dealt with by not linearizing the gravity model. The Pseudo Poisson maximum likelihood estimator is robust when dealing with heteroskedasticity and it also gives consistent estimates when using fixed

effects (Shepherd, p.28, 52 2013) (Santos Silva and Tenreyro, 2006). This approach has been found to be successful in many studies for example those conducted by Bourdet and Persson (2012) and Westerlund and Wilhelmsson (2011) were both studies use fixed effects Pseudo Poisson maximum likelihood estimation and find it being robust.

Another alternative method used to deal with zero trade flows is to do an Ordinary Least Square (OLS) regression and dropping all zero trade values. But this could lead to inconsistent results since the zeros either could be rounded down to small trade values or there actually do not exist any trade during that time period between the two countries. Furthermore, missing values that are reported as zeros might also lead to inconsistent results. To summarize, the greatest problem when doing an OLS regression is that the results might be inconsistent, only randomly distributed zeros and no zero trade flows would lead to consistent results (Santos Silva and Tenreyro, 2006) (WTO and UNCTAD 2012).

Another way to attack the problem with zero trade flows is to use a Tobit estimator, and adding a constant such as 1 to the log zero trade value. But this might give misleading results since some zero trade flows actually represent zero trade between a country pair (WTO and UNCTAD 2012). Both the OLS estimator and Tobit estimator will be used as robustness tests in this thesis. Another estimator used to check the robustness is a negative binomial model that for example Bourdet and Persson (2012) used in their study. When using this estimator, zero trade values do not need to be dropped since the model does not need to be log linearized. This can be seen as a good alternative to the Pseudo Poisson maximum likelihood. Furthermore, this estimator gives consistent results when dealing with heteroskedasticity (Burger et al., 2009). The downside with the negative binomial model is that result in different scales will not yield the same results e.g. millions of Euros and thousands of Euros. Another downside that the Pseudo Poisson maximum likelihood estimator does not suffer from is that the distribution of the data when using a negative binomial model must have a greater variance than the mean (Shepherd, p.54 2013).

With that basis, Pseudo Poisson maximum likelihood estimator is probably the best approach to take. Furthermore, the similar study conducted by Davis and Gift (2014)

also argues that this approach is most suitable. Both pair fixed effects and year fixed effects will be used in the baseline estimation. The other estimation methods described will be used as robustness. Other alternative approaches to test the results will be to use importer and export fixed effects.

5.3 Data and Sample

A panel data set that includes 31 countries during the time span 1980 to 2014 is used in this thesis. Data on the dependent variable, import value, comes from UN Comtrade Database and is expressed in nominal US dollars. The data is collected in all 1-digit Standard International Trade systems Classifications (SITC)[5] codes for commodities and are from the second revision. Table 2 presents a list of the ten categories of commodities included in the 1-digit SITC sections. Disaggregated data is used to examine if all commodity groups are affected in the same way through the Schengen area. One thing to keep in mind is that there might not be bilateral trade in every category of products, meaning that some trade values might be zero (WTO and UNCTAD 2012).

Table 2: Commodity sections, 1-digit SITC codes. Source: United Nations Statistics Division, 2016.

Standard International Trade Systems Classifications (SITC)
0. Food and Live animals
1. Beverages and Tobacco
2. Crude materials, inedible, except fuels
3. Minerals fuels, lubricants and related materials
4. Animal and vegetable oils, fats and waxes
5. Chemicals and related products
6. Manufactured goods classified chiefly by material
7. Machinery and transport equipment
8. Miscellaneous manufactured articles
9. Commodities and transactions not classified elsewhere in the SITC

[5] A further explanation on SITC is to be found in section 5.1.

The sample consists of countries[6] that are members of the European Union but also countries that solely are a part of the Schengen area and that are not members of the European Union. The sample of countries[7] is represented in Table 3. There are 28 countries[8] that are members of the European Union and the ones that are not members of the union are Iceland, Norway and Switzerland (European Union, 2016).

