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Currency Unions and International Trade

The Case of the Euro

Bachelor's thesis within economics

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Abstract

The efficiency and practicality of currency areas is a controversial source of debate in the field of economics nowadays. Advocates of the system predict that currency unions lead to higher trade volumes as a result of reduced exchange rate uncertainty and higher integration. Possibly the most prominent example of a currency area nowadays is the EMU, initiated in 1995 with the purpose of nurturing a unified European market as one of the main aims. There is no consensus on whether the EMU has induced a net loss or benefit upon its members, but one common finding among academic studies is that the EMU leads to higher trade among union members.

The purpose of this study is to evaluate the impact of the euro adoption on trade between EMU members. The model uses a pooled data set comprising the years from 1990 to 2012. Two separate groups are analysed, one including all OECD and EU countries, and another using data from only European countries from the sample. After allowing for different circumstances, I find that two countries belonging to the EMU trade between 17 and 32 per cent more than country pairs outside the union. Moreover, I find that language similarity has a neutral effect in the European sample, while it seems to have a highly significant effect on the sample including all countries.

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1 Introduction

After the breakdown of the Bretton Woods system in 1973 many countries allowed their currencies to float, leading to a sharp increase in exchange rate variability. The simultaneous decline in trade flows led economists to question the possibility of an existing relationship between exchange rate variability and trade volumes (Sekkat, 1997). Although there is no consensus on the effect that exchange rate variability has on the level of international transactions it is commonly viewed as having a negative impact on trade and investment (Dell'Ariccia, 1999). This is one of the reasons why many countries have decided to join currency unions. Currency unions are conventionally viewed as a source of benefit to the joining countries, so long as they meet certain convergence criteria (Mundell, 1961). One of the most discussed currency unions today is the European Monetary Union (EMU), which despite being viewed as a source of trade growth and higher integration between member countries, has also been highly criticized for not having met the convergence criteria to be considered an optimum currency area at the moment of its creation (Krugman & Obstfeld, 2008).

The subject of whether a fixed or floating exchange rate regime is more efficient in promoting trade growth has led to conflicting conclusions and is a matter that scholars are still raging with. One of the main arguments against floating exchange rate systems is that the absence of the discipline that is imposed under a fixed exchange rate might cause countries to embark on high-expansionary and beggar-thy-neighbour policies (Krugman & Obstfeld, 2008). Advocates of fixed exchange rate systems argue that floating exchange rates lead to a reduction in world welfare due to a decrease in specialization associated with the increased cost and risk of engaging in trade. This is based on the assumption that more trade always leads to higher welfare. However, by removing this assumption it can be argued that a decrease in trade will not necessarily reduce welfare, as a decrease in trade may in fact imply a movement towards an optimal allocation point, if there were to be too much trade (Clark, 1973). Additionally, a fixed exchange rate system could also lead to a decrease in welfare. In a fixed exchange rate system, government pegging operations act as a subsidy for international transactions, meaning that the risk premium related to exchange rate variability may be incurred by other sectors of the economy instead of being reflected in the currency price, as is in the case of floating exchange rate systems (Clark, 1973). Predictably, the subject of the effect that fixed and floating exchange rate systems have on world trade has also been contested with scepticism. There is literature concluding that there is no proven significant relationship between exchange rates and trade (Chowdhury, 1999) and that welfare can be high within both fixed and floating exchange rate regimes depending on the policies and preferences adopted by each of them (Baccheta & Van Wincoop, 2000).

The debate on which exchange rate system is best for overall trade has raised concerns about the impact that joining a currency union has on its members and on international transactions. In principle, adopting a common currency will reduce the transaction costs associated with exchange rate variability and lead to greater financial integration (Rose, 2000). This, in turn, could lead to a higher level of political integration (Rose, 2000). Empirical studies have shown that countries with same currencies trade more than three times as much as countries with different currencies (Rose, 2000), and that two countries that adopt a common currency will experience a nearly doubling in the volume of bilateral trade (Glick & Rose, 2001). This may be partially related to the reductions in 'home bias' and the 'border effect,' two factors that affect international trade negatively and which can be partly

attributed to exchange rate uncertainty and to people's preference for making purchases with domestic rather than international currencies (Rose, 2000; Hooper & Kohlhagen, 1978). The adoption of a system where all its members employ a single currency has its benefits but it may also bring negative consequences along the path, such as the loss of monetary policy as a macroeconomic stabilizer. Additionally, trade disputes are bound to become a problem and increased competition may lead to layoffs. Under such circumstances a country may implement protectionist policies which are detrimental for intra-union trade (Rose, 2000).

In 1999, a number of European countries took a major step towards integration through the creation of the European Monetary Union (EMU). Members of the currency union adopted the euro as their new currency in hopes that this would increase trade among members, reduce transaction costs associated with exchange rate variability, and allow them to gain from price transparency, better inflation control, and from the bargaining power that Europe would attain as an economic power (Artis, 1991).

The purpose of this paper is to measure the impact that the EMU has had on trade between member countries. In order to do this, an augmented gravity formula is constructed using pooled data for the years ranging between 1990 and 2012. Two samples are analysed, one including all Organisation for Economic Co-Operation and Development (OECD) and European Union (EU) countries, and one including only European countries from the sample. The model incorporates a number of factors that either alleviate or hamper trade, in order to be able to accurately measure the EMU effect under different circumstances.

Section 2 presents the reader with the fundamental knowledge which is necessary in order to understand the impact a currency union may have on trade. It also gives the reader an insight to some of the previous literature written on the effect of exchange rate variability and currency unions on international transactions. Section 3 presents the theoretical framework on which the empirical analysis of this study is based. In Section 4, the data and variables used to build the empirical model are introduced, as well as a detailed summary of the data's descriptive statistics. Section 5 presents the empirical model and the results yielded, and the last section summarizes the study's findings and gives suggestions for further research.

2 Background

Since the end of World War II, trade has become an increasingly prominent force in the global economy, leading to more product diversification, higher specialization levels, economic growth, and technical change. One of the main goals aimed through the creation of the EMU was to enhance trade between members in order to create a stronger and more integrated European market. This section provides the reader with an insight to some of the fundamental knowledge that is necessary in order to be able to assess the impact of currency unions on trade.

Section 2.1 presents a recollection of the main events that led to the creation of the EMU, and the aftermaths. Following this, a brief overview of the history of trade growth during recent decades is shed light upon. Section 2.3 describes the main events that occurred during the recent European crisis, and Section 2.4 discusses some of main literature written on the effect that exchange rate variability and currency unions have on international trade.

2.1 A brief history of the European Monetary System

In 1944, the Articles of Arrangement of the Agreement of the International Monetary Fund (IMF) was signed by 44 countries, creating the Bretton Woods System. Under the new international monetary system, member countries pegged their currencies to the US dollar, which was itself pegged to gold at $35 an ounce. The 1960s gave rise to a series of events that would lead the turbulent path to the system's demise. Whenever a country experienced a constant and large current account deficit, fear of a possible devaluation would lead holders of the country's currency to shift their wealth to other currencies. As a result, the country's exchange rate would rise and its central bank would have to sell foreign reserves in order to maintain the currency pegged to the US dollar. Conversely, when a country enjoyed a current account surplus for a prolonged period of time, speculation would cause its currency to appreciate. In turn, its central bank would become swamped with foreign reserves, many times with the consequence of upsetting internal balance (Krugman & Obstfeld, 2008).

Meanwhile, excessive fiscal spending had started taking place in the US after it joined the Vietnam War, resulting in high domestic inflation and a large decrease in their current account. Expecting an increase in the price of gold, speculators began to buy gold from the Federal Reserve, European central banks, and private traders. In the 1970s, the country sunk into a recession and its currency was devalued against major European currencies, raising the price of gold to $38 an ounce. High expansionary policies implemented by the US and the rise of speculative crises during the late 1960s marked the end of the Bretton Woods System. By 1973, the exchange rates of the major industrialized countries had started floating against the dollar (Krugman & Obstfeld, 2008).

The economic difficulties experienced by some countries throughout the first half of the twentieth century made the world realize that bad management and lack of cooperation within the international monetary system could have a detrimental impact on the world's economies. Thus, in 1979, Europe created the EMS with the purpose of nurturing a unified European market and enhancing Europe's role in the monetary market. The exchange rate mechanism (ERM) introduced by the EMS was created as a semi-pegged exchange rate system, where member currencies were allowed to float against each other at a margin of ±2.25 per cent, with the exception of particular cases in which a wider band had been ne-

gotiated (Krugman & Obstfeld, 2008). Additionally, capital controls were implemented, limiting the sale or purchase of domestic for foreign currencies to domestic residents, but these were eliminated in 1989. The EMS was initially adopted by France, Italy, Germany, Belgium, Denmark, Ireland, Luxembourg, and the Netherlands; and followed by Spain in 1989, Britain in 1990, and Portugal in 1992. Britain and Italy, however, left the system in 1992 (Krugman & Obstfeld, 2008).

