Gravity Model: The Commercial Exchange between Spain and Germany

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Abstract

The Gravity Model is a highly useful tool to study international trade between countries and understand which the factors are affecting it. Spain and Germany are two European Union countries with decades of commercial exchange between them. The methodology will be a regression model using numerical data regarding GDP, exports, and distance, among others. This study aims to apply the Gravity Model to understand how these two countries behaved regarding trade during the mandate of one of the key European Leaders of all times: Angela Merkel. Did the chancellor widen or shorten the distance between the two countries? This study shows that a new leader doesn't necessarily affect the realtionship between one country and another as there may be other factors affecting it.

El Modelo de Gravedad es una herramienta altamente útil para poder estudiar en comercio internacional entre países y lograr entender cuales son los factores que le afectan. España y Alemania son dos países que forman parte de la Unión Europea con décadas de intercambio comercial entre ellos. La metodología que se usará será un modelo de regresión usando datos como el PIB, exportaciones, distancia, entre otros. Este estudio tiene como objetivo aplicar el Modelo de Gravedad para entender cómo esos dos países procedieron en términos de intercambio comercial durante la presidencia de una de las líderes europeas clave: Angela Merkel. ¿Fue la canciller responsable de ensanchar o acortar las distancias entre los dos países? Este estudio apunta a que un líder nuevo no implica un efecto asegurad en la relación entre un país e otro ya que pueden haber otros factores afectándola.

El Model de Gravetat és una eina immensament important per a poder realitzar l'estudi sobre el comerç internacional entre països i arribar a entendre quins són els factors que afecten aquest. Espanya i Alemanya són dos països que formen part de la Unió Europea amb dècades d'intercanvi comercial entre ells. La metodologia emprada serà un model de regressió a partir de dades com ara el PIB, les exportacions, la distància, entre d'altres. Aquest estudi té com a objectiu aplicar el Model de Gravetat per entendre el comportament d'aquests dos països en termes d'intercanvi comercial durant la presidència d'una de les líders europees més emblemàtiques de tots els temps: Angela Merkel. Fou la canceller la responsable d'ampliar o reduir les distàncies entre els dos països? L'estudi señala que un nou líder no implica un efecte sobre la relació entre un país i un altre podent a ver-hi altres factors afectant-la.

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1. Theoretical Framework

a. Introduction:

It is of common knowledge that international trade plays a crucial role in the globalized world we live in nowadays. The European Union's origins are built on commercial alliances grounds, and so it has been since the 50s.

In a constant evolving and changing world it is crucial to understand how trade between countries work and what affects these, to put into practice certain policies and rules to allow an easy flow of trade and empower the economies of all countries involved in this movement of goods or services (Shepherd, 2016).

A tool to study the effects of trade policies between countries is the Gravity Model, which also provides a useful testing point of view where trade impacts and in different places that can be portrayed on.

The model has been used to evaluate trade-related policies and it has become the point from which all research questions with a policy component began from.

Having attained a series of micro-founded theoretical bases, after being introduced as an intuitive explanation, those bases have affected how data, specification and econometric techniques used to shape the model (Deardroff, 1995).

The countries that will be analyzed are both part of the European Union, which initiated with the European Coal and Steel Community, a post-war organization aiming to regulate trade between coal and steel. Not all 27 current countries started during the 50s -when the treaty was put into practice-, but they have been joining the Union and entering the European Economic Area, which grants the countries the freedom to trade between excluding tariffs and in a less challenging way.

One of the countries of analysis, Spain, entered the European Union in the year 1986 while Germany, on the other hand, was one of the *"founding fathers"* of the EU, which has allowed them to play an important role in the organization and in the decision-taking processes it has involved in throughout the years.

b. History:

For the past fifty years it can be observed how the model has been the focus of many studies and has allowed many international trade publications to be issued.

Many analyses have been carried out in literature, but a meta-analysis on the effect of distance on trade was performed and directly related trade flows with economic size and inversely with trade costs (Disdier & Head, 2008).

Furthermore, they established geographical distance as a measure of transport costs, allowing to demonstrate a pattern between international trade and production.

The effect of tariffs that are imposed at the border seem to also cover behind-the border barriers as well (Kimura & Lee, 2006) and, in addition to that, elements that were not expected to be influential over trade, such as political and institutional characteristics, which also appear to be affecting trade.

After having been traditionally based on intuitive ideas, it can be observed how in more recent times the appearance of more theoretical gravity models with microeconomic-based theories to obtain models like the gravity one (Deardorff, 1995).

c. The Gravity Model

As mentioned before, the initial model was established as a rather intuitive interpretation of the trade flows, represented in the following equations:

Equation 1. Intuitive Gravity Model

$$\log X_{ij} = c + b_1 \log GDP_i + b_2 \log GDP_j + b_3 \log t_{ij} + e_{ij}$$

$$\log t_{ij} = \log(distance_{ij})$$

Source: The Gravity Model of International Trade: A User Guide.

where X_{ij} represents exports from country i to j; GDP representing a country's gross domestic product; t_{ij} indicating trade costs between the two countries:

distance representing the geographical distance between them and e_{ij} being a random error term (Anderson & van Wincoop, 2003a).

The c and b are regression constant and coefficients that need to be estimated respectively.

The term "gravity" derives from Newton's law of gravity: meaning that the expected trade is between larger countries and at the same time, countries being further apart are expected to trade less, since transport costs between them are higher (Shepherd, 2016).

Note that, aiming at simplifying and for a better understanding of these economical figures, this theoretical framework will be based on a written explanation for an easier and simpler explanation of the macro and micro economical aspects.

After having considered that bigger countries tend to trade more, and more distant countries trade less, it can be seen how either in different products or periods of time these two facts apply, it isn't clear if these affirmations go further beyond being a starting point.

We observe how problems with the basic gravity model can arise after introducing more advanced concepts such as the impact on trade (Anderson & van Wincoop, 2003).

One example could be if we consider trade between countries *i* and *j*, alongside with a change of trade costs between country *i* and *k,* that change being, to give an example, reducing them.

It could be considered, for instance, that countries *i* and *k* would be entering a more beneficial agreement -after the change of trade costs between them-, while at the same time country *j* would still be affected regardless of being or not a part of the agreement.

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All in all, the interpretation of this example is that the reduction of the trade costs between two countries (i and k) does not have fully effect on trade between the other two (i and j), which is a contradiction of other standard economic theories.

Another type of problem that may arise would be if an equal reduction in trade costs is considered including goods that a country sells internally. If there were to be a fall, for instance, in the price of oil, that would automatically imply the fall of transport costs as well (Chaney, 2008).

The basic gravity model explains that there would be an increase in trade, proportionally between all parties, including domestically. But there is once more a contradiction with standard economic theories as, regardless of the fall of trade costs, the relative prices have not changed; implying that patterns of consumption should remain constant, according to the basic gravity model.

Therefore, there appear to be several issues regarding the simple interpretation of the basic intuitive gravity model. After having stated those, researchers have shaped the model in different ways to obtain a solution to handle the contradictions it had.

The first model we find in literature is presented as "gravity with gravitas" model of Anderson and Wincoop (2003). It was presented as a demand function, where it is depending on the elasticity of substitution structure based on consumer preferences. In other words, the main factors of this function are the quantity demanded, demand and a couple other variables that affect that quantity demanded. As a matter of a fact, that would mean that customer's preferences allow the utility to increase the consumption of a certain product than another.

Moving forward, the following model is based on how firms produce only a single product variety (Krugman, 1979). We should assume a high number of firms that highly engage between them, allowing a constant markup price and competitive interaction to be gone. All these assumptions, lead to an equilibrium that allows to cover the fixed cost of market entry.

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Considering that the international trade of goods requires transport costs, note that prices of those non-domestic goods will be shifting upwards to consider the cost of moving these good (Krugman, 1979). Whereas in domestic products, it is assumed that this rise in the prices will not be found.