Table 3: The sample of countries in used in the data set

	Country Sample	
Austria	Greece	Norway
Belgium	Hungary	Poland
Bulgaria	Iceland	Portugal
Croatia	Italy	Romania
Cyprus	Ireland	Slovakia
Czech Republic	Latvia	Slovenia
Denmark	Lithuania	Spain
Estonia	Luxemburg	Sweden
Finland	Malta	Switzerland
France	Netherlands	United Kingdom
Germany		

Information on the main independent variable $Schengen_{ijt}$, is collected from the European Commission (2016:c). The information consist of what nations that have implemented the Schengen Agreement and which year they implemented it. That information is of great importance, since the dummy is assumed to take the value 1 when both countries are a part of the Schengen area. For example, the Netherlands implemented the Schengen Agreement in 1995 while Sweden implemented it in 2001. The Schengen dummy for the country pair Sweden and Netherlands will then take the value 1 from 2001 to 2014 and have the value 0 before Sweden implemented the agreement.

[6] Trade data for Belgium and Luxemburg are until 1998 bundled together. I have created a synthetic country 'BELLUX' for the years 1980-1998 where I use Belgiums distance, common border and language and calculated the countries GDP by adding both Belgiums and Luxemburgs GDP to get the total GDP for 'BELLUX' and added both countries populations and then dividing 'BELLUX' total GDP with 'BELLUX' total population. This country does not exist from the year 1999 and forward i.e. after that there is both Belgium and Luxemburg.

[7] Trade data on the Schengen country Liechtenstein was difficult to find and did not exist in UN COMTRADE database. This country is the only Schengen country that is not included in the sample.

[8] The European countries have not always existed in the same way as they do today. The sample is larger after the fall of the Berlin Wall and after the Soviet Union dissolved; before the countries exist they are missing observations and treated as missing observations in the sample.

Other independent variables are $GDPcap_{it}$, $GDPcap_{jt}$, GDP_{it}, and GDP_{jt} are collected from the World Bank Development Indicators Database. All the variables are expressed in nominal US dollars since the import value are expressed in that as well. Data on the bilateral variables distance, common border and common language are collected from CEPII database.

6. Empirical Results

This section outlines the empirical results. It also discusses problems that occurred during the estimation. The results are presented in different chapters where there is also a discussion connecting the empirical evidence with the theory. Further robustness checks are presented in the appendix. This section has a brief summary in the end where the most important empirical results are emphasized.

6.1 Baseline Estimation

The results from the baseline estimation are presented in Table 4 in column (a). The main estimation in this thesis is a Pseudo Poisson maximum likelihood estimation with year and pair fixed effects. Due to collinearity, when using pair fixed effects *Distance*, *Common Border* and *Common Language* are dropped.

GDP Importer and *GDP Exporter* are both significant in the baseline estimation, but *GDP Importer* is only significant at a five percent level while *GDP Exporter* is significant at a one percent level. The coefficient show a negative sign for both variables which indicates that a one percent increase in *GDP* for the importing country would lead to a decrease in the import value with approximately 0.54 percent. The same interpretation goes for *GDP Exporter*. These results go against economic theory, which states that richer countries trade more, and are concerning[9]. Furthermore, *GDP per Capita Importer* and *GDP per Capita Exporter* are both significant at a one percent level in the baseline estimation when using both pair and year fixed effects. The results imply that an increase in *GDP per Capita Importer* and *GDP per Capita Exporter,* i.e. the purchasing power, would have a positive effect on the import value.

[9] In order to see if GDP importer and GDP exporters coefficients are affected by including GDP per Capita, I do a the baseline estimation without including GDP per Capita. The results are found in table 2 in Appendix.

The main independent variable of interest, the *Schengen Dummy*, is only significant at a ten percent level. The coefficient is positive which indicates that countries with all else equal will trade more when both parties are members of the Schengen Agreement then when at least on of them is not. To do a further interpretation of the variable, a recalculation needs to be done: $e^{0.0356} - 1 = 0.036$. This means that the import value increases with 3.6 percent if the country pair has signed the Schengen agreement. This goes in line with previous research, where for example Felbermayr et al. (2016) also find that Schengen has a positive impact on trade, with on average 3 percent on trade with goods. One thing to point out is that the Schengen variable is not defined in the same matter as Felbermayr et al. (2016) but the result obtained is close to theirs. Hence, here is only a ten percent level of significance.