Throughout the years following the creation of the EMS and until the beginning of the 1990s, a substantial decrease in exchange rate variability between member countries was witnessed (Artis, 1991; Sekkat, 1997). The rocky path to higher exchange rate stability involved 11 realignments, which took place between the years 1979 and 1987 (Krugman & Obstfeld, 2008). This period was followed by a crisis that hit Europe between 1992 and 1993. Before the crisis emerged, many European countries had pegged their currencies to the Deutsche Mark (DM). However, the reunification of Eastern and Western Germany in 1990 gave rise to a boom in the country, causing the Bundesbank to increase interest rates in order to fight inflationary pressures at home. Many countries whose currencies were pegged to the DM were not experiencing high inflation but raised their interest rates nevertheless in order to maintain the fixed exchange rate. This drove them into deep recessions and the margin within which the exchange rates of members of the EMS were allowed to fluctuate was extended up to ±15 per cent (Krugman & Obstfeld, 2008).

Although the EMS experienced times of difficulty since its adoption in 1979, it has played a key role in fostering European market integration. In 1991, EU representatives proposed the introduction of a single European currency and a European central bank. In 1993, the Maastricht Treaty was ratified by the 12 members of the EU, followed by Sweden, Austria, and Finland in 1995 after they joined the EU. Under the Maastricht Treaty, four convergence criteria were listed, which any EU country had to meet in order to be able to enter the currency union (Krugman & Obstfeld, 2008). In 1999 the euro was officially adopted by Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain. Denmark and Britain decided to withhold from adopting the currency, and Greece was not able to join until it was able to meet the criteria in 2001. Sweden did not meet the criteria stating that it was required to have had a stable exchange rate within the ERM without devaluing its currency through its own initiative, since it had not previously belonged to the ERM, and has decided to withhold from joining the union until today (Krugman & Obstfeld, 2008). In 2004, ten new members joined the EU, followed by two more in 2007, and one in 2013 (EUROPA, a). Additionally, the euro was adopted by Slovenia in 2007, Malta and Cyprus in 2008, Slovakia in 2009, and Estonia in 2011 (EUROPA, b).

2.2 The growth of world trade

In the early twentieth century there were those who believed that the world had reached a new era of expansion in trade, triggered by the development of steam-ships, railroads and the telegraph. However, this prediction proved to be mistaken, as the Great Depression, two subsequent world wars, and a severe wave of protectionism drew closer (Krugman & Obstfeld, 2008). During the second half of the twentieth century, the world began to witness a steady upward trend in international trade. Although integration is commonly viewed as the source of this sudden growth, Krugman (1995) expounds that a large share of this expansion was an effect of the recovery process from the contraction that had taken place between 1913 and the post-World War II years. Figure 2.1 illustrates the upward trend in world trade that emerged in recent decades.

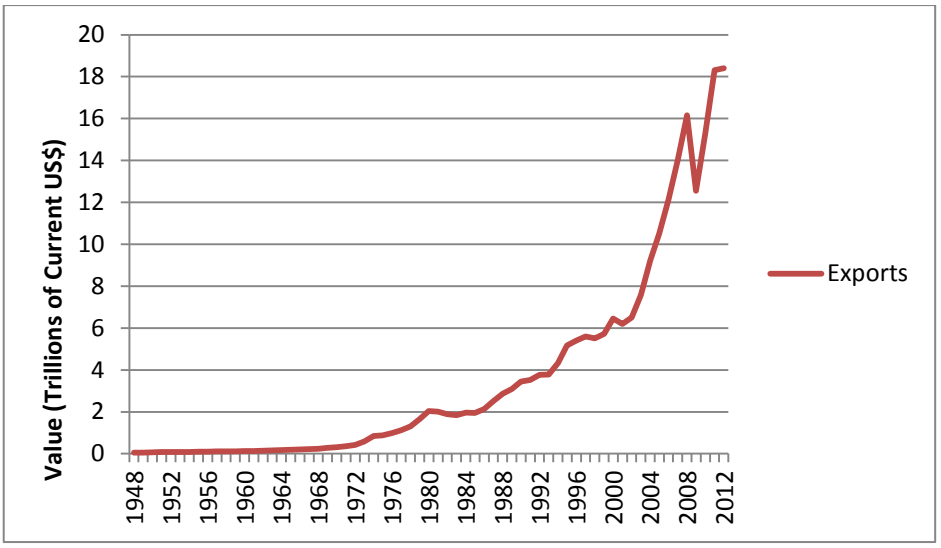

Figure 2.1: Total World Exports, 1948-2012

Data Source: World Trade Organization Statistics Database

One of the main causes of the abnormal growth in trade is attributed to the process of trade liberalization that started taking place in the latter half of the twentieth century. After World War II a group of countries engaged in multilateral negotiations that would eventually lead to the creation of the General Agreement on Tariffs and Trade (GATT) in 1947. Under the GATT countries agreed to cut tariff rates that could lead to mutual benefit. In 1978, a further step towards globalization was taken when China decided to lower its trade barriers, which had nearly isolated China from the rest of the world's economies prior to that (Krugman, 1995). These events marked the beginning of an on-going wave of trade liberalization.

Although it is conventional wisdom that trade liberalization was a major contributing factor to the dramatic increase in trade throughout the past decades, trade has also evolved in the forms in which it takes place. Krugman (1995) stresses some of the prominent aspects of new world trade as: the rise of intra-industry trade, the shift to production of parts of the value added chain to different geographical locations, the emergence of supertraders (countries that export exceptionally high shares of their gross domestic product, or GDP), and the significant growth of exports from newly industrializing economies (NIEs) to high-income countries since the 1980s.

Another factor that is commonly viewed as one of the main stimuli in recent trade growth is technological progress, which has led to lower transport costs and more efficient communications. Not only did this make the recent tendency of slicing up the value chain across the geographical plain possible, but it has also allowed for potential business relationships, which would otherwise be hampered by the distance factor, to take place (Krugman, 1995).

Despite the recent increase in trade caused by the alleviation of trade barriers, full integration of the world's economies is still hampered by differences in their fundamental structures. In the words of Paul Krugman (1995): "there remains substantial room for policy moves to expand international trade through a process of harmonization of laws and institutions" (p. 339).

2.3 The Financial Crisis of 2007 and the aftermath

After the Great Depression, the US entered an era of strict financial regulation, as mainstream economics of the time dictated that light regulation could eventually stimulate other recessions of the same degree. However, after shaky economic and financial stability in the 1970s and 1980s, a wave of deregulation in the financial markets hit the American economy through the emergence of what would be called the New Financial Architecture (NFA). The rise of the NFA was based on the belief that freer financial markets would allow buyers and sellers to make optimal decisions which would in turn lower the probabilities of further financial crises and bailouts (Crotty, 2009). Unfortunately, NFA philosophy was proven not to work after significant financial deregulation and the emergence of financial innovations became the source of a devastating crisis that infected economies all around the globe. This episode is now described as the worst recession since the Great Depression.

In the early years of the twenty-first century, the US economy experienced a setback as a result of the Tech-bubble crash and the September 11 attacks. In order to stimulate economic recovery, the Federal Reserve lowered interest rates from 6.5% to 1% between 2000 and 2003 (Federal Reserve Board). Instead of stimulating businesses into engaging in more economic activity, lower interest rates led to a rise in the demand for real estate. As an effect, banks started issuing billions of dollars' worth of mortgages, most of which were then packaged into mortgage-backed securities (MBSs) and sold in the secondary market.

In practice, credit generating institutions would engage in screening and monitoring practices before they issued a loan, in order to evaluate its risk. However, by securitizing mortgages and other forms of loans and then selling them onto third parties, the distance between the originator of the mortgage and the risk-holder increased. This, in turn, gave rise to lax incentives, as credit and financial institutions could now originate a loan, earn a fee, and distribute it to the secondary market, passing all the risk associated with the loan onto investors (Purnanandam, 2010; Berndt & Gupta, 2008). A study by Berndt & Gupta (2008) revealed that "borrowers whose loans are sold on the secondary market underperform their peers by about 9% per year (risk-adjusted) over the three-year period following the sale of their loans" (p. 1). The volume of loans traded in the secondary loans market grew from $8 billion to $196 billion between 1991 and 2005. Additionally, as loans with subprime ratings yield higher returns, it is commonly argued that there was an incentive to originate loans of this sort.

Even though securitization allowed for a higher availability of loans, credit agencies were still required to have an 8% of core capital against risk-weighted assets, and important financial institutions were required to only hold assets with AAA ratings (Crotty, 2009). This gave rise to moral hazard, as higher ratings could lead to higher bonuses resulting from higher profits. As the demand for high ratings increased, rating agencies started to meet this demand. In not doing so they would lose clients and thus revenue (Crotty, 2009).

In the second quarter of 2007 the US saw the value of MBSs plummet, as real estate prices fell and the country collapsed into a deep recession.

The European Crisis

In 2010, a wave of concern emerged in response to the increasing levels of public debt around the world. Up until 2008, six out of the twelve euro countries of the time had been revealing excessive budget deficits (Pisani-Ferry, 2012). In the autumn of 2009, following the collapse of the Irish economy, a crisis unfolded in Greece after it was revealed that its government had been significantly misreporting its soaring deficit (Featherstone, 2011).