Aiming at obtaining a gravity-like model that fulfills these conditions, we could create an equation in which certain elements will lead to a model where the sum of all production must be equal to the GDP.

The elements would be the following: the exports over two countries (based on the sum of the GDP of the sector in certain country), the expenditure of that certain sector from another country, while having the GDP in the sector overall affecting negatively.

Elasticity of substitution would also be needed to be considered here, as they would be negatively affecting the model (Anderson & van Wincoop, 2003). Whereas at the same time, trade costs are also involved in the equation as they affect exports from one country to another and are also involve supplier coverage.

The type of data to be used and the way in which a gravity model should be set up has an important impact. The use of dependent variables that was made in early literature has pointed out towards misleading results. Furthermore, the use of unidirectional export flows is needed considering that each line in the gravity database must be representing one single flow (Eaton & Kortum, 2002).

Other theoretical models can be found in literature where we can find the development of gravity-like equations based on models of trade where companies are heterogeneous in productivity, among others (Chaney, 2008). This shows that it has become increasingly more difficult for the models to be atheoretical because of the justification of those.

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d. The Gap:

After having stated and considered the theoretical framework, the main gap in this investigation is whether there has been an increase in the trade between Spain and Germany during the Merkel administration.

One of the principal motivations for the investigation of this topic is the fact that Spain is my home country and the one which I find myself currently residing in; on the other hand, Germany being the motor country of the European Union and one of Spain's main business partner, has allowed me to find the sufficient motivation to study how the trade evolved and what factors affected it, especially during such an extended period time which can be Angela Merkel's mandate.

Furthermore, the idea of analyzing two different countries with different cultures and of different wealth will allow to change perspectives regarding the policy and treaty making between the two nations.

Angela Merkel's mandate began on the 30th of May of 2005 and ended on the 8th of December of 2021, a period of 15 years in which both European and Worldwide scene have changed and evolved (Yoder, 2011). Being one of the main European leaders, Merkel was always seen as a success for European integration and commerce.

The German Chancellor has had a unique style of leadership and not only has been seen as chancellor, but also cooperated along other German politicians for the Germany Presidency of the European Council in 2007, which led to the adoption of new environmental measures and the Lisbon Treaty, among others (*Founding Agreements*, n.d.).

While we observe constancy in the governance of Germany, in Spain, presidents have had a changing tendency as from the year 2005 to 2021 (years during which Merkel was Chancellor) there have been three different Spanish presidents (Yoder, 2011).

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Regarding Spain's governance, the presidency has been composed by José Luis Rodríguez Zapatero (PSOE, equivalent to the Spanish center-left), Mariano Rajoy Brey (PP, equivalent to the Spanish center-right) and Pedro Sánchez Perez (PSOE).

Before Angela Merkel, Germany's Chancellorship belonged to the SPD (Social Democratic Party of Germany), specifically to Gerhard Schröder. Previous to his leadership, the country was deeply concerned with unemployment and It seemed to be one of the most urgent problem (Patzelt, 2004). The issue lied on the incompatibility between business representatives and the traditional SPD party, which for instance, gave great support to trade unions (Patzelt, 2004). Considering the times we are living in, several influential newspapers such as the NY Times have pointed out at how Schröder is currently in relatively good terms with Russia's president Vladimir Putin, whom after having started the war in Ukraine, does not appear to be a Euro-enthusiast. His left-wing policies did not enforce an international trade scenery, which can be observed in the following table.

Graph 1. Exports from Spain and Germany from Schröder's first Administration and Merkel's first administration

Source: dataworldbank.com, own elaboration

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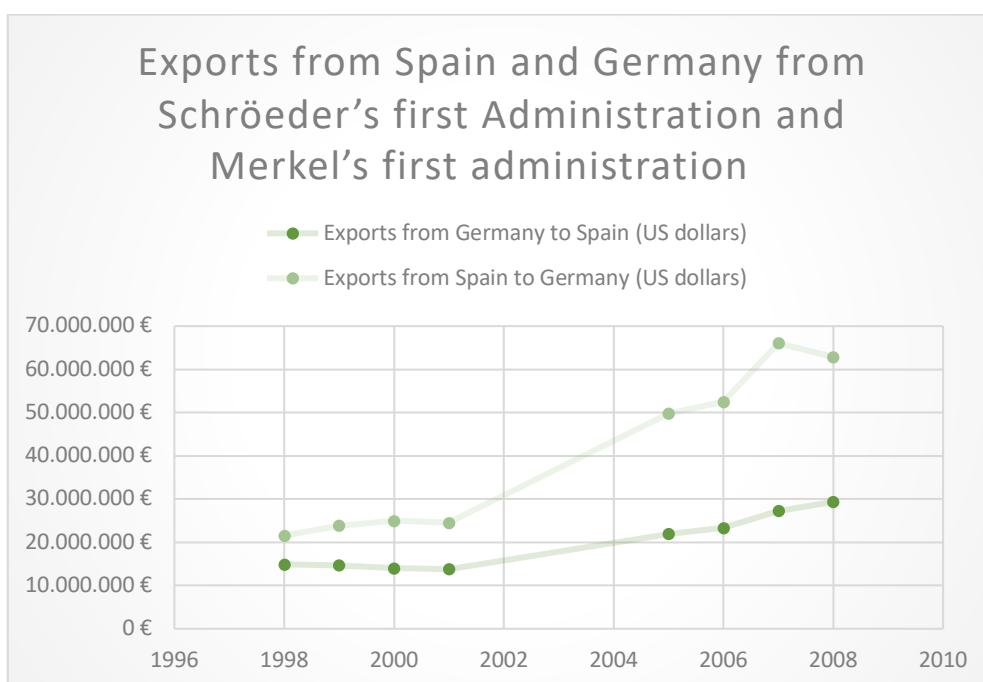
In this graph, we observe two time periods: 1998 to 2001 corresponding to Gerhard Schroder's mandate and 2005 and 2008 being Angela Merkel's first mandate. It is clear how during Merkel's mandate, trade between the two countries of choice, Spain, and Germany, increases significantly whereas in previous years, the figures appear to be much lower.
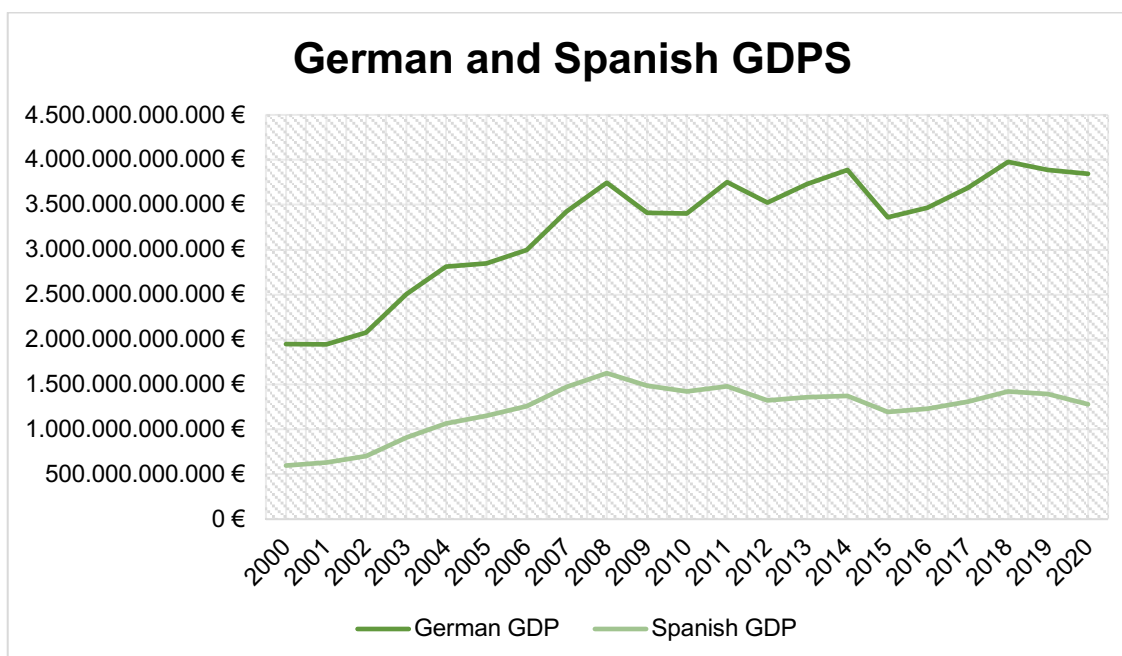
Therefore, the comparison is clear: exports show how Merkel's administration meant a higher trade between the two countries. Considering Merkel's presidency as one of the main drivers of trade between Spain and Germany, we can claim that is seen as having a very positive view of the commerce with other European countries and the rest of the world.