Table 4: Baseline results

IMPORTS in nominal USD	(a)	(b)	(c)	(d)	(e)
Distance				-0.575***	-0.505***
				(0.0638)	(0.0559)
Common Border				0.472***	0.413***
				(0.0849)	(0.0670)
Common Language				0.231**	0.430***
				(0.0988)	(0.0948)
GDP Importer	-0.536**	-1.077***	-0.434*	-0.648	0.766***
	(0.266)	(0.182)	(0.227)	(0.407)	(0.0191)
GDP Exporter	-0.891***	-1.690***	-0.755***	0.734***	-0.943*
	(0.241)	(0.201)	(0.216)	(0.0266)	(0.524)
GDP per Capita Importer	1.321***	1.886***	1.074***	1.419***	-0.200***
	(0.247)	(0.166)	(0.225)	(0.384)	(0.0497)
GDP per Capita Exporter	1.729***	2.402***	1.445***	-0.0465	1.812***
	(0.236)	(0.186)	(0.222)	(0.0800)	(0.503)
Schengen Dummy	0.0356*	0.0526**	0.0935***	0.165***	0.0809**
	(0.0192)	(0.0213)	(0.0168)	(0.0563)	(0.0336)
Observations	216,791	216,879	216,791	216,879	216,879
R-squared		0.307			
Pair Fixed Effect	YES	YES	YES	NO	NO
Exporter Fixed Effect	NO	NO	NO	NO	YES
Importer Fixed Effect	NO	NO	NO	YES	NO
Year Fixed Effect	YES	YES	NO	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Column (a) is the baseline Poisson estimation with fixed pair and year effects. Column (b) is the OLS baseline estimation with pair and year fixed effects. Column (c) is the baseline Poisson estimation with pair fixed effects. Column (d) is the baseline Poisson estimation with importer and year fixed effects. Column (e) is is the baseline Poisson estimation with exporter and year fixed effects.

6.2 Robustness Test 1: OLS Estimation

The results presented in Table 4 column (b) are the baseline estimation when using OLS with year and pair fixed effects as an estimation method. There is a slight difference in the numerical values when comparing this regression to the baseline regression when using the Poisson estimation, although the coefficient shows the same sign as in (a). In the OLS estimation all variables except the *Schengen Dummy* are significant at a one percent level while the *Schengen Dummy* is significant at a five percent level.

Still, *GDP Importer* and *GDP Exporter* have a negative coefficient while *GDP per Capita Importer* and *GDP per Capita Exporter* have a positive coefficient indicating that an increase in GDP per Capita has a positive effect on trade. Furthermore, as mentioned in the previous section, the bilateral variables *Distance, Common Language* and *Common Border* are dropped due to collinearity. However, the *Schengen Dummy* has a positive effect with 5.4 percent on the import value when a country pair has signed the Schengen agreement. This result shows a slightly higher increase in the import value than the one from the baseline regression and also with a higher significance level at five percent.

6.3 Robustness Test 2: Baseline Estimation without Year Fixed Effects

Table 4 column (c) show the results obtained when using the baseline estimation Poisson with only pair fixed effects. All results are significant at one percent level except *GDP Importer* that is only significant at a ten percent level. The coefficients show the same sign as in the previous estimations, with a difference in the values. A conclusion made is that when not using year fixed effects, the *Schengen Dummy* obtains the highest value so far and is also significant at a one percent level. The result implies that the import value increases with 9.8 percent if both countries are a part of the Schengen Area.

6.4 Robustness Test 3: Baseline Estimation with Importer Fixed Effects

Column (d) in Table 4 presents the result when using the Poisson estimation with importer and year fixed effects to check the robustness in the results obtained. The bilateral variables *Distance, Common Language* and *Common Border* are not dropped since there is no perfect collinearity when not using pair fixed effects. *GDP Importer* and *GDP per Capita Exporter* are not significant at any level. The other variables are significant at a one percent level except *Common Language*. *GDP Exporter* and *GDP per Capita Importer* have a positive coefficient implying that an increase with one percent in either *GDP Exporter* or *GDP per Capita Importer* has a positive impact on the import value with 0.734 percent and 1.419 percent, respectively. This goes more in line with economic theory than the results obtained for GDP when using pair fixed effects.

