Are There Winners and Losers in the Game of the Euro?

Hedvig Westphal

Abstract

In the midst of the economic turbulence around Europe today, the European currency has been put to its greatest test so far. Now more than ever, an assessment of the euro is needed. The purpose of the paper is therefore to re-assess the euro's effect on trade and to estimate and compare the individual Member States