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2. Justification

Aiming to justify the reasons for which this is the topic of choice, it is needed to understand the perspective from which this study will be carried out. Being a European citizen and living in one of the countries is key to observe there is a gap that must be investigated, considering that Spain's GDP is considerably lower than Germany's and what an impact Merkel's presidency has had. According to the OECD, Germany's GDP appears to be over the Euro Area (19 countries), the OECD, and the EU (*GDP and Spending - Gross Domestic Product (GDP) - OECD Data*, n.d.).

To further understand the selection of these two countries, it is easily observed how Germany's GDP is two times bigger than Spain's, seen in the table below where last twenty years' GDPs are shown. This can lead to a very interesting study considering the difference of the two countries and how a country such as Spain interacts with Germany: the motor of the EU.

Graph 2. German and Spanish GDPs

Source: dataworldbank.com, own elaboration

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It is important to understand that business administration is directly related to how trade in a country works and the effect that a single mandate can have on all businesses' exports and imports is crucial.

Germany and Spain were the countries of choice, because of several reasons. Firstly, a comparison between the commercial exchange of such different countries can allow for an investigation where findings regarding better policy improvements can be established.

It also needs to be considered how the length of Merkel's chancellorship has somehow made it feel safer for some of us born in the late 90s-early 2000s, mainly because her being in power during all these years is equal to the years we have been alive, and in some way she in one way or another represents the European Union and has been in the public eye for such a long period of time.

Furthermore, Spain is among the most touristic countries of the EU and Germany is one of the top 3 countries where these tourists come from, meaning that there could be a possible relationship established between tourism and trade, which can be further investigated (INE, 2021).

There is a clear connection between the two countries, as, according to ICEX, Germany is Spain's second customer and main supplier. What's more, Spain ranks 12th, both among customers and among Bundesbank data-providers, and, likewise, Spain is the twelfth commercial partner of Germany (adding exports and imports).

Moreover, the balance of the trade balance in 2020 with Spain was also twelfth by volume. The number of exporting companies in 2020 amounted to 14,277 (*ICEX España Exportación e Inversiones, E.P.E >> Relaciones Bilaterales*, n.d.). Looking at what are these specific products, it has been found that Germany's main exports to Spain are chemical products, automobilist components and industrial machinery.

On the other hand, Spain's exports to Germany tend to be similar with the exception that fruit and legumes are also exported to Germany among industrial products (*ICEX España Exportación e Inversiones, E.P.E >> Relaciones Bilaterales*, n.d.).

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Another issue that needs to be considered is how the 2008 crisis affected both the European Union and Merkel's administration. The attitudes towards the financial market aggravated and Greek debt became the focus of Merkel's Second Administration (Zimmermann, 2014). The way the latter managed to cop out of the crisis has been highly criticized, but the Chancellor dealt with the situation in a way that allowed for the crisis to avoid being a great threat for her country (Zimmermann, 2014).

The cause of this crisis, according to the official German interpretation, was the lack of structural policies in the countries most affected by the crisis, which it seemed to have been aggravated by certain institutional incentives from the Eurozone's structure, leading to a long-lasting debate by politicians regarding the certainty of the latter affirmations (Zimmermann, 2014).

Taking into consideration the rest of the European countries and how the crash of the financial markets influenced the political spectrum, we observe that in Germany, Angela Merkel remained somehow stable. Other parties from the *Bundestag* did not manage to encourage a solid alternative, but instead, the only reaction was the creation of a non-parliamentary party: "Alternative for Germany" (*Alternative für Deutschland).*

A similar movement started throughout Europe, but the phenomenon in Germany remained somehow shocking, seeing that the European crisis did not, or hardly had an impact on the administration of Angela Merkel (Zimmermann, 2014). It is important to relate the "Realist Theory" of International Relations, based on firstly, Germany being focused on imposing and following an organized European policy in the EU as it represents an important part of their foreign policy. Secondly, there is the classical view of Germany as one of the main drivers of the Union and all in all, leads to a country with a very strong sense of willingness to empower their international position.

Thus, after stating the latter reasons, it is now clear that Germany has a key leading role in the European Union and is an adequate country to investigate in this study. Furthermore, it is important to know that countries such as, for example, Italy, in which I carried out an Erasmus exchange program and could

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have also been a country of interest; turned out not to be as appealing mainly because of their lack of significance in the EU and because of a less supportive view they have of it. According to a 2019 survey, 37% of Italians believed that being part of the EU had a positive impact on their country, whereas a 42% claimed it was not either a good or bad thing, alongside with the 17% percent of responders who had a rather negative view (• *Italy: Opinions on EU Membership 2019 | Statista*, n.d.).

It also lies at a lower position in terms of trade, being the third country with whom Spain traded the most in the year 2021. To better understand these claims, it numerical figures can be considered, seeing that the value in dollars of the exports from Spain to Italy is of $31.42B USD representing an 8,6% of the total trade, whereas Germany constitutes a 10% of the share with a value of $38.32B (*GDP and Spending - Gross Domestic Product (GDP) - OECD Data*, n.d.).

To summarize, after looking at all the figures and statistics, and carrying out a deep investigation on the relationships between the EU, Spain and Germany, and the leaders' background, the decision of choosing these two countries appears to be the appropriate one as it holds a set of interesting characteristics that can allow for the study to be carried out in a very satisfactory way.

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3. Objectives and Hypotheses

Therefore, the objectives of study are as follows:

- Observe whether there has been an increase of trade between Spain and Germany during the Merkel administration, and which have been the causes and consequences of it, considering this is the hypothesis that will be considered as the starting point.
- Study whether distance between Spain and Germany were affected by Angela Merkel's chancellorship.

In conclusion, the main objective is to analyze the Gravity Model in terms of the trade between Germany and Spain during the Merkel Administration and observe the factors affecting the function; and at the same time study if the other models deriving from the Gravity one work and can be applied, while observing the effects of the Merkel administration over said trade.

Before the study is carried out, the following hypotheses are presented:

H1. During the years 2005 and 2021, corresponding to the Merkel administration and considering that she is the most long-lasting chancellor of Germany's history, there has been an increase of trade between Spain and Germany.

Therefore, based on the previous information, the investigation will be based on the following research assumption:

A1. Angela Merkel's administration helped shorten distances (in all aspects) between Spain and Germany and allowed for trade to increase.

To understand this approach, we must know what is it that makes Angela Merkel such a particular Chancellor. She is the longest lasting German presidents in history -let alone the fact that she is a woman leader- which whether one wants it or not, affects relationships with other leaders: the longer time a connection is strengthened, the better.

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4. Methodology

The methodology being used in this study will be firstly, doing research of articles in Google Scholar, which will allow for a complete understanding of what the Gravity Model stands for and what other factors affect trade between countries.