Furthermore, the bilateral variables: *Distance, Common Language* and *Common Border* do all show the expected sign and goes in line with economic theory. Having a great distance implies a negative effect on the import value, while sharing a common border or a common language has a positive effect on the import value. The main variable of interest, the *Schengen Dummy,* has positive coefficient just as it has in the other estimations signaling that being a member of Schengen has a positive impact on trade. When using importer fixed effects, the result implies that being a member of the Schengen Agreement increases the import value with 18 percent. To conclude, when controlling for importer specific effects and year effects, the coefficient for Schengen shows the strongest effect on import value. The sign on the coefficient is the same as in the previous estimations, which is contributing as a good basis for the other results. Furthermore, this result is in line with the results obtained by Davis and Gift (2014). Their results suggest that both countries signing the Schengen Agreement should increase the import value with approximately 15 percent.

6.5 Robustness Test 4: Baseline Estimation with Exporter Fixed Effects

Column (e) in Table 4 presents the results obtained when using PPML with exporter and time fixed effects. All variables in the estimation are significant even if *GDP Exporter* only significant at a ten percent level and the *Schengen Dummy* is only significant at a five percent level. The other variables, however, are significant at a one percent level. The variables *Distance, Common Language* and *Common Border* do, as in the estimation when using importer fixed effects, show the expected sign. Sharing a *Common Language* or having a *Common Border* can be seen as decreasing the trade costs, which have a positive impact on the import value. *Distance* on the other hand has a negative impact on trade, which also is confirmed since sharing a border affect trade in a positive direction.

GDP Importer shows a positive sign, which was expected from the beginning and is confirmed in international trade theory. Furthermore, *GDP per Capita Importer* has a negative coefficient. As mentioned in the previous section, GDP per Capita is an indicator of both the population but also about the consumption level. Meaning that an increased population in the importing country would have a negative effect on the import value. While on the other hand an increase in the population in the exporting country implies a positive effect on the import value. It is difficult to do more of an interpretation of the results since it contradicts the result found in the previous regressions. Furthermore, *GDP Exporter* shows a negative coefficient, which it has done in the previous estimations when using pair fixed effects[10]. The main independent variable, the *Schengen Dummy*[11], show a positive coefficient. The results show that when both trading countries have implemented the Schengen Agreement, the import value increases with 8.4 percent.

[10] Observe, *GDP Exporter* is only significant at a ten percent level and it has a positive coefficient when using importer fixed effect.

[11] Observe, the *Schengen Dummy* is only significant at a five percent level.

6.6 Robustness Test 5: Baseline Estimation Without GDP per Capita

Table 2 in the appendix shows the results obtained when excluding GDP per Capita in the baseline estimation. Both *GDP Importer* and *GDP Exporter* have positive coefficients in all estimations, which go in line with economic theory, and are significant at a one percent level. Furthermore, the *Schengen Dummy* is also significant at a one percent level in all estimations except the one using exporter and year fixed effects. However, as in the other estimations, countries with all else equal trade more when both parties are members of the Schengen Agreement, than when at least one of them is not. The bilateral variables *Distance, Common Language* and *Common Border* show the expected sign in (d) and (e).

6.7 Further Robustness Tests

To further check the robustness in the results obtained in this thesis some more robustness test are conducted and presented in the appendix. Table 3 column (a) show the results obtained when using a pair and year fixed effects negative binomial estimation. This approach is among some researchers seen as a complement to the Poisson estimation. The *Schengen Dummy* has a positive coefficient at a one percent significance level in the negative binomial estimation, stating that signing the Schengen agreement has a positive impact on the import value. Table 3 column (b) show the result obtained from the Tobit estimation. The result at a one percent significance level goes in line with earlier results obtained and implies that Schengen has a positive effect on trade. Column (c) and Column (d) are the OLS estimations when using importer, exporter and year fixed effects. In both estimations the *Schengen Dummy* is found to be significant at a one percent level and having a positive sign. The results in Table 3 give the baseline[12] estimation further robustness and implies that countries with all else equal will trade more when both parties are members of the Schengen Agreement than when at least one of them is not.