The crisis quickly spread onto the rest of the continent, which had been suffering from budget deficits, housing bubbles, and poor discipline; and onto the rest of the already-weakened global economy. Although the term PIIGS (Portugal, Ireland, Italy, Greece, and Spain) has been coined to represent the economies that had the greatest negative impact in the European recession, rising instability was a feature prominent in the whole of Europe prior to its downfall and one which played a key role in the expansion of the crisis (Featherstone, 2011).

In times of crisis, the ECB was in charge of buying government bonds in order to avoid contagion between sovereign bond markets. However, when the Greek scandal came to light, the ECB failed to fulfil its duty by refusing to buy Greece's debt (De Grauwe, 2011). Instead, Greece received economic assistance from a number of Eurozone countries and the IMF (Congressional Research Service, 2012). Subsequently, the European Financial Stability Facility (EFSF) and the European Stability Mechanism (ESM) were created as surrogates to the ECB, providing financial assistance to EU members that are going through financial difficulties (European Commission; European Stability Mechanism). According to Paul De Grauwe (2011), "the reluctance of the ECB to take up its responsibility as a lender of last resort [in Greece] is the single most important factor explaining why the forces of contagion in the Eurozone's sovereign bond markets has not been stopped," (p. 2).

Prokopijević (2010) argues that one of the main causes leading to the crisis was the loss of discipline of Eurozone members after the introduction of the euro. He describes the violation of the budgetary rule (where euro countries that allowed GDP to fall by more than -3% would be punished through fines) by member countries as follows:

> *"In 1999 and 2000, no country violated the budgetary rule; in 2001, three did (Greece, Italy and Portugal). Deterioration marked the period 2002-2005. In 2002, France and Germany did the rule wrong; in 2003, France, Germany, Italy and Holland; in 2004, Austria, France, Germany, Italy and Portugal; and in 2005, Germany, Italy and Portugal. Greece violated the budgetary rule every year of its Eurozone membership but 2006" (Prokopijević, 2010, p. 372).*

Since 2012, all euro area members have seen their GDP shares of debt increase, with the exceptions of Denmark, Latvia, and Lithuania. The highest increases were witnessed in Greece (+24.1%), Ireland (+18.3%), Spain (+15.2%), Portugal (14.9%), and Cyprus (12.6%) (Eurostat, 2013a). In 2012 Greece reported the highest debt to GDP ratio of all EU member states, reaching 156.9% (Eurostat, 2013b).

2.4 Previous studies

After the collapse of the Bretton Woods System, economists realized that exchange rate variability could have a large impact on the volume of international transactions. As a result, scholars have been trying to come up with a model that accurately defines this relationship. Most of the literature written on the subject focuses mainly on the effect that exchange rate uncertainty has on trade. However, as of today no consensus has yet been reached. More recent studies have shifted their scope to the impact that joining a currency union may have on trade.

Studies that have been conducted on the relationship between exchange rate uncertainty and trade have yielded mixed results. Some empirical literature provides evidence suggesting that uncertainty has a negative impact on trade flows. Chowdhury (1993), and Arize, Onsang & Slottje (2000) have found a significant negative relationship between exchange rate volatility and the volume of exports. Chowdhury (1993) evaluates this relationship us-

ing data from the G-7 countries[1] and finds that risk-averse market participants will prefer domestic to foreign trade in reaction to exchange rate volatility. Arize, Onsang & Slottje (2000) use data from 13 less developed countries (LDCs) revealing that high exchange rate volatilities depress export flows and demand in the short run and the long run. De Grauwe (1988) and Dell'Ariccia (1999) also find a negative relationship between exchange rate uncertainty and international trade. De Grauwe (1988) created a model that uses data from the Bretton Woods and post-Bretton Woods years, revealing negative correlation between exchange rate volatility and bilateral trade. He finds that, despite the reduction in welfare, an increase in exchange rate volatility may also induce exporters to increase their export activities. Dell'Ariccia's (1999) research concludes that exchange rate volatility has a small negative impact on bilateral trade flows, while the effect of other measurements of uncertainty has a higher magnitude.

Conversely, studies conducted by Hooper & Kohlhagen (1978) and Baccheta & Van Wincoop (2000) found no significant relationship between uncertainty and trade flows. Hooper & Kohlhagen (1978) used data from several industrial countries in order to examine the impact that exchange rate uncertainty has on bilateral and multilateral trade flows. Their empirical results reveal that exchange rate uncertainty has a significant impact on prices but not on trade volume. The direction of the price change depends on who bears the impact of exchange rate risk. If the effect is borne by the importer, the importer's increase in risk aversion will lead to a fall in the price of the foreign currency in response to a decline in import demand. If the impact is borne by the exporter, the exporter will reduce supply and charge higher prices that reflect the increase in risk premium (Hooper & Kohlhagen, 1978). Baccheta & Van Wincoop (2000) evaluated the effect of exchange rate stability on trade and welfare and found that trade and welfare can be high under both fixed and floating exchange rate regimes depending on the country's monetary policies and the specific rules of each system. A one-to-one relationship between the levels of exchange rate variability, and welfare and trade is not found. A study by Clark (1973) on the relationship between exchange rate variability on exports concludes that the negative effects of exchange rate variability can be reduced if movements in exchange rates are counterbalanced by prices in traded goods. He notes that a decrease in trade does not necessarily imply a reduction in welfare, as it could represent a movement towards an optimum position in a situation where there exists too much trade.

The literature measures exchange rate uncertainty through several different methods. For instance, De Grauwe (1988) uses the variability of the yearly percentage changes in bilateral exchange rate between country i and j around the mean observed during a given period, Chowdhury (1993) measures volatility as the standard deviation of the growth rate of the exchange rate, and Sekkat (1997) uses two measurements of exchange rate fluctuations around its equilibrium level: volatility and misalignment. Additionally, there is no consensus on whether it is best to use the nominal or the real exchange rate but the preference of one over the other does not generally lead to divergent results since both measurements are highly correlated (Baccheta & Van Wincoop, 2000).

Towards the end of the twentieth century, Europe had successfully managed to reduce exchange rate variability among members of the ERM. Policy makers and researchers started considering the effects that the creation of a European currency union would have on European integration and Europe's role in the world market. It was during that time that the

[1] Canada, France, Germany, Italy, Japan, the United Kingdom and the United States (European Commission, 2012).

study of how exchange rates affect trade started focusing more on how joining a currency union may affect trade. Studies conducted by Rose (2000), Glick & Rose (2001), Engel & Rose (2000), and Micco et al. (2003) show a positive relationship between joining a currency union and trade growth. Rose's (2000) work on the effect of exchange rate volatility on currency unions and international trade showed that countries joining a currency union experience three times as much trade among each other as they would with countries outside the currency area. These robust results have on several occasions been criticized by scholars. More modest conclusions are revealed by Glick & Rose (2001), who find that there is a nearly doubling in bilateral trade as two countries join a currency union. A study by Engel & Rose (2000) which examines whether currency unions replicate the desirable characteristics stated under Mundell's optimum currency areas (OCAs) finds that members of currency unions are more integrated, have less volatile exchange rates, and have more synchronized business cycles among each other than with countries outside the currency area. They note, however, that members of currency unions are more integrated but not to the extent of members who are fully politically integrated. The study by Micco et al. (2003) on the currency union effect on trade, stresses the finding that the EMU not only has increased trade between euroland members but also with the rest of the world. The results reveal that the impact ranges between 4 and 10 per cent within the Eurozone and between 8 and 16 per cent compared to all other country pairs.

3 Theoretical Framework

This section presents the theoretical framework on which the empirical section of this study is based. The empirical model is based on an augmented gravity formula, which is why I begin by briefly summarizing the theoretical foundations and implications of the gravity model of trade. Additionally, the terms "trade creation" and "trade diversion" are put into perspective, followed by an insight to Robert Mundell's theory of optimum currency areas.

3.1 The gravity model

Throughout the past fifty years the gravity formula has been widely recognized for the high explanatory power it has in predicting international trade flows. Despite previous scepticism based on the grounds that the model lacked theoretical foundations, today "the model stands proudly on both theoretical and empirical legs" (Rose, 2000, p. 13). The model was first empirically tested by Tinbergen in 1962, based on previous literature extrapolating that the level of trade between two countries is dependent on the size of each economy, measured by their gross domestic product (GDP), and their geographic location (Tinbergen, 1962). The gravity model was given its name in analogy to Newton's law of gravity, which states that the gravitational attraction between two objects is proportional to the product of the two bodies' masses and decreases the larger the distance between them. In a similar nature, the level of bilateral trade between two countries will be proportional to the product of the two countries' GDPs and will fall with distance (Krugman & Obstfeld, 2008).

Fischer and Johansson (1996) define the level of trade between two countries through the use of a gravity formula of the following form:

$$T_{ij} = A_i (Y_i)^{\beta_1} (Y_j)^{\beta_2} F_{ij} \qquad \textbf{(3.1)}$$

where T_{ij} represents the trade flow from region i to region j, Y_i and Y_j represent the outputs of regions i and j respectively, A_i is an origin-specific constant, and F_{ij} represents elements that may alleviate or hamper trade (see section 4 for a more detailed view on all trade aid and obstacle factors used in this study's empirical model, and section 5 for a brief explanation on how these variables are specified in the model).