Furthermore, there will be use of data from the selected countries to create and work a model analyzing trade between Spain and Germany. The sources of data extraction will be World Databank, Eurostat, and Statista.

The variables in this case will be all quantitative: GDP, exports, and years of chancellorship of each of the Presidents. Aiming at creating the most precise model, these were the variables of choice

After having collected all the data needed, it shall be applied to the formula of the Gravity Model. If we recall *Figure 1*, the figures we have are: exports from country i to j, gross domestic product, trade costs between the two countries: distance representing the geographical distance between them and e_{ij} being a random error term. The c and b are regression constant and coefficients that need to be estimated respectively.

Aiming at answering the main research question alongside with reaching the objective and find out if the hypotheses were correct, the following empirical work has been carried out.

The extraction of data has been done through Eurostat, World Databank and Statista, obtaining the exports of the chosen countries, the GDPs, and the years of chancellorships. Regarding the exports, the countries that were considered are: Spain, Germany, France, Italy, Poland, Austria, The Netherlands, Switzerland, and Greece. The reason to justify the choice of all these countries, is merely the fact that by comparing trade between Germany and Spain with Germany and more countries, is going to bring more precision and accuracy to the investigation.

Furthermore, with regards to the GDP, the work will be carried out using the variables from Spain and Germany as principal countries of interest. Lastly, we

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have the years, which is key when determining the periods of Chancellorship of each one of the Chancellors chosen: Helmut Kohl (1982 – 1998), Gerhard Schroeder (1998 – 2005) and Angela Merkel (2005 – 2021). Considering these periods of time, the chancellorships will be divided into 6 more variables each belonging to the years that each President was at power. Firstly, Gerhard Schroeder's two mandates are marked from 1998 – 2002 from which the variable "schroeder1" is created, and 2002 to 2005 which is the time period belonging to his second mandate making the variable "schroeder2". With regards to Angela Merkel, we have the following variables: "*merkel1*" being the first mandate (2005 – 2010), "*merkel2*" corresponding to the second mandate (2010 – 2013), "*merkel3*" corresponding to the third mandate (2013 – 2018) and "*merkel4*" being her last mandate (2018 -2021). Note that, Helmut Kohl's mandate was not separated into periods because Spain's adherence to the EU was not until 1986 which left the variable not fully fulfill its purpose.

All these variables were firstly placed into an Excel sheet which allowed for a better visualization of the data that was being worked with, to then being exported onto Stata.

Once exported, the next step was to converting the data into codified variables to ease the work: all exports between Germany and "x" country were named as "expDEtoX", both GDPs were named as "gdpDE/ES" and years were used to create the Chancellorships' variables: from 1982 to 1998 we obtained the variable "*khol*", followed by "*schröeder*" which belonged to the period between 1998 and 2005 and the last period between 2005 and 2021 is named as "*merkel*". Furthermore, the creation of 6 other variables was made: two belonging to the periods Schroeder was in power and four belonging to the four periods Merkel was in his position.

Lastly, to follow the Gravity Model, there was the need to convert exports and GDP into logarithms so that finally the creation of 3 models could be carried out: the first model would be done by using exports from Germany to Spain as the dependent variable, while GDP from Spain and Germany and exports from Germany to the other 7 countries chosen. This will result in a rather general model

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in which the chancellorships were not considered separately. The second model was done by adding Schroeder and Merkel's mandate with respect to Khol's, to the previous model and the last one, by using: GDP, exports, and Merkel' and Schroeder's different chancellorships.

From all the models that will be discussed we obtained coefficients for each one that are interpreted in the following way: if the coefficient is positive and has asterisks, this is understood as an increase in the dependent variable, while at the same time denoting a positive relationship with it. Contrarily, if the symbol is negative and has asterisks, it is seen as a negative relationship making the dependent variable decrease.

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5. Results

a. Table 1

Starting with the first model that has been worked with, the dependent variable are exports from Germany to Spain, which have been converted into: "logexpDEtoES" and from there, the creation of 9 more equation was made: with Germany and Spain's GDP respectively, followed by the creation of 7 more models which included both GDPs and exports from Germany to each country previously chosen. Finally, the 9th model included all variables previously mentioned.

Note that, for Stata to indicate that a coefficient is important, and we have the need to study it, the latter will be highlighted with an asterisk.

The first interesting coefficient that needs to be addressed is the one obtained from crossing the dependent variable with the two GDPs (1) which happens to be 1.574***: the interpretation is that were there to be a growth in Spain's GDP, commercial exchange with Germany will take place and therefore German exports to Spain will grow. Nonetheless, with that same model we have obtained the coefficient -0.604*, indicating that if Germany's GDP grows, there will be a decrease in exchange with Spain

	(1) logexpDEtoES	(2) logexpDEtoES	(3) logexpDEtoES	(4) logexpDEtoES	(5) logexpDEtoES	(6) logexpDEtoES	(7) logexpDEtoES	(8) logexpDEtoES	(9) logexpDEtoES
loggdpES	1.574***	1.414**	0.460	1.220***	1.139*	1.794***	1.806***	1.637***	-0.325
	(8.28)	(3.62)	(1.04)	(7.25)	(2.64)	(6.97)	(8.63)	(9.43)	(-0.83)
loggdpDE	-0.604*	-0.679*	-0.230	-1.170***	-0.741*	-0.449	-0.347	-0.919*	0.506
	(-2.18)	(-2.31)	(-0.80)	(-4.65)	(-2.45)	(-1.49)	(-1.21)	(-2.75)	(0.95)
logexpDEtoFR		0.209							-0.0929
		(0.50)							(-0.23)
logexpDEtoIT			1.081*						1.197***
			(2.73)						(4.41)
logexpDEtoPOL				0.306***					0.219*
				(4.44)					(2.48)
logexpDEtoAUS					0.471				1.033
					(1.12)				(1.18)
logexpDEtoNETH						-0.322			0.175
						(-1.25)			(0.24)
logexpDEtoSWITZ							-0.412*		-1.384***
							(-2.14)		(-4.54)
logexDEtoGR								-0.0903	-0.269*

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								(-0.57)	(-2.33)
_cons	-8.809[*]	-6.062	-8.090[*]	11.98[*]	-1.181	-13.56[*]	-15.38[**]	-0.164	-4.924
	(-2.64)	(-1.21)	(-2.67)	(2.23)	(-0.16)	(-2.69)	(-3.50)	(-0.04)	(-0.66)
N	32	31	32	32	32	32	32	26	26

t statistics in parentheses
[*] $p < 0.05$, [**] $p < 0.01$, [***] $p < 0$

Source: Stata

Moving forward to model 3, we observe how 1.081* as a coefficient coming from exports from Germany to Italy and 0.460 as Spain's GDP is still a positive result, considering that regardless of how these two countries trade between them, the situation in Spain is still beneficial as the coefficient doesn't appear as negative.

Model 4 shows that even if the coefficient is positive (0.306***) and exports from Germany to Poland were to grow, they will still have a good situation in Spain (1.220***).

The reason of this happening, is because Poland is the 13th country in Europe with the lowest hourly labor cost, as seen in the table below. Thus it is safe to say that this is what causes German countries to move their production to the eastern countries of Europe. (• *Hourly Labor Cost in Europe 2020, by Country | Statista*, n.d.)

Table 6. Hourly Labor Cost in Europe by country.

Country	Hourly labor cost
Germany	**36.6**
European Union (EU27)	**28.5**
Poland	**11**
Croatia	10.8
Latvia	10.5
Lithuania	10.1
Hungary	9.9
Romania	8.1
Turkey	6.6
Bulgaria	6.5
Serbia	5.8
Montenegro	5.6
Bosnia and Herzegovina	5.2
North Macedonia	3.6
Albania	2.6

Source: Statista, own elaboration, see Annex.

This is directly related to the fact that Germany's factories are located to eastern countries such as Poland, considering that workforce is much cheaper than in other European areas.