Table 4 in the appendix presents the result when using pair and year fixed effect with the dependent and the main independent variable. Column (a) is a Poisson estimation

[12] Observe that the Schengen Dummy is only significant at a ten percent level in the baseline estimation.

where the *Schengen Dummy* is significant at a one percent level and has a positive sign. This gives further strength to the other results, while the OLS estimation in (b) is not significant but still goes in line with the rest of the results obtained in this study.

6.8 Baseline Estimation with Separate Sectors

Table 5 show the results obtained with the baseline estimation when using Poisson for the ten different SITC[13] commodity groups. The prediction for studying the different commodity groups is that some goods should be more sensitive to time delays. For example food, which might become inferior and bad if it is not delivered in time. Due to the reason that pair fixed effects are used, the bilateral variables for distance, sharing a common border and a common language are dropped. When studying the different commodity groups separately, the results are less significant than the studies conducted on the aggregated level. In the estimations[14] where the results for *GDP Importer* and *GDP Exporter* are significant at a one percent level the coefficient show the same negative sign as in the baseline equation in Table 5 column (a). Furthermore, the variables *GDP per Capita Importer* and *GDP per Capita Exporter* do also show the same positive sign as in the baseline Poisson estimation where they are significant[15] at a one percent level.

The main variable of interest, the *Schengen Dummy,* is significant at a one percent level in the estimations where the 1-digit SITC commodity groups are 'Food and Live animals', 'Beverages and Tobacco' and 'Manufactured goods classified chiefly by material'. The same estimations as where GDP and GDP per capita are significant at a one percent level.

The *Schengen Dummy* has a positive impact with 16.4 percent on the import value for 'Food and Live animals' if the country pair has signed the Schengen agreement. This goes in line with theory that refers to food being rather sensitive to delays such as border controls due to the risk that it becomes bad. For example, fruit and other vegetables may become inferior if the transport gets stuck in line at a border control. The same analysis goes for 'Beverages and Tobacco' where the import value increases

[13] See table 1 for the 1-digit SITC codes

[14] Estimations with the SITC-codes:0, 1,2,5,6,7

[15] Estimations with the SITC-codes:0, 1,2,5,6,7

with 24.6 percent if the country pair has signed the Schengen agreement. Furthermore, if the country pair are Schengen members the import value for 'Manufactured goods classified chiefly by material' for example leather goods increases with 8.4 percent. There is no need to discuss the other estimations since the main independent variable of interest; the *Schengen Dummy* is not significant.

Table 5: Baseline Poisson estimation with year and pair fixed effects, 1-digit SITC codes

IMPORTS in nominal USD	SITC 0	SITC 1	SITC 2	SITC 3	SITC 4	SITC 5	SITC 6	SITC 7	SITC 8	SITC 9
Distance										
Common Border										
Common Language										
GDP Importer	0.487	0.254	-1.335***	1.135	-1.100	-0.999**	-1.401***	-1.501***	0.0923	9.384**
	(0.475)	(0.594)	(0.506)	(0.801)	(0.860)	(0.462)	(0.325)	(0.356)	(0.562)	(4.637)
GDP Exporter	-1.820***	-2.905***	-0.680	-0.523	-0.589	0.214	-1.705***	-2.894***	-0.0733	-3.853*
	(0.456)	(0.641)	(0.439)	(0.911)	(0.754)	(0.344)	(0.477)	(0.413)	(0.494)	(2.180)
GDP per Capita Importer	0.481	0.626	2.125***	-0.655	1.527**	1.563***	2.117***	2.386***	0.800*	-7.091*
	(0.448)	(0.591)	(0.502)	(0.844)	(0.772)	(0.443)	(0.304)	(0.329)	(0.475)	(3.846)
GDP per Capita Exporter	2.442***	3.696***	0.971**	0.237	1.378	0.691*	2.282***	4.200***	0.575	5.423**
	(0.465)	(0.730)	(0.436)	(0.835)	(0.914)	(0.392)	(0.447)	(0.403)	(0.452)	(2.190)
Schengen Dummy	0.152***	0.220***	0.0469	0.0322	0.0251	0.00279	0.0813***	0.0493	-0.00659	0.237
	(0.0426)	(0.0535)	(0.0406)	(0.0928)	(0.0836)	(0.0319)	(0.0266)	(0.0324)	(0.0340)	(0.188)
Observations	23,267	20,946	22,707	19,408	16,892	23,379	23,716	23,730	23,813	18,933
Pair Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6.9 Empirical Summary