Economic size

Krugman & Obstfeld (2008) depict the reasoning behind why the volume of trade between two economies is correlated to their respective sizes, quite simply. By postulating the reasonable assumption that a domain's share of world spending represents the amount the world spends on that domain's goods, one may conclude that the larger the size of the economy, the greater the world demand for its goods will be. The higher level of world consumption on goods produced in large economies can be partly attributed to the wider selection of goods they produce and their ability to create greater supply quantities. Countries that represent a high share of world GDP will also tend to have higher income levels. This, in turn, should have a positive influence on the demand these countries will have for goods from abroad.

Geographical distance and transport costs

The main argument for why geographical distance has a negative impact on trade is that large distances between regions imply higher transport costs. As a result, the gravity model of trade uses distance as a proxy for transport costs. However**,** there are numerous factors other than bilateral distance which are key elements in defining the level of overall trade between nations and which could, in turn, lead to deviations from the gravity equation. Geographical and cultural factors; the implementation of trade barriers, such as tariffs, import quotas, export subsidies, and voluntary export restrains (VERs); or simply whether two countries share a common border or language; are all elements that could have an impact on trade volumes (Krugman & Obstfeld, 2008).

Brakman, Garretsen, & Marrewijk (2009) define transport costs as a "notation for many different types of obstacles to trade between locations, such as tariffs, language and culture barriers, and indeed the costs of actually getting goods or services at another location" (p. 41). Although the impact of geographical distance on trade has become less significant with the evolution of technology that has led to easier communications and lower costs of transporting goods across the globe, a significant negative relationship between distance and trade flows can still be supported on strong empirical grounds (Krugman, 1995). Other factors, such as whether a country has coastal access or whether two countries share a common border, are commonly viewed as having a significant effect on the level of international transactions. Brakman et al. (2009) suggest that "a median landlocked country has only about 30 per cent of the trade flows that a coastal country has" and that "being landlocked raises transport costs by about 50 per cent" (p. 109). Common borders are usually seen as a source of trade alleviation, since adjacency usually leads to familiar structures, similar conventionalisms, and enhanced communications (Fischer & Johansson, 1995).

3.2 Trade creation versus trade diversion

A common debate in the field of international trade questions whether countries should engage in free trade or implement protectionist policies, and if so, to which extent. In 1962, Tinbergen said on the topic of protectionism and free trade:

> *"We must realize that the concepts free trade and protection are not equally definitive. Free trade is a more precise term than protection, for protection is a relative matter. There may be a greater difference between a high-tariff policy and a low-tariff policy than between a low-tariff policy and a free-trade policy. For policy making purposes, the significant need is to indicate what level of protection is optimal; as a limiting case this level may be zero, meaning free trade" (p. 41).*

In 1953 Professor Jacob Viner coined the terms "trade creation" and "trade diversion", which stand for the gains and losses countries may face as an effect of the increase in trade that arises from the creation of customs unions. In a trade-creation scenario, a country that joins a customs union begins to import a good from another union member, which it would not have otherwise imported whatsoever due to the high prices levied on that good. By lowering tariffs through the customs union agreement, the country is now able to import the aforementioned good, leading to trade creation. On a trade-diversion scenario, the creation of a customs union diverts trade in such a way that a union member begins to import a good from another union member, and ceases to import that good from a third country outside the union, from which it imported the good from prior to the ratification of the tariff-reducing agreement. Viner (1953) views the trade-creation effect as one leading to global gains, since it creates trade that would otherwise not exist. On the other hand, as

trade diversion shifts production from a low-cost to a high-cost country, it is seen as a loss to the external world and to the world as a whole, to the sole benefit of the supplier.

The view that the formation of a currency union can lead to the black-and-white scenario where countries either gain or lose from trade creation and trade diversion respectively, is debated by Lipsey (1957), who suggests that currency unions not only affect the patterns of production, but also the patterns of consumption, and thus global welfare. Lipsey argues that when trade diversion takes place, this also leads to an increase in welfare for the importing country since it now faces domestic prices on those imports from members of the customs union. If this gain outweighs the losses from diversion from a low-cost to a high-cost country, then trade diversion may also increase welfare.

Whatever the case may be, customs unions are usually created as a result of already existing high levels of trade between union members, which is why in most cases the creation of customs unions is seen as a source of trade creation rather than trade diversion.

3.3 Optimum currency areas

I begin by defining an optimum currency area (OCA) as a region or domain for which fixed exchange rates are most appropriate. The theory of OCAs was first proposed by Robert Mundell in 1961, during a time where the creation of currency areas defined by a high degree of factor mobility and trade among members, would seem implausible. We are talking about the post-World War II era, where the currencies of most developed economies were pegged to the US dollar, which was itself pegged to gold. The underlying question that Mundell's theory deals with is: "What is the appropriate domain of a currency area?" (Mundell, 1961, p. 657). In other words, what we are trying to find out is what the ideal characteristics of a region or domain should be in order to for it to be considered an OCA.

Mundell (1961) illustrates his theory by presenting a situation involving two regions, which we shall denote as A and B. A shift in the demand from the goods of region B to the goods of region A would lead to inflationary pressure and a balance of payments surplus in region A, and higher unemployment in B. The only way to avoid unemployment in B would be to raise prices in A. However, if A decides to fight inflation by tightening credit restrictions, the only options left for country B to deal with adjustment are to lower real income, or if this is not possible, to allow for a fall in output and employment within the region. Conversely, if regions A and B would share the same currency, unemployment levels would be defined by the central authorities' willingness to allow for unemployment in deficit regions. It should be noted that, given the aforementioned scenario, it is not possible to fight both inflation and unemployment simultaneously. The only solution to adjust for the burden would be for surplus regions to allow for inflation, or for both regions to share the burden by allowing for both unemployment and inflation in more moderate levels (Mundell, 1961).

The argument for floating exchange rates was introduced after the gold standard took most of the blame for the series of events that lead to the creation and expansion of the Great Depression. However, Mundell (1961) argues that the same negative effects of a fixed exchange rate system could also be seen within a country with a floating currency if it were to be comprised by different regions. As an effect, floating exchange rates would only be effective if exchange rates were based on regional and not national currencies.

In Mundell's (1961) words:

> *"If the world can be divided into regions within each of which there is factor mobility and between which there is factor immobility, then each of these regions should have a separate currency which fluctuates relative to all other currencies" (p. 663).*

Recent literature on the theory of OCAs expound that fixed exchange rates are most appropriate for areas with a high degree of integration not only through factor mobility but also in international trade (Krugman & Obstfeld, 2008).

Mundell's optimum currency areas are defined using a cost-benefit analysis, where the monetary efficiency gains from joining the currency area should equal-to or outweigh the economic stability loss that results from it. A country that joins a currency union will face a monetary efficiency gain that results from the elimination of the uncertainty associated with exchange rate volatility, and from the reduction of transaction costs. By giving up its ability to use monetary policy as a national stabilization tool, the country will also face an economic stability loss. The higher the level of integration between the countries in question, the higher the monetary efficiency gain, and the lower the economic stability loss will be. A country should decide to join a currency union when the level of integration is high enough so that the monetary efficiency gain is equal-to or outweighs the stability loss acquired from entering the union (Krugman & Obstfeld, 2008).

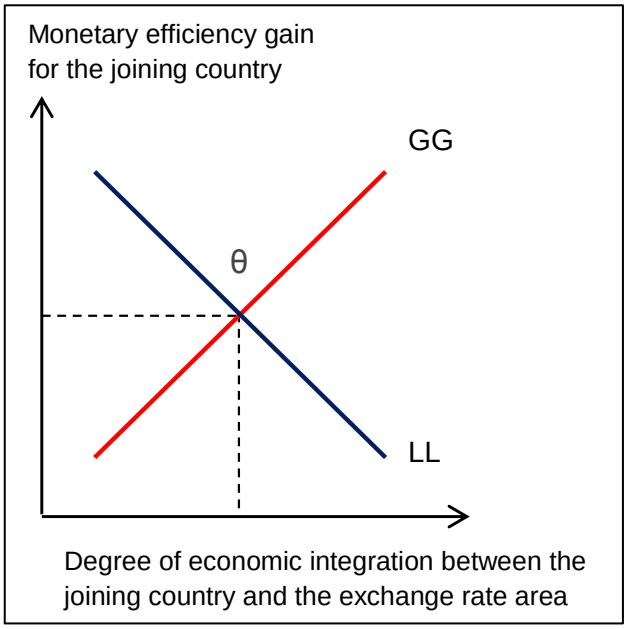

Figure 3.1 Deciding When to Peg the Exchange Rate

Source: Krugman & Obstfeld (2008)

This relationship is illustrated in Figure 3.1, which shows a depiction of the GG-LL schedule. The GG-LL schedule is a standard format used in economics in order to evaluate the gains and losses a country faces when joining a currency union, following the theory of OCAs. The GG curve represents the relationship between level of integration and the monetary efficiency gain that results from joining the currency area, and the LL curve shows the relationship between the level of integration and the economic stability loss that results from joining a currency area. A country should decide to join a currency union if the level of integration equals to or exceeds θ, in which case the monetary efficiency gain would outweigh the economic stability loss (Krugman & Obstfeld, 2008).