Lastly, considering model 9, we observe that the two negative coefficients containing asterisks are Greece (-0.269) and and Switzerland (-1.384): they can be considered as competition for Spain's situation for Germany as the coefficients are negatively related. It can also be considered that France (-0.0929) and The

Netherlands's coefficients lack asterisks so, in terms of effect on the trade between the two main countries of study, it is inexistent.

b. Table 2

	logexpDEto ES	logexpDEto ES	logexpDEto ES	logexpDEto ES	logexpDEto ES	logexpDEto ES	logexpDEto ES	logexpDEto ES	logexpDEto ES
loggdpES	1.304***	0.822*	0.182	1.262***	0.414	0.819*	1.240**	1.586**	-0.288
	(4.50)	(2.21)	(0.58)	(5.03)	(1.34)	(2.42)	(3.69)	(3.72)	(-0.99)
loggdpDE	-0.139	-0.228	0.288	-0.714*	-0.587*	-0.172	-0.156	-1.104	-0.563
	(-0.50)	(-0.85)	(1.32)	(-2.31)	(-2.45)	(-0.67)	(-0.54)	(-1.87)	(-1.44)
merkel1	0.0639	-0.0640	0.0992	-0.0744	-0.247	-0.0206	0.0338	0.0542	0.0967
	(0.36)	(-0.34)	(0.78)	(-0.46)	(-1.59)	(-0.12)	(0.17)	(0.19)	(0.97)
merkel2	-0.111	-0.311	-0.0843	-0.253	-0.505**	-0.278	-0.170	-0.0271	-0.0136
	(-0.70)	(-1.66)	(-0.75)	(-1.75)	(-3.28)	(-1.72)	(-0.78)	(-0.10)	(-0.13)
merkel3	0.0491	-0.121	0.0514	-0.121	-0.325*	-0.157	-0.0100	0.194	0.108
	(0.35)	(-0.74)	(0.52)	(-0.91)	(-2.33)	(-1.01)	(-0.05)	(0.70)	(1.01)
merkel4	0.0245	-0.101	0.0188	-0.141	-0.297	-0.173	-0.0383	0.173	0.143
	(0.14)	(-0.55)	(0.16)	(-0.90)	(-1.96)	(-0.98)	(-0.16)	(0.60)	(1.21)
schroeder1	0.286***	0.217**	0.276***	0.104	0.153*	0.328***	0.289***	0.207	0.106
	(4.04)	(2.90)	(5.45)	(1.20)	(2.43)	(4.88)	(3.99)	(1.59)	(1.90)
schroeder2	0.237	0.177	0.263**	0.101	0.0727	0.260*	0.236	0.205	0.205*
	(2.01)	(1.48)	(3.11)	(0.90)	(0.73)	(2.39)	(1.95)	(0.95)	(2.38)
logexpDEtoFR		0.769							0.205
		(2.08)							(0.79)
logexpDEtoIT			1.021***						0.854***
			(4.79)						(4.65)
logexpDEtoPOL				0.229**					0.197*
				(2.95)					(2.46)
logexpDEtoAUS					1.361***				0.708
					(4.13)				(1.22)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
logexpDEtoNETH						0.669*			0.231
						(2.32)			(0.44)
logexpDEtoSWITZ							0.129		-0.685*
							(0.40)		(-2.28)
logexpDEtoGR								0.302	0.181
								(1.10)	(1.52)
_cons	-14.76***	-12.86**	-14.26***	-0.879	-1.159	-12.28**	-14.72***	0.729	11.68
	(-3.98)	(-2.97)	(-5.38)	(-0.15)	(-0.27)	(-3.45)	(-3.90)	(0.07)	(1.95)
N	32	31	32	32	32	32	32	26	26

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Stata

Aiming at observing the behavior the exports from Germany to Spain had during both Schroeder's and Merkel's mandates, the following nine models were elaborated.

Starting with Model 1, we observe that the coefficient of Spain's GDP is 1.304*** and the coefficient corresponding to Schroeder's first mandate is also positive: 0.256***. This allows for the claim that Spain and Germany's trade was positively affected by Gerhard Schroeder's mandate and allowed Spain to be in a beneficial situation.

As a further observation, if the table is looked at in a horizontal way from the variable *schroeder1*, it is seen that most effects with asterisks are positive meaning that his mandate affected trade between the two main countries was affected in the right way.

From Model 2 we can extract that the coefficient 0.217** shows that Germany trading with France benefits trade between Germany and Spain. Like that, Model 3 also shows a positive correlation regarding trade between Germany and Italy, with the coefficient being 1.021***, implying a good situationship for the two main countries of study. Furthermore, the coefficient 0.276*** in the variable *schroeder1* allows for the interpretation that him being in power during that period was beneficial for trade between Spain and Germany.

Model 5 shows a negative coefficient of -0.505** with regards to the variable *merkel2,* meaning that it negatively affected Germany's trade with Spain. It is also important to remember that her first two mandates were affected by the 2008 crisis, which might be affecting the behavior of the variables.

In that same model there is also the coefficient 1.361*** shows that commercial exchange between Germany and Austria increase exports from Germany to Spain, but if we consider the fact that the coefficient belonging to Merkel's second mandate is negative, we can assume a negative impact from both.

In the last model, we observe the coefficient 0.854*** representing trade between Germany and Italy, which is positive meaning it is beneficial for the commercial relationships Germany and Spain have.

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6. Conclusions

After having stated several theoretical concepts, clarified the gap, settled the objectives alongside with the hypotheses and most importantly, carried out the empirical work, it is necessary to draw certain conclusions.

It is not hard to observe how the Gravity Model is a highly useful tool to understand matters such as international trade. Barriers of trade such as supplier costs or tariffs can affect commerce between the countries of choice, which is not our case with the second variable, as the European Union eradicated tariffs facilitating trade between all countries of the Union.

Our investigative gap is whether Angela Merkel's administration has allowed for distance between her country and Spain to be shortened, even in terms of trade. Meaning that, we aim to understand if the role of the politician running a country allows for better relationships with another. See how, for example, nowadays Russia's relationships with the European Union are not in their best terms, hence trade is not exactly at its peak.

Note that, in each Model the dependent variable remained unchanged, and that in each model there was an addition and change of independent variables.

Starting with Table 1, the most general one, we can extract that trade between Spain and Germany is positively affected by the growth of Spain's GDP, but if it is the other way round -Germany's GDP growing-, it will have a negative impact on trade between the two countries.

Germany's trade with other countries such as Italy, or Poland does not affect trade with Spain in a negative aspect. Considering Poland, we can claim that the relationship it has with Germany is with workforce purposes: for German factories, it is more beneficial to produce in Poland. Contrarily, Switzerland's commercial relationship with Germany is not favorable for Spain, as observed in the empirical part.

From the second table we can claim that Germany trading with Italy and France during the periods of Schroeder's mandate affects commercial relationships between Germany and Spain in a positive way.

The models created also show that Schroeder's mandate meant an increase of commercial exchange between Spain and Germany.

Merkel's second mandate had an unfavorable effect on the two main countries of study trading. That can be directly related to the 2008 crisis which affected all countries in a negative way.

After the study was carried out, it is observed how the new government doesn't necessarily mean an effect between countries, and that it cannot be claimed that Angela Merkel shortened distances between Germany and Spain, as there is not enough evidence to confirm nor deny.

For further investigations, the model should be redone with more data and countries to confirm if there is an effect. All in all, it remains behind the scope of this investigation.

As a final reflection, and to raise the question for any other study from the basis of this one, it is important to consider the fact that a long-lasting relationship between countries is key: trust is gained throughout the years and, even though it is not clear if Merkel allowed for Germany and Spain to be in better terms, the relationship she had with most leaders was a solid one.