When summarizing the results obtained in the various econometric estimations conducted in the previous parts only one conclusion can be made; namely that the *Schengen Dummy* has a positive coefficient and is significant in almost every estimation except the one when studying the commodity groups. As presented above, the main independent variable of interest makes it possible with help of the data to draw the conclusion that countries with all else equal will trade more when both parties are members of the Schengen Agreement than when at least on of them is not.

Furthermore, studying disaggregated data gives a good indication of which commodity groups that are affected the most in a region with no internal borders. 'Food and Live animals', 'Beverages and Tobacco' and 'Manufactured goods classified chiefly by material' are found to be affected positively by Schengen membership at a one percent significance level. The result is expected since food and beverages might lose quality with time.

The results also goes in line with previous research where both Davis and Gift (2014) and Felbermayr et al. (2016) find that the Schengen area has a positive impact on trade. Furthermore, Aussilloux and Le Hir (2016) find that reintroducing internal borders will yield higher trade costs, which can be analyzed as not having internal borders consequently have a positive impact on the bilateral trade. The mechanisms that affect trade can be the preferences from people migrating for a short or a long period of time demanding differentiated goods from the country of origin such as Bordeaux wine. Another mechanism might be that a person settling down for work in another country possesses information about markets and have social networks, which establish new trade relationships.

7. Summary and Further Research

The aim of this thesis was to investigate if the bilateral trade has increased due countries implementing the Schengen Agreement. As an extension, disaggregated data was used on 1-digit SITC commodity groups.

With the three theoretical hypotheses: transporting goods across borders, preferences and information the assumption is that the Schengen Area should boost trade. Along with the theoretical basis, previous research also suggests that Schengen should yield a positive effect on trade. The results obtained with the baseline Poisson model goes in line with previous research. The baseline results show that countries with all else equal will trade more when both parties are members of the Schengen Agreement then when at least on of them is not. The import value increases with 3.6 percent if both countries have implemented the agreement. Davis and Gift (2014) find that if both countries are joining the Schengen area boost the imports with 15 percent. The baseline result obtained in this thesis goes more in line with the one found by Felbermayr et al. (2016), which states that Schengen on average boosts trade with 3 percent.

Several other estimations are conducted to check the robustness in the result. The significant results obtained when studying the 1-digit SITC commodity groups also show a positive coefficient, and implies that Schengen has a positive effect on trade. For example Schengen has a positive impact with 16.4 percent on the import value for 'Food and Live animals'. This result is expected since delays might reduce the quality on food.

It is assumed that new trade relationships are established by making it easier for people to settle down in another country. Schengen has made it easier for people to cross borders and migrate. The immigrants might possess information about foreign markets and efficient production methods, which give companies incentives to enter the export market. Furthermore, immigrants' preferences for specific goods from their country of origin are assumed to further increase trade. Transporting goods across borders is assumed to go faster when there are no traffic jams due to showing the passport when entering another country.

A general conclusion made that free movement of persons is beneficial in many ways. This study has solely focused on trade and finds that the passport free area has an

overall positive effect on trade. Another interesting aspect to do more research on would be how the Schengen area has affected the service sectors and the four different modes of supply in services.