Krugman and Obstfeld (2008) argued that, in the case of the EU, "the extent of intra-European trade was not large enough to convey an overwhelming reason for believing that the EU itself was an optimum currency area" (p. 583). This assumption does not necessarily hold true, as there was a substantially large amount of intra-EU trade prior to the creation of the EMU. Table 3.1 shows the level of intra-EU27 and extra-EU27 trade of goods in 2002, when the euro was officially adopted, for the countries who adopted the currency that year. By observing the values in column four, we may see that the level of intra-EU27 trade in terms of dispatches was more than twice as large as the level of exports from EU-27 to non-member countries during the time where the euro was adopted. Only the Netherlands exported more goods to non-member countries than to EU-27 members. The ratio of intra- to extra-EU27 trade for all other countries is higher than one, with Luxembourg having a level of dispatches to EU27 members that is an impressive 7.55 times larger than exports to non-member countries.

Table 3.1 Intra- and extra-EU27 trade of goods

Country/region	Intra-EU27 trade (dispatches in millions of euros)	ExtraEU27 (exports in millions of euros)	Ratio of intra-EU27 against extra-EU27 trade
EU27	1,897,440	891,899	2.13
Austria	62,318	20,881	2.98
Belgium	172,403	56,159	3.07
Finland	29,187	18,556	1.57
France	228,385	122,418	1.87
Germany	412,715	238,545	1.73
Greece	6,699	4,314	1.55
Ireland	61,602	31,742	1.94
Italy	163,906	105,158	1.56
Luxembourg	9,539	1,263	7.55
Netherlands	20,751	50,589	0.41
Portugal	22,292	5,106	4.37
Spain	99,373	33,545	2.96

Data source: External and intra-EU trade – statistical yearbook
*EU-27 countries found in Appendix I

Additionally, Krugman and Obstfeld (2008) expounded that, although the EU has seen more integration in the national financial markets and an increase in intra-EU trade since the introduction of the euro, "labour mobility is nowhere near the high level countries would need to adjust smoothly to product market disturbances through labour migration" (Krugman & Obstfeld, 2008, p. 586-587). In other words, the EU was not an optimum currency area when the euro was adopted. Trade between EU members has increased as a result of the creation of the Eurozone, thus making the EU get closer to becoming an optimum currency area. Nonetheless, there is strong evidence suggesting that the gains from joining the Eurozone still do not outweigh the losses faced by member countries when joining the currency area (Krugman & Obstfeld, 2008).

4 Data, Variables and Descriptive Statistics

The following section gives an insight of the data that is used for the empirical section of this study. An augmented gravity model of trade is implemented, using variables such as the economic sizes of the two countries in a country pair and the geographical distance between them, as well as additional variables which are commonly used in gravity models nowadays. The empirical model implemented in this study will be further discussed in Section 5.1.

Section 4.1 presents the data that was used to build the empirical model, as well as the sources where the data was retrieved from. In Section 4.2, the variables the model makes use of are put into perspective, followed by Section 4.3, which gives a brief description of the data's descriptive statistics.

4.1 Data

This study uses a set of pooled data for the period from 1990 to 2012, using observations from all EU and OECD countries. All regressions are tested on two samples: one including all EU and OECD countries, and the other one including only European countries from the sample. The model uses a log-linear model, in which the dependent variable and some of the explanatory variables are measured as natural logarithms. All regressions were run using White's robust standard errors, due to signs of heteroscedasticity across the error terms (Gujarati & Porter, 2009).

The reason behind why OECD countries are included in the first sample is due to their homogeneity, as both groups of countries are all highly industrialized and possess similar structures. By selecting a wide variety of countries, it is possible to analyse the impact of the EMU on trade flows between members using data from a large and diverse set of countries, most of which do not adopt the euro. The European sample derives its observations mostly from data from EU nations, meaning that the impact of EMU membership on trade flows is bound to be larger. By running regressions for both sets of countries it is possible to observe and compare the effects that the EMU has on trade between members when only countries closely linked to the union are included, as well as when a larger and more diverse set of countries is included.

I have chosen to use pooled data due to the fact that I selected a large country sample. By creating one grand regression, it is possible to make deductions about how certain factors influence trade flows using data from a wide selection of countries, some of which do not necessarily trade with each other to a high extent or whatsoever, and on a more general basis. This also makes it possible to focus mainly on the impact of the EMU on trade as a whole, and not on individual country pairs, which are significantly large in number.

Pooled regressions have become an increasingly popular method of quantitative analyses throughout the past decades (Podestà, 2002). One of the reasons for the method's popularity is that it allows us to use large numbers of observations, eliminating the problem of having too many explanatory variables and too few degrees of freedom. Additionally, it makes it possible to capture variation through time or space, or through both simultaneously (Podestà, 2002). One of the consequences of using pooled data is that we may encounter serial correlation across time, and also across country pairs within a particular point in time (Podestà, 2002). After running the Woolridge test for autocorrelation in panel data, I found that there is in fact first-order autocorrelation within the dataset. Within the presence of au-

tocorrelation, ordinary least squares (OLS) estimators are no longer best, linear, and unbiased since they are no longer minimum variance estimators. This may in turn lead to inefficient t, F, and X^2 tests (Gujarati & Porter, 2009). This, however, does not seem to have a large impact within this study's results, as the values of most of the OLS estimators presented in the empirical section of this study are in line with vast previous literature (see Section 5).

The data for the total amount of merchandize was retrieved from UN Comtrade, the virtual trade database of the United Nations. The geographical and cultural factors affecting trade positively or negatively that were used in this study's model, such as bilateral distance and sharing a common language, were obtained from the CEPii virtual database. Economic size and countries' real effective exchange rates (REER), were retrieved from the World Bank internet database. Dummy variables used to represent whether two countries belong to the EMU, were constructed using information from the EU website.

Countries outside the EU which are currently making use of the euro as their national currency are not included in this model's sample. Moreover, Croatia, which joined the EU in 2013, is not included either since the data used dates only until 2012. The GDP values are missing for Estonia during the period between 1990 and 1994, and for Israel during 2012. The data on the real effective exchange rate is missing for Estonia, Korea, Latvia, Lithuania, Slovenia, and Turkey on all years; for Germany, Japan, Israel, Italy, and Portugal during 1991; for Bulgaria between 1990 and 1991; and for Romania during 1990. All cases where trade data is missing were dropped from the model.

4.2 Variables

Volume of trade and economic size

Following the methodology of Fischer and Johansson (1996), I decided to measure trade, or the dependent variable, as the total value of exports in merchandize from country i to country j. The independent variable representing the size of economy i stands for the exporting country's potential supply level and the size of economy j represents country j's potential demand for the exports of country i. This makes it possible to measure how much influence the potential supply of the exporting economy and the potential demand of the importing economy effectively have on the realized level of exports from one country to the other. The value of a country's GDP in current US dollars is used as a proxy for its respective economic size.

Transport costs

For the empirical model, the approach to transport costs used by Brakman, Garretsen, & Marrewijk (2009) is used, defining transport costs as any obstacle to trade between two locations. The model constructed in this study implements the conventionally used distance variable as an obstacle to trade, measuring the geographical distance (kilometres) between the two most important cities, or the two largest agglomerations, of a country pair. Additionally, other common variables are included as dummies, namely those denoting whether two countries are landlocked, contiguous, or if they share a common language. The landlocked variable takes the value of one when at least one country in a country-pair is landlocked and a value of zero when both countries have coastal access. The dummy variable for common language is one when two countries share a language, and zero otherwise; and similarly, the contiguity variable is one when two countries have a common border and zero otherwise.

The EMU effect

This study's main focus is to evaluate the effect that the introduction of the euro has had on trade between Eurozone members. In order to capture this impact, and basing the assessment on the model by Micco et al. (2003), an EMU dummy variable is employed, taking the value of one when two countries form part of the EMU and zero otherwise. This way, the impact of having a common currency is estimated, as different countries enter the Eurozone in different years.

Real effective exchange rate

Recent literature (Rose, 2000; Engel & Rose, 2000; Engel & Rose, 2001; Micco, et al, 2003) includes variables representing the real exchange rates of two countries in a country pair. Micco et al. (2003) argue that not including these variables could lead to possible underestimation of the EMU variable. The logic behind this argument is that, if the euro were to appreciate against other currencies, the value of the volume of exports between two Eurozone countries would decrease, leading to possible underestimation of the EMU effect (Micco et al., 2003). The REER of a country is measured as the value of its currency against a weighted average of several foreign currencies (World Bank).

In this model I implement a measurement of the real effective exchange rate instead, which is derived by using the value of each currency against a weighted average of foreign currencies (as opposed to the US dollar) divided by the country's price index or deflator (World Bank). The value of the real effective exchange rate for all countries is 100 in 2005, which is the base year used for the calculation of the value.