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8. Annexes

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Year	GDP DE (US$)	GDP ES
1995	$ 2.585.792.275.146,720	$ 614.609.020.549,773
1996	$ 2.497.244.606.186,640	$ 642.588.992.512,807
1997	$ 2.211.989.623.279,950	$ 590.077.272.727,273
1998	$ 2.238.990.774.702,680	$ 619.214.834.614,099
1999	$ 2.194.945.278.872,590	$ 634.693.160.025,570
2000	$ 1.947.981.991.011,770	$ 596.877.648.793,072
2001	$ 1.945.790.973.803,150	$ 627.286.800.894,855
2002	$ 2.078.484.517.474,510	$ 705.394.315.829,098
2003	$ 2.501.640.388.482,350	$ 905.492.099.322,799
2004	$ 2.814.353.869.359,080	$ 1.067.093.369.754,160
2005	$ 2.846.864.211.175,100	$ 1.153.285.660.987,440
2006	$ 2.994.703.642.023,530	$ 1.259.343.871.534,310
2007	$ 3.425.578.382.921,580	$ 1.472.131.125.102,660
2008	$ 3.745.264.093.617,190	$ 1.625.224.842.536,990
2009	$ 3.411.261.212.652,340	$ 1.485.583.495.415,390
2010	$ 3.399.667.820.000,010	$ 1.420.722.034.063,000
2011	$ 3.749.314.991.050,590	$ 1.478.772.824.224,030
2012	$ 3.527.143.188.785,160	$ 1.324.820.091.194,670
2013	$ 3.733.804.649.549,030	$ 1.354.757.433.212,720
2014	$ 3.889.093.051.023,520	$ 1.369.398.844.599,580
2015	$ 3.357.585.719.351,560	$ 1.195.119.269.971,520
2016	$ 3.469.853.463.945,530	$ 1.232.076.017.361,530
2017	$ 3.690.849.152.517,650	$ 1.309.297.246.509,310
2018	$ 3.977.289.455.388,230	$ 1.420.300.232.663,590

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2019	$	3.888.326.788.627,440	$	1.393.046.093.137,250
2020	$	3.846.413.928.653,710	$	1.281.484.640.043,580

Exports

Year	Exports from ES to DE		Exports from DE to ES	
1995	$	13.809.764,35	$	18.262.318,00
1996	$	14.920.052,74	$	19.260.488,00
1997	$	14.219.900,93	$	18.719.145,98
1998	$	14.891.008,00	$	21.569.468,42
1999	$	14.647.134,59	$	23.845.873,66
2000	$	14.023.001,09	$	24.994.053,00
2001	$	13.763.106,37	$	24.501.741,00
2002	$	14.466.820,62	$	27.456.887,00
2003	$	18.657.190,98	$	36.816.560,00
2004	$	21.246.258,36	$	45.777.069,00
2005	$	21.901.060,18	$	49.796.586,00
2006	$	23.347.529,78	$	52.472.241,00
2007	$	27.282.097,98	$	66.023.015,00
2008	$	29.357.782,00	$	62.907.838,11
2009	$	24.705.320,30	$	43.631.817,44
2010	$	25.784.512,52	$	45.338.545,27
2011	$	30.365.658,64	$	48.435.742,32
2012	$	29.935.172,44	$	39.929.334,99
2013	$	31.286.745,73	$	41.607.663,33
2014	$	33.119.659,32	$	46.242.248,89
2015	$	30.043.109,72	$	42.928.410,25
2016	$	32.397.303,14	$	44.823.249,54
2017	$	34.542.646,18	$	48.525.685,38
2018	$	36.264.844,36	$	52.258.979,47
2019	$	34.767.304,64	$	49.495.538,04

Year	Exports from DE to FR		Exports from FR to DE	
1995	$	61.364.328,00	$	50.152.185,86
1996	$	58.431.309,00	$	49.120.346,11
1997	$	52.954.906,62	$	44.978.978,82
1998	$	58.830.295,04	$	48.001.089,54
1999	$	61.159.776,26	$	46.587.424,77
2000	$	62.803.030,00	$	44.461.096,54
2001	$	61.235.632,00	$	41.519.873,03

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Year			
2002	$	63.786.532,00	$ 44.216.499,51
2003	$	79.186.813,00	$ 53.413.850,66
2004	$	93.594.208,00	$ 62.210.702,76
2005	$	93.354.819,00	$ 63.112.311,08
2006	$	106.705.583,00	$ 69.417.315,28
2007	$	128.665.995,00	$ 77.914.753,20
2008	$	137.703.126,83	$ 86.841.525,39
2009	$	113.102.143,90	$ 68.985.005,98
2010	$	118.330.725,62	$ 82.988.674,10
2011	$	140.516.046,39	$ 97.949.179,35
2012	$	131.280.185,26	$ 92.316.938,18
2013	$	131.619.154,33	$ 93.524.553,95
2014	$	133.478.427,06	$ 93.804.334,97
2015	$	113.887.994,27	$ 79.145.560,16
2016	$	111.854.017,63	$ 78.851.327,54
2017	$	118.932.072,07	$ 77.609.886,14
2018	$	124.361.108,66	$ 83.212.117,33
2019	$	119.249.537,12	$ 78.210.511,11

Year	Exports from DE to IT	Exports from IT to DE
1995	$ 39.747.800,00	$ 43.236.425,73
1996	$ 39.421.243,00	$ 44.087.701,50
1997	$ 36.806.516,74	$ 39.960.091,14
1998	$ 39.377.301,50	$ 39.892.103,17
1999	$ 39.984.427,01	$ 39.031.960,23
2000	$ 41.698.240,00	$ 36.216.997,15
2001	$ 41.349.910,00	$ 35.665.701,83
2002	$ 43.911.295,00	$ 34.988.872,95
2003	$ 55.238.627,00	$ 41.856.583,41
2004	$ 65.251.082,00	$ 47.903.818,52
2005	$ 67.002.331,00	$ 48.804.633,92
2006	$ 74.568.764,00	$ 54.863.954,03
2007	$ 89.263.638,00	$ 64.445.509,52
2008	$ 91.324.176,34	$ 68.826.031,82
2009	$ 70.564.376,96	$ 51.217.526,47
2010	$ 77.571.211,52	$ 57.766.851,65
2011	$ 85.779.446,95	$ 68.230.665,25
2012	$ 71.051.974,53	$ 62.768.607,91
2013	$ 70.061.897,93	$ 64.356.077,05
2014	$ 71.564.794,56	$ 66.568.027,59
2015	$ 64.002.980,53	$ 56.269.723,22
2016	$ 67.660.840,51	$ 58.311.989,57

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2017	$	73.528.552,33	$	63.318.718,76
2018	$	82.414.016,51	$	68.756.281,37
2019	$	75.801.862,54	$	65.509.540,99

Year	Exports from DE to POL		Exports from POL to DE	
1995	$	8.877.864,00	$	8.777.546,00
1996	$	10.861.695,00	$	8.417.332,00
1997	$	11.705.555,97	$	8.483.642,79
1998	$	13.552.444,42	$	10.233.276,00
1999	$	12.931.611,65	$	9.903.803,00
2000	$	13.350.113,00	$	11.005.320,00
2001	$	13.389.772,00	$	12.377.320,00
2002	$	14.991.548,00	$	13.209.198,00
2003	$	18.556.512,00	$	17.241.534,00
2004	$	23.372.484,00	$	22.132.309,47
2005	$	27.729.562,00	$	25.222.684,66
2006	$	36.487.238,00	$	29.701.289,55
2007	$	49.555.244,00	$	35.901.248,04
2008	$	59.692.621,96	$	43.104.491,68
2009	$	43.005.814,46	$	35.679.585,24
2010	$	49.611.940,72	$	40.890.944,78
2011	$	60.202.557,17	$	48.868.859,61
2012	$	53.599.899,46	$	44.741.107,10
2013	$	56.170.087,18	$	50.941.987,11
2014	$	63.110.601,21	$	55.615.019,29
2015	$	57.696.644,50	$	52.261.452,17
2016	$	60.314.723,06	$	53.033.745,35
2017	$	66.402.711,97	$	60.209.648,68
2018	$	74.773.677,15	$	73.691.774,70
2019	$	73.592.537,19	$	69.224.851,57