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Appendix

Table 1: Variables and Definitions

Variable	Definition and Data Source
Imports	*Imports in nominal USD. Data source: UN Comtrade Database*
GDP	*GDP in nominal USD. Data source: World Bank (2016)*
GDP per capita	*GDP in nominal USD divided with Population. Data source: World Bank (2016)*
Distance	*Distance in km between the two largest cities in two countries. Data source: CEPII (2016)*
Common border	*Dummy variable that is defined as 1 if two countries share a common border. Data source: CEPII (2016)*
Common official language	*Dummy variable that is defined as 1 if two countries share a common official or primary language. Data source: CEPII (2016)*
Schengen Dummy	*Dummy variable that is defined as 1 if two countries has joined the Schengen Area. Computed by the author using information from the European Commission (2016:c).*

Table 2: Baseline results

IMPORTS in nominal USD	(a)	(b)	(c)	(d)	(e)
Distance				-0.570***	-0.480***
				(0.0691)	(0.0635)
Common Border				0.478***	0.448***
				(0.0860)	(0.0647)
Common Language				0.212**	0.341***
				(0.0908)	(0.0851)
GDP Importer	0.789***	0.941***	0.571***	0.743***	0.735***
	(0.0473)	(0.0414)	(0.0407)	(0.0837)	(0.0139)
GDP Exporter	0.789***	0.778***	0.579***	0.728***	0.789***
	(0.0566)	(0.0410)	(0.0434)	(0.0212)	(0.123)
Schengen Dummy	0.0725***	0.105***	0.0929***	0.165***	0.0606*
	(0.0203)	(0.0218)	(0.0170)	(0.0561)	(0.0332)
Observations	216,791	216,879	216,791	216,879	216,879
R-squared		0.298			
Pair Fixed Effect	YES	YES	YES	NO	NO
Exporter Fixed Effect	NO	NO	NO	NO	YES
Importer Fixed Effect	NO	NO	NO	YES	NO
Year Fixed Effect	YES	YES	NO	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2: Column (a) is the baseline Poisson estimation with fixed pair and year effects. Column (b) is the OLS baseline estimation with pair and year fixed effects. Column (c) is the baseline Poisson estimation with pair fixed effects. Column (d) is the baseline Poisson estimation with importer and year fixed effects. Column (e) is is the baseline Poisson estimation with exporter and year fixed effects.

Table 3: Further robustness checks

IMPORTS in nominal USD	(a)	(b)	(c)	(d)
Distance	-0.220***	-1.386***	-1.436***	-1.295***
	(0.00520)	(0.0494)	(0.0508)	(0.0453)
Common Border	0.328***	1.097***	0.695***	0.848***
	(0.0124)	(0.118)	(0.0653)	(0.0690)
Common Language	0.0684***	0.0107	0.0121	-0.00678
	(0.0151)	(0.134)	(0.0988)	(0.104)
GDP Importer	0.100***	0.594***	-1.078**	0.841***
	(0.00201)	(0.0181)	(0.435)	(0.0130)
GDP Exporter	0.236***	0.775***	1.055***	-1.648***
	(0.00204)	(0.0183)	(0.0138)	(0.607)
GDP per Capita Importer	0.129***	0.0762***	1.901***	-0.180***
	(0.00367)	(0.0204)	(0.416)	(0.0319)
GDP per Capita Exporter	0.0749***	-0.0834***	-0.0844***	2.263***
	(0.00361)	(0.0206)	(0.0303)	(0.554)
Schengen Dummy	0.157***	0.138***	0.341***	0.218***
	(0.00499)	(0.00845)	(0.0396)	(0.0355)
Observations	216,791	216,879	216,879	216,879
R-squared			0.579	0.534
Pair Fixed Effect	YES	NO	NO	NO
Exporter Fixed Effect	NO	NO	NO	YES
Importer Fixed Effect	NO	NO	YES	NO
Year Fixed Effect	YES	NO	YES	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Column (a) is a negative binomial estimation with year and pair fixed effects. Column (b) is a Tobit estimation. Column (c) is a OLS estimation with importer and year fixed effects. Column (d) is a OLS estimation with exporter and year fixed effects.

Table 4: Poisson and OLS

IMPORTS in nominal USD	(a)	(b)
Schengen Dummy	0.0984***	0.00762
	(0.0223)	(0.0228)
Observations	228,93	229,015
R-squared		0.289
Pair Fixed Effect	YES	YES
Year Fixed Effect	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Column (a) is the Poisson estimation with the dependent variable import value and independent variable, the Schengen Dummy. Column (b) is the OLS estimation with the dependent variable import value and independent variable, the Schengen Dummy.