4.3 Descriptive statistics

Table 4.1 gives a detailed summary of the descriptive statistics of the data used for the sample including all countries. The table presents the number of observations (n) and the values of the mean, minimum (min), maximum (max), standard deviations (sdv), skewness, and kurtosis for the normalized (logged) values of the level of exports, of the GDPs of each country, of their real effective exchange rates (REER), and of the bilateral distance between them. Table 4.2 shows the same data using observations only from the European countries from the sample.

By taking a glance at the descriptive statistics one may witness that the standard deviations from both samples are close to their respective mean values. Additionally, the median values for all variables in both tables are close to their respective mean values. This implies that the data for each variable has a central tendency, and is thus less likely to be considerably skewed.

In most cases the values for skewness and kurtosis do not differ much from the rule-of-thumb values, zero and three respectively (Gujarati & Porter, 2009). In Table 4.2, the values for skewness and kurtosis are not as close to the rule-of-thumb values, for the distance variable. This could be attributed to the fact that the value of distance does not change over time for any country. Additionally, the skewness and kurtosis values are quite different from those predicted by the rule-of-thumb for the real effective exchange rates in both samples. One possible explanation for this is that the real effective exchange rate changes at a different pace for every country, and thus the values are much higher for some countries than for others in different points in time, depending on the historical trend of each country's real effective exchange rate values.

Table 4.1 Descriptive Statistics: All OECD and EU Countries

	n	mean	median	min	max	sdv	skewness	kurtosis
exports	31312	19.039	19.269	4.691	26.592	2.792	-0.442	3.249
GDP	35646	25.849	25.980	21.658	30.384	1.846	-0.024	2.501
REER	30343	4.559	4.592	3.625	4.921	0.155	-1.523	8.048
distance	35880	7.929	7.717	4.088	9.883	1.133	-0.047	2.275

Table 4.2 Descriptive Statistics: European Countries from the Larger Sample

	n	mean	median	min	max	sdv	skewness	kurtosis
exports	18185	19.215	19.428	7.032	25.684	2.729	-0.469	3.250
GDP	21240	25.494	25.760	21.658	28.919	1.748	-0.124	2.166
REER	17850	4.549	4.590	3.625	4.921	0.160	-1.757	8.443
distance	21390	7.156	7.271	4.088	8.493	0.652	-1.053	4.698

5 Empirical Model and Analysis

Based on empirical theory expounded in the previous sections, the following section constructs the model that is implemented in this study's regressions.

5.1 Empirical model

Basing the assessment on the theoretical framework of this study and on previous empirical literature (Fischer & Johansson, 1996; Engel & Rose, 2000; Glick & Rose, 2001; Micco et al., 2003; Rose, 2000) I constructed a formula of the following form:

$$T_{ij} = A_i(Y_i)^{\beta_1}(Y_j)^{\beta_2}(REER_i)^{\beta_3}(REER_j)^{\beta_4}(D_{ij})^{\beta_5}F_{ij} \quad \textbf{(5.1)}$$

where T_{ij} denotes the trade flow from region i to region j, Y_i and Y_j represent the outputs of regions i and j respectively, $REER_i$ and $REER_j$ are the real effective exchange rates of the two countries, D_{ij} is the distance between them, and A_i is an origin-specific constant (Fischer & Johansson, 1996). F_{ij} encompasses dummy variables that represent different elements that may influence trade levels positively or negatively, and is specified in the following way:

$$F_{ij} = e^{(\beta_6 EMU + \beta_7 Lang + \beta_8 Landlocked + \beta_9 Contig)} \quad \textbf{(5.2)}$$

where EMU represents membership in the EMU, Lang represents whether two countries share a common language, Landlocked if at least one of them is landlocked, and Contig if they are contiguous. By expanding the F vector in Equation 5.1, the following model is formulated for use in the regressions:

$$\begin{aligned}\ln(T_{ij}) = A_i &+ \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_3 \ln(REER_i) + \beta_4 \ln(REER_j) \\ &+ \beta_5 \ln(D_{ij}) + \beta_6 EMU + \beta_7 Lang + \beta_8 Landlocked \\ &+ \beta_9 Contig\end{aligned} \quad \textbf{(5.3)}$$

This study analyses one regression using conventionally used gravity model variables, and adding the EMU effect as the main source of exploration; an additional regression including language, landlocked, and contiguity characteristic dummies; and one final regression that controls for yearly unobserved effects. The three regressions are run for the two aforementioned country groups. The results are presented and analysed in the following subsection.

5.2 Results and analysis

Table 5.1 shows the results obtained by estimating Equation 5.3. The first two columns show the results using observations from all OECD and EU countries, and the last two columns show results using data from only European countries from the sample. In columns one and three a regression is run using conventional gravity model variables, including economic size, distance, the real effective exchange rate, and in this case the EMU dummy, which is the main subject of this study. In the second and fourth columns all other dummies are included. Robust standard errors are included in parentheses, along with their respective levels of significance.

Table 5.1 Regression Results

Regression Results: Gravity model estimates				
	OECD and EU countries		**European Countries**	
Intercept A_i	-12.041	-12.513	-8.105	-10.014
	(0.485)***	(0.471)***	(0.602)***	(0.597)***
EMU	0.197	0.159	0.273	0.230
	(0.024)***	(0.025)***	(0.026)***	(0.026)***
$\ln(GDP_i)$	0.966	0.964	0.970	0.986
	(0.006)***	(0.006)***	(0.008)***	(0.008)***
$\ln(GDP_j)$	0.833	0.833	0.767	0.783
	(0.006)***	(0.006)***	(0.008)***	(0.008)***
$\ln(REER_i)$	-0.934	-0.924	-1.172	-1.203
	(0.086)***	(0.084)***	(0.119)***	(0.117)***
$\ln(REER_j)$	-0.764	-0.789	-0.839	-0.891
	(0.082)***	(0.079)***	(0.104)***	(0.103)***
$\ln(D_{ij})$	-0.987	-0.936	-1.114	-0.937
	(0.009)***	(0.010)***	(0.020)***	(0.025)***
Language		0.702		0.085
		(0.028)***		(0.052)
Landlocked		0.355		0.304
		(0.021)***		(0.026)***
Contiguity		0.149		0.275
		(0.038)***		(0.042)***
Observations	22487	22487	12710	12710
R^2	0.741	0.751	0.761	0.764

NOTE: Robust standard errors in parentheses; * significant at 10%, ** significant at 5%, ***significant at 1%.

Taking a first glance at the results one can verify that all coefficients but the ones for the landlocked dummy have the expected signs according to theory. Most coefficients are highly significant and the R^2 values range between 0.741 and 0.764. In line with previous literature (Fischer & Johansson, 1996), the coefficient for the size of the economy of the exporting country shows elasticity around unity. This is not the case for the coefficient of the economic size of the importing country, which is smaller. This implies that the size of the economy of the exporting country plays a higher role on the realized volume of trade be-

tween a country pair, than that of the importing country. In other words, potential supply has a greater importance than potential demand in determining volumes of exports from one country to another. We must keep in mind, however, that both factors have a high explanatory power on trade flows between countries in the sample.

Despite transport costs no longer being a major barrier to trade nowadays, there is empirical literature suggesting that geographical distance still plays a crucial role in determining the volume of trade between two countries (Fischer & Johansson, 1996; Krugman, 1995). Table 5.1 reveals that trade between two countries falls by a dramatic 60 to 70 per cent for every kilometre of distance between two countries. Additionally, contiguity seems to play a much more significant role on the volume of trade between countries in the European sample than in the sample including all countries, increasing trade by approximately 16 per cent in the sample with all countries, and by 32 per cent, twice the value, in the European one. This is not a surprising result, considering that European countries are closely linked by the short distance among them, which is also a major source for integration between nations.

One remarkable outcome is that language is highly significant for the sample including all countries, whereas in the case using only European countries from the sample the language coefficient seems to have a neutral impact. In fact, the data reveals that in the sample including all countries, trade will increase by more than onefold as an effect of sharing a common language, as opposed to a null increase in the second group of countries. One possible explanation for this is that a wide range of languages are spoken within European countries. As an effect, language is not likely to play an important role in the volume of trade between countries in the region. Instead, other factors, such as proximity and sharing a common currency, will more certainly have a significant influence on trade flows within the region.

Moreover, including all other time-invariant variables in the model does not seem to have a large impact on the values of the other coefficients, with the exception of the EMU variable, whose results are discussed in the next subsection.

The EMU impact

Previous empirical literature has found divergent results on the impact of currency union membership on trade. Rose (2000) found that two countries that belong to a same currency union will trade by more than three times more than other countries; Engel and Rose (2000) exacerbated this result, finding an increase between three and six and a half times larger in trade between two members of a currency union, and Glick and Rose (2001) found more modest results, with a nearly double in trade. In their study of the EMU effect on trade, Micco et al. (2003) found that countries that belong to the EMU trade by approximately 4 to 26 per cent more than other countries.