Year	Exports from DE to AUS		Exports from AUS to DE	
1995	$	29.110.654,00	$	21.523.419,14
1996	$	30.231.217,00	$	21.219.817,47
1997	$	26.314.895,36	$	20.187.727,87
1998	$	28.933.347,33	$	22.155.859,97
1999	$	29.555.521,54	$	21.176.406,16
2000	$	29.219.019,00	$	21.137.865,34
2001	$	29.245.873,00	$	21.635.374,05
2002	$	31.258.928,00	$	23.407.086,70
2003	$	39.808.797,00	$	28.383.058,49
2004	$	49.032.280,00	$	35.540.423,87

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Year			
2005	$	53.765.327,00	$ 37.425.416,49
2006	$	62.213.490,00	$ 42.702.395,70
2007	$	72.334.828,00	$ 47.190.430,48
2008	$	80.071.111,94	$ 51.167.590,88
2009	$	63.761.932,02	$ 40.799.374,36
2010	$	68.330.564,52	$ 45.740.024,51
2011	$	79.124.243,81	$ 52.119.735,77
2012	$	71.672.683,98	$ 47.722.877,05
2013	$	73.352.504,35	$ 48.802.587,52
2014	$	72.909.334,49	$ 49.507.682,29
2015	$	63.790.607,89	$ 42.862.880,07
2016	$	65.441.171,97	$ 43.505.236,55
2017	$	69.853.176,90	$ 47.526.291,48
2018	$	75.276.412,20	$ 53.090.756,60
2019	$	70.988.488,26	$ 50.107.811,07

Year	Exports from DE to NETH		Exports from NETH to DE
1995	$	39.894.319,00	$ 46.123.319,30
1996	$	40.059.373,00	$ 45.896.306,69
1997	$	34.503.073,79	$ 46.094.979,07
1998	$	36.343.681,02	$ 39.611.191,30
1999	$	34.932.236,29	$ 41.687.651,62
2000	$	35.495.581,00	$ 54.912.529,69
2001	$	34.007.128,00	$ 55.260.688,74
2002	$	36.352.499,00	$ 53.348.195,33
2003	$	46.411.793,00	$ 64.216.028,13
2004	$	56.566.863,00	$ 75.773.807,34
2005	$	60.942.951,00	$ 83.272.317,31
2006	$	71.001.811,00	$ 99.146.668,27
2007	$	85.550.223,00	$ 112.490.194,51
2008	$	93.291.755,92	$ 133.509.594,53
2009	$	73.105.412,72	$ 104.921.005,56
2010	$	81.730.271,19	$ 119.690.612,77
2011	$	93.448.452,94	$ 137.940.813,87
2012	$	87.674.610,49	$ 136.461.769,42
2013	$	90.491.653,01	$ 141.981.267,99
2014	$	93.045.614,55	$ 138.757.278,02
2015	$	81.541.846,39	$ 109.257.782,06
2016	$	82.835.426,61	$ 107.318.598,65
2017	$	89.749.977,65	$ 120.674.245,94
2018	$	99.570.755,25	$ 133.402.354,61
2019	$	92.760.194,93	$ 128.001.847,70

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Year	Exports from DE to SWITZ	Exports from SWITZ to DE
1995	$ 27.952.023,00	$ 19.437.543,42
1996	$ 25.371.266,00	$ 18.073.128,96
1997	$ 22.321.747,97	$ 17.031.659,52
1998	$ 23.826.640,90	$ 18.174.097,41
1999	$ 23.720.296,45	$ 18.112.401,41
2000	$ 23.941.198,00	$ 17.259.585,18
2001	$ 23.869.003,00	$ 17.792.194,50
2002	$ 24.520.478,00	$ 18.693.565,13
2003	$ 29.666.086,00	$ 21.732.554,81
2004	$ 35.314.750,00	$ 24.900.676,64
2005	$ 37.433.729,00	$ 25.457.783,98
2006	$ 44.366.358,00	$ 29.054.828,40
2007	$ 50.510.801,00	$ 35.015.449,68
2008	$ 57.770.307,85	$ 39.521.636,95
2009	$ 49.886.836,91	$ 33.222.859,82
2010	$ 55.930.654,97	$ 37.757.587,94
2011	$ 67.278.677,49	$ 47.320.036,77
2012	$ 63.623.651,09	$ 46.781.464,84
2013	$ 63.150.724,07	$ 45.187.321,59
2014	$ 62.606.692,23	$ 47.334.107,66
2015	$ 55.454.715,44	$ 41.452.744,31
2016	$ 56.693.388,40	$ 43.704.321,06
2017	$ 62.306.449,38	$ 45.312.226,28
2018	$ 65.490.002,83	$ 47.447.290,79
2019	$ 64.755.169,35	$ 47.900.111,20

Year	Exports from DE to GR	Exports from GR to DE
1995	$ 3.882.604,00	$ 2.421.818,37
1996	$ 3.713.969,00	$ 2.207.218,69
1997	$ 3.465.970,94	$ 2.078.835,97
1998	$ 3.884.581,12	$ 1.994.037,76
1999	$ 4.321.717,25	$ 1.823.140,07
2000	$ 4.244.135,00	$ 1.331.349,12
2001	$ 4.508.530,00	$ 1.175.165,63
2002	$ 4.619.880,00	$ 1.077.318,77
2003	$ 6.341.102,00	$ 1.755.196,39
2004	$ 7.836.261,00	$ 2.012.008,38
2005	$ 8.065.762,00	$ 2.171.999,35
2006	$ 9.174.128,00	$ 2.362.340,43
2007	$ 10.969.135,00	$ 2.714.191,08

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2008	$ 11.785.624,78	$ 3.014.495,01
2009	$ 9.126.852,84	$ 2.431.025,97
2010	$ 7.740.508,09	$ 2.555.844,89
2011	$ 7.055.374,92	$ 2.614.594,01
2012	$ 6.097.079,11	$ 2.242.078,06
2013	$ 6.277.519,80	$ 2.347.834,24
2014	$ 6.446.459,23	$ 2.342.430,60
2015	$ 5.173.942,35	$ 2.058.146,11
2016	$ 5.494.155,11	$ 2.131.516,55
2017	$ 5.890.529,72	$ 2.278.015,75
2018	$ 6.783.145,53	$ 2.490.599,56
2019	$ 6.803.026,97	$ 2.519.379,89

Years	Exports from Spain to Germany (US Dollars)	Exports from Germany to Spain (US Dollars)
1998	14.891.008,00	21.569.468,42
1999	14.647.134,59	23.845.873,66
2000	14.023.001,09	24.994.053,00
2001	13.763.106,37	24.501.741,00
2005	21.901.060,18	49.796.586,00
2006	23.347.529,78	52.472.241,00
2007	27.282.097,98	66.023.015,00
2008	29.357.782,00	62.907.838,11

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DO FILES

**Changing from capitals to small letters

rename GDPDEUS gdpDE

rename GDPES gdpES

rename ExportsfromEStoDE expEStoDE

rename ExportsfromDEtoES expDEtoES

rename ExportsfromDEtoFR expDEtoFR

rename ExportsfromFRtoDE expFRtoDE

rename ExportsfromDEtoIT expDEtoIT

rename ExportsfromITtoDE expITtoDE

rename Year year

***Defining year dummies

tab year, gen(year_)

***Defining logs of variables of interest

gen loggdpES=log(gdpES)

label var loggdpES "GDP_ES"

gen loggdpDE=log(gdpDE)

label var loggdpDE "GDP_DE"

gen logexpEStoDE=log(expEStoDE)

label var logexpEStoDE "Exports ES to DE"

gen logexpDEtoES=log(expDEtoES)

label var logexpDEtoES "Exports DE to ES"

gen logexpDEtoFR=log(expDEtoFR)

label var logexpDEtoFR "Exports DE to FR"

gen logexpFRtoDE=log(expFRtoDE)

label var logexpFRtoDE "Exports FR to DE"

gen logexpDEtoIT=log(expDEtoIT)

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```
label var logexpDEtoIT "Exports DE to IT"

gen logexpITtoDE=log(expITtoDE)

label var logexpITtoDE "Exports IT to DE"

gen logexpDEtoPOL=log(expDEtoPOL)

label var logexpDEtoPOL "Exports DE to POL"

gen logexpPOLtoDE=log(expPOLtoDE)

label var logexpPOLtoDE "Exports POL to DE"

gen logexpDEtoAUS=log(expDEtoAUS)

label var logexpDEtoAUS "Exports DE to AUS"

gen logexpAUStoDE=log(expAUStoDE)

label var logexpAUStoDE "Exports AUS to DE"

gen logexpDEtoNETH=log(expDEtoNETH)

label var logexpDEtoNETH "Exports DE to NETH"

gen logexpNETHtoDE=log(expNETHtoDE)

label var logexpNETHtoDE "Exports NETH to DE"

gen logexpDEtoSWITZ=log(expDEtoSWITZ)

label var logexpDEtoSWITZ "Exports DE to SWITZ"

gen logexpSWITZtoDE=log(expSWITZtoDE)

label var logexpSWITZtoDE "Exports SWITZ to DE"

gen logexpDEtoGR=log(expDEtoGR)

label var logexpDEtoGR "Exports from DE to GR"

gen logexpGRtoDE=log(expGRtoDE)

label var logexpGRtoDE "Exports from GR to DE"

***Computing linear models for Gravity Model between ES and DE

**Using model building strategy

est clear

eststo clear
```

```
reg logexpDEtoES loggdpES loggdpDE

eststo M1

reg logexpDEtoES loggdpES loggdpDE logexpDEtoFR

eststo M2

reg logexpDEtoES loggdpES loggdpDE logexpDEtoIT

eststo M3

reg logexpDEtoES loggdpES loggdpDE logexpDEtoPOL

eststo M4

reg logexpDEtoES loggdpES loggdpDE logexpDEtoAUS

eststo M5

reg logexpDEtoES loggdpES loggdpDE logexpDEtoNETH

eststo M6

reg logexpDEtoES loggdpES loggdpDE logexpDEtoSWITZ

eststo M7

reg logexpDEtoES loggdpES loggdpDE logexpGRtoDE

eststo M8

reg    logexpDEtoES    loggdpES    loggdpDE    logexpDEtoFR    logexpDEtoIT    logexpDEtoPOL    logexpDEtoAUS
logexpDEtoNETH logexpDEtoSWITZ logexpGRtoDE

eststo M9

esttab M1 M2 M3 M4 M5 M6 M7 M8 M9 using Models1.rtf, replace

***Computing linear models for Gravity Model between ES and DE with Controlls for German Chancellor

**Using model building strategy

est clear

eststo clear

reg logexpDEtoES loggdpES loggdpDE schroeder merkel

eststo M1

reg logexpDEtoES loggdpES loggdpDE logexpDEtoFR schroeder merkel

eststo M2
```

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```
reg logexpDEtoES loggdpES loggdpDE logexpDEtoIT schroeder merkel

eststo M3

reg logexpDEtoES loggdpES loggdpDE logexpDEtoPOL schroeder merkel

eststo M4

reg logexpDEtoES loggdpES loggdpDE logexpDEtoAUS schroeder merkel

eststo M5

reg logexpDEtoES loggdpES loggdpDE logexpDEtoNETH schroeder merkel

eststo M6

reg logexpDEtoES loggdpES loggdpDE logexpDEtoSWITZ schroeder merkel

eststo M7

reg logexpDEtoES loggdpES loggdpDE logexpGRtoDE schroeder merkel

eststo M8

reg    logexpDEtoES    loggdpES    loggdpDE    logexpDEtoFR    logexpDEtoIT    logexpDEtoPOL    logexpDEtoAUS
logexpDEtoNETH logexpDEtoSWITZ logexpGRtoDE schroeder merkel

eststo M9

esttab M1 M2 M3 M4 M5 M6 M7 M8 M9 using Models2.rtf, replace

*** Defining Chancellery Periods

gen kohl=0

replace kohl=1 if year>=1982 & year<=1998

label var kohl "Helmut Kohl"

gen schroeder=0

replace schroeder=1 if year>=1999 & year<=2005

label var schroeder "Gerhard Schroeder"

gen merkel=0

replace merkel=1 if year>=2006 & year<=2019

label var merkel "Angela Merkel"

*** Defining Merkel Periods

gen merkel1=0
```

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```
replace merkel1=1 if year>=2006 & year<=2009

label var merkel1 "Merkel 1"

gen merkel2=0

replace merkel2=1 if year>=2010 & year<=2013

label var merkel2 "Merkel 2"

gen merkel3=0

replace merkel3=1 if year>=2014 & year<=2018

label var merkel3 "Merkel 3"

gen merkel4=0

replace merkel4=1 if year>=2019 & year<=2021

label var merkel4 "Merkel 4"

*** Defining Schroeder Periods

gen schroeder1=0

replace schroeder1=1 if year>=1999 & year<=2001

label var schroeder1 "Schroeder 1"

gen schroeder2=0

replace schroeder2=1 if year>=2002 & year<=2005

label var schroeder2 "Schroeder 2"

***Computing linear models for Gravity Model between ES and DE with All Chancellorships

**Using model building strategy

est clear

eststo clear

reg logexpDEtoES loggdpES loggdpDE merkel1 merkel2 merkel3 merkel4 schroeder1 schroeder2

eststo M1

reg logexpDEtoES loggdpES loggdpDE logexpDEtoFR merkel1 merkel2 merkel3 merkel4 schroeder1 schroeder2

eststo M2

reg logexpDEtoES loggdpES loggdpDE logexpDEtoIT merkel1 merkel2 merkel3 merkel4 schroeder1 schroeder2
```

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```
eststo M3
```

```
reg logexpDEtoES loggdpES loggdpDE logexpDEtoPOL merkel1 merkel2 merkel3 merkel4 schroeder1 schroeder2
```

```
eststo M4
```

```
reg logexpDEtoES loggdpES loggdpDE logexpDEtoAUS merkel1 merkel2 merkel3 merkel4 schroeder1 schroeder2
```

```
eststo M5
```

```
reg logexpDEtoES loggdpES loggdpDE logexpDEtoNETH merkel1 merkel2 merkel3 merkel4 schroeder1 schroeder2
```

```
eststo M6
```

```
reg logexpDEtoES loggdpES loggdpDE logexpDEtoSWITZ merkel1 merkel2 merkel3 merkel4 schroeder1 schroeder2
```

```
eststo M7
```

```
reg logexpDEtoES loggdpES loggdpDE logexpGRtoDE merkel1 merkel2 merkel3 merkel4 schroeder1 schroeder2
```

```
eststo M8
```

```
reg  logexpDEtoES  loggdpES  loggdpDE  logexpDEtoFR  logexpDEtoIT  logexpDEtoPOL  logexpDEtoAUS
logexpDEtoNETH logexpDEtoSWITZ logexpGRtoDE merkel1 merkel2 merkel3 merkel4 schroeder1 schroeder2
```

```
eststo M9
```

```
esttab M1 M2 M3 M4 M5 M6 M7 M8 M9 using Models3.rtf, replace
```