This study's results are more in line with those of Micco et al. (2003). Taking a look at the sample including all EU and OECD countries, I find that EMU membership increases trade between two member countries by approximately 22 per cent more than other countries. When the additional time-invariant dummies are included this value falls to a lower 17 per cent. One possible explanation for this is that the EMU variable could be overestimated, as it could be taking some of its value from other elements that induce trade within the region, such as when two countries share a common border. Thus, by adding the additional dummies in the second regression, the EMU coefficient drops. The European sample

yields slightly differing results, with a trade increase of approximately 31 per cent in the first regression, and with a lower 26 per cent increase once the dummies are added.

Regression implementing yearly dummies

In order to capture unobserved factors that may affect trade over time I run a regression adding yearly dummy variables. The results are presented in Table 5.2, where column one reveals the results for the sample including all countries, and column three those for European countries only. Columns two and four show the robust standard errors (in parenthesis) for each regression, along with their respective levels of significance.

Comparing the results of Table 5.2 with those from Table 5.1, it becomes clear that, in most cases, the coefficients from both samples do not alter drastically. Among other results, we see that the economic size coefficients of the exporting countries continue to show elasticities around unity, that countries trade by slightly more than one third of the potential value due to the distance effect, and that the language dummy is once more insignificant for the European sample. The real effective exchange rate seems to have less of a negative impact once the yearly dummies are included.

By observing the coefficients for the yearly dummies we may see that trade between two countries in the sample tends to decrease systematically over time. The fall in trade, however, seems to have become more severe as the world reached the years of the global recession. The yearly fall in trade due to unobserved factors reached its lowest point in the sample's timespan in 2009, where the data reveals that countries traded approximately 45 per cent of the amount they would have otherwise, due to unobserved factors hampering trade.

If one compares the results from Table 5.2 to those from the regressions using time-invariant transport cost dummies in Table 5.1 (columns two and four), one may observe that including yearly dummies has a strong impact on the measured EMU coefficient. On the sample including all OECD and EU countries the impact increases from a 17 per cent increase to a 27 per cent increase in trade between two EMU countries, once yearly dummies are added. In the case of the European sample there is a shift from a 26 per cent to a 32 per cent increase in trade between two EMU countries. The reason for this could be that when the unobserved yearly factors are excluded from the model, some of the negative impact caused by such factors could be subsumed in the EMU coefficient.

Is the EMU an optimum currency area?

There is no right answer for this question, but it can be argued that the EMU was not and is still not an optimum currency area. Under Mundell's criterion, a country considering joining a currency area should only decide to do so if the level of integration with the area is high enough so that the economic stability loss resulting from joining the area is outweighed by the monetary efficiency gain (see Section 3.3). The model suggests that, for this purpose, integration is crucial within two main aspects: labour mobility and the level of trade between the country and the region. Although this study does not focus on the aspect of labour mobility between EMU members, there is substantial evidence suggesting that the level of integration in the labour market was by no means high enough for the EMU to be considered an optimum currency area (Krugman & Obstfeld, 2008).

Table 5.2 Regression Results

Regression results: Gravity model estimates implementing yearly dummies				
	EU and OECD Countries		**European Countries**	
Intercept A_i	-15.978	(0.548)***	-1.988	(0.750)***
EMU	0.244	(0.025)***	0.281	(0.027)***
$\ln(GDP_i)$	0.976	(0.006)***	0.994	(0.008)***
$\ln(GDP_j)$	0.845	(0.006)***	0.791	(0.008)***
$\ln(REER_i)$	-0.550	(0.087)***	-0.868	(0.126)***
$\ln(REER_j)$	-0.438	(0.084)***	-0.572	(0.113)***
$\ln(D_{ij})$	-0.941	(0.010)***	-0.925	(0.025)***
Language	0.691	(0.029)***	0.067	(0.052)
Landlocked	0.387	(0.021)***	0.327	(0.026)***
Contiguity	0.113	(0.039)***	0.267	(0.042)***
R^2	0.755		0.767	
Year				
1991	-0.258	(0.155)*	-0.743	(0.241)***
1992	-0.157	(0.094)*	-0.220	(0.134)
1993	-0.192	(0.090)**	-0.268	(0.126)**
1994	-0.338	(0.086)***	-0.458	(0.121)***
1995	-0.386	(0.086) ***	-0.491	(0.121)***
1996	-0.362	(0.084) ***	-0.484	(0.118)***
1997	-0.263	(0.084)***	-0.378	(0.119)***
1998	-0.244	(0.083)***	-0.323	(0.117)***
1999	-0.351	(0.083) ***	-0.445	(0.116)***
2000	-0.218	(0.082) ***	-0.310	(0.116)***
2001	-0.231	(0.082) ***	-0.301	(0.115)***
2002	-0.322	(0.082) ***	-0.373	(0.114)***
2003	-0.475	(0.082) ***	-0.517	(0.114)***
2004	-0.507	(0.081) ***	-0.539	(0.114)***
2005	-0.523	(0.081) ***	-0.556	(0.114)***
2006	-0.517	(0.082) ***	-0.512	(0.114)***
2007	-0.604	(0.081) ***	-0.602	(0.114)***
2008	-0.681	(0.081) ***	-0.694	(0.114)***
2009	-0.800	(0.082) ***	-0.801	(0.114)***
2010	-0.735	(0.081) ***	-0.736	(0.114)***
2011	-0.718	(0.081) ***	-0.713	(0.114)***
2012	-0.736	(0.082) ***	-0.734	(0.115)***

NOTE: Robust standard errors in parentheses; * significant at 10%, ** significant at 5%, ***significant at 1%.

In line with previous studies, this study's results reveal that trade between members of the EMU is higher than trade with other countries. However, one question many scholars pose regarding this matter is that of whether the higher levels of trade should be attributed to the EMU itself, or if these result from a pre-existing history of trade. Prior to the creation of the EMU there was a high tendency to engage in trade between EMU countries, induced by factors such as their proximity, as well as due to their membership in the EU, which being a customs area serves as a form of trade creation between member countries, and perhaps also as a form of trade diversion from countries outside of the EU. By assuming that countries entering the EMU already had a history of trade with the union, it could be implied that perhaps the EMU coefficient captures the impact of some of the trade that would exist regardless of the existence of the EMU, in which case the coefficient's effect would be overestimated.

In summary, although it is evident from this and other studies that the EMU does in fact increase potential trade between members, empirical evidence suggests that the EMU is not, and never was, an optimum currency area.

6 Conclusions

Based on previous methodology, this study constructs a gravity model of trade with the purpose of finding to what degree the creation of the EMU has affected trade integration among members. For this purpose, an EMU dummy is introduced, making it possible to make a quantitative estimate of the impact of EMU membership in the volume of exports from one region to another. The regression is run for two pooled samples, one using data from all OECD and EU countries, and one using only data from European countries from the sample. Two additional regressions are run, adding common gravity model dummy variables that capture the influence of common languages, contiguity, and if at least one country is landlocked. Finally, a regression is run per sample adding yearly dummies that capture unobserved factors which could affect trade over time.

The most crucial finding of this study is that two countries belonging to the EMU will trade between 17 and 32 per cent more than other countries. These results are in line with results yielded by Micco et al. (2003), who find a 4 per cent to 26 per cent increase in trade between two EMU countries. Conversely, Rose (2000), Engel and Rose (2000), and Glick and Rose (2001), find significantly differing results, where membership in a currency union increases trade between members by threefold, between three and six and a half the amount, and by nearly twice as much, respectively.

The EMU was created in order to nurture integration between members of the EU, and to create a unified European market. The question remains: was it the right decision to take such a dramatic step to integration? Economic theory suggests it was not. In accordance to the criteria encompassed in Mundell's theory of optimum currency areas, high levels of integration were essential in the international trade and labour markets in order for the EMU to be considered an optimum currency area. During the time of its creation, the labour market was not nearly as integrated as it needed to be for the benefits to outweigh the costs of joining the union, and although trade levels were high, some argue they were not high enough either (Krugman & Obstfeld, 2008). Lack of integration in the political structures of EMU countries triggered the financial disaster that wrecked European economies, especially those which had adopted the euro, since the late 2000s.

In summary, the EMU has increased trade. This however, does not imply that the overall effect in European economies has been positive.

6.1 Suggestions for further research

This study evaluates the relationship between common currencies, particularly the case of the euro, and trade volumes, using data from all OECD and EU countries. Future studies should focus on evaluating this relationship using alternative groups of countries. For instance, it would be interesting to use a sample of all European countries and perhaps other neighbouring countries which, due to proximity and historical reasons, have a high tendency to trade with Europe, and re-evaluate the impact of EMU membership on trade. As seen from this study's results, the EMU coefficient increased once only European countries from the sample were included. This implies that the EMU coefficient could be overestimated and that the high levels of trade between these countries could be attributed to other factors, such as geographical distance and having a previous history of trade. By selecting a sample of countries that are closely integrated but in which many countries do not make use of the euro, perhaps the results yielded will diverge from those of previous studies fo-

cusing on the impact of EMU membership on trade, such as this study and the one conducted by Micco et al. (2003).

Moreover, it should be interesting to conduct studies that measure the impact of the introduction of the ERM and the EU on trade, using a similar methodology to the one from studies focusing on the impact of currency unions on trade. If the impact of any of the two on trade were to be positive, this could serve as proof that there is in fact a history of trade between EU countries, which would naturally alter the interpretation of the EMU coefficient in models such as the one used for this study.

One final suggestion would be to run regressions for separate timespans and observe the value of the EMU coefficient within each period. In doing so, one could witness whether the coefficient (and thus the EMU impact on trade flows between members) is increasing, decreasing, or remaining at around the same level.

As in nearly all major economical debates, there is no consensus on whether currency unions have a positive effect on those who decide to join them. It is not a surprising result that countries entering currency unions experience higher levels of trade volumes. However, the question lies on whether the benefits from higher integration outweigh the costs of losing monetary sovereignty, and the European Union is perhaps the best experiment we can rely on today in order to answer this question.

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Databases

CEPii: Research and Expertise on the World Economy, webpage: http://www.cepii.fr/CEPII/en/bdd_modele/bdd.asp

The World Bank, webpage: http://data.worldbank.org/

UN Comtrade, webpage: http://comtrade.un.org/db/

World Trade Organization – Statistics Database, webpage: http://stat.wto.org/Home/WSDBHome.aspx

Appendix I: EU27 countries

The following olist of countries includes all countries that adopted the euro up until June 30, 2013.

Austria	Germany	Netherlands
Belgium	Greece	Poland
Bulgaria	Hungary	Portugal
Cyprus	Ireland	Slovakia
Czech Republic	Italy	Slovenia
Denmark	Latvia	Spain
Estonia	Lithuania	Romania
Finland	Luxembourg	United Kingdom
France	Malta	

Appendix II: Countries used in regressions

All EU and OECD Countries

Australia	Korea
Austria	Latvia
Belgium	Lithuania
Bulgaria	Luxembourg
Canada	Malta
Chile	Mexico
Cyprus	Netherlands
Czech Republic	New Zealand
Denmark	Norway
Estonia	Poland
Finland	Portugal
France	Romania
Germany	Slovakia
Greece	Slovenia
Hungary	Spain
Iceland	Sweden
Ireland	Switzerland
Israel	Turkey
Italy	United Kingdom
Japan	United States

Note: Countries that entered the EU after 2012 are not included.

Only European countries from the sample

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

EMU members and their year of entry

Austria	1999
Belgium	1999
Cyprus	2008
Estonia	2011
Finland	1999
France	1999
Germany	1999
Greece	2001
Ireland	1999
Italy	1999
Latvia	2014
Luxembourg	1999
Malta	2008
Netherlands	1999
Portugal	1999
Slovakia	2009
Slovenia	2007
Spain	1999

Appendix III: Results from previous studies

Table A 1

Author(s) and year	Rose, 2000	Engel & Rose, 2000	Glick & Rose, 2001	Micco, Stein, & Ordoñez, 2003
Countries	186 countries from the UN Statistical Office	Over 150 countries from the UN International Trade Statistics Yearbook	UN set including 186 countries	One sample including 22 countries from the IMF's Direction of Trade Statistics data set, and another including only EU-15 countries
Period	1970-1990	1995	1970-1990	1992-2002
Model Used	Gravity model	Gravity model	Gravity model	Gravity model
Dependent Variable	Logarithm of bilateral trade between countries i and j	Logarithm of bilateral trade between countries i and j	Log of the average value of real bilateral trade between i and j at time t	Log of total exports plus imports
Explanatory Variables	Logarithm of the product of GDP i and j, logarithm of the product of the GDP per capita of i and j, logarithm of the distance, volatility of the bilateral exchange rate, and dummies for contiguity, common languages, regional trade agreement, common nations, whether two countries were colonies after 1945 with the same colonizer, whether i colonized j or vice versa, and common currency.	Log of distance, log of the products of the real GDPs of countries i and j, log of the products of the real GDPs per capita, log of the sum of the land areas, log of the product of the land areas, and dummies for currency union membership, membership in a regional trade agreement, common languages, common borders, common colonizers, same nations, colonial relationships, the number of landlocked countries (0, 1, or 2), and number of island countries (0,1, or 2)	Log of distance, log of the product of the GDPs of countries i and j, log of the products of the real per capita GDPs, and dummies for common languages, common borders, common colonizers, whether countries are current colonies, the number of islands, number of landlocked countries, if a country was ever a colony, same nations, and regional trade agreement membership	Log of the product of the real GDPs of countries i and j, the real GDPs per capita, EMU membership, membership in a free trade agreement, EU membership, EU trend, landlocked, island, distance, area, contiguity, common language, real exchange rate of countries i and j
Results	Countries that belong to currency areas experience three times as much trade as other country pairs.	Trade between countries in a currency union is between 3 and 6.5 times greater than between other country pairs.	Countries that belong to currency areas experience a nearly doubling in trade from membership in the area.	Countries in euroland trade somewhere between 4 and 26% more than other country pairs.

Appendix IV: Additional regressions

Table A 2

Regression Results: Gravity model estimates		
Intercept A_i	-12.609	-10.014
	(0.484)***	(0.668)***
EMU	0.179	0.235
	(0.030)***	(0.029)***
EU	-0.033	-0.011
	(0.027)	(0.031)
$\ln(GDP_i)$	0.965	0.987
	(0.006)***	(0.008)***
$\ln(GDP_j)$	0.833	0.783
	(0.006)***	(0.008)***
$\ln(REER_i)$	-0.909	-1.194
	(0.085)***	(0.120)***
$\ln(REER_j)$	-0.775	-0.883
	(0.081)***	(0.107)***
$\ln(D_{ij})$	-0.942	-0.938
	(0.012)***	(0.026)***
Language	0.700	0.083
	(0.029)***	(0.053)
Landlocked	0.352	0.303
	(0.021)***	(0.027)***
Contiguity	0.145	0.274
	(0.039)***	(0.042)***
Observations	22487	12710
R^2	0.751	0.764

NOTE: Robust standard errors in parentheses; * significant at 10%, ** significant at 5%, ***significant at 1%.

a) EU is a dummy variable that takes the value of one when two countries in a country pair belong to the EU, and zero otherwise.
b) Columns 1 and 2 show the results for the sample including all OECD and EU countries, and for the one including only European countries from the sample, respectively.

Table A 3

Regression results: Gravity model estimates implementing yearly dummies				
Intercept A_i	-15.898	(0.553)***	-12.706	(0.800)***
EMU	0.262	(0.031)***	0.217	(0.030)***
EU	0.047	(0.028)*	0.043	(0.032)
ln(GDP_i)	0.976	(0.006)***	0.993	(0.008)***
ln(GDP_j)	0.844	(0.006)***	0.789	(0.008)***
ln($REER_i$)	-0.566	(0.08)***	-0.896	(0.128)***
ln($REER_j$)	-0.453	(0.085)***	-0.598	(0.116)***
ln(D_{ij})	-0.932	(0.012)***	-0.921	(0.025)***
Language	0.696	(0.029)***	0.072	(0.053)
Landlocked	0.391	(0.021)***	0.331	(0.027)***
Contiguity	0.119	(0.039)***	0.270	(0.042)***
R^2	0.755		0.767	
Year				
1991	-0.257	(0.155)*	-0.738	(0.241)***
1992	-0.157	(0.094)*	-0.222	(0.134)*
1993	-0.191	(0.091)**	-0.268	(0.126)**
1994	-0.336	(0.086)***	-0.458	(0.121)***
1995	-0.387	(0.086) ***	-0.494	(0.120)***
1996	-0.362	(0.084) ***	-0.487	(0.118)***
1997	-0.263	(0.084)***	-0.381	(0.120)***
1998	-0.244	(0.083)**	-0.324	(0.117)***
1999	-0.349	(0.083) ***	-0.446	(0.116)***
2000	-0.217	(0.082) ***	-0.312	(0.116)***
2001	-0.229	(0.082) ***	-0.301	(0.115)***
2002	-0.319	(0.082) ***	-0.371	(0.115)***
2003	-0.471	(0.082) ***	-0.513	(0.114)***
2004	-0.511	(0.081) ***	-0.546	(0.114)***
2005	-0.526	(0.081) ***	-0.563	(0.114)***
2006	-0.521	(0.081) ***	-0.518	(0.114)***
2007	-0.611	(0.081) ***	-0.612	(0.114)***
2008	-0.686	(0.081) ***	-0.701	(0.114)***
2009	-0.804	(0.082) ***	-0.808	(0.114)***
2010	-0.739	(0.081) ***	-0.744	(0.114)***
2011	-0.722	(0.081) ***	-0.720	(0.114)***
2012	-0.742	(0.082) ***	-0.742	(0.115)***

NOTE: Columns 3 and 4 show the robust standard error in parentheses; * significant at 10%, ** significant at 5%, ***significant at 1%.

a) EU is a dummy variable that takes the value of one when two countries in a country pair belong to the EU, and zero otherwise.
b) Columns 1 and 3 show the results for the sample including all OECD and EU countries, and for the one including only European countries from the sample, respectively.
c) Notice that the EU dummy is insignificant in three out of the four regressions in tables A2 and A3. It has got negative sign in the two cases in table A2 and positive signs in both cases in table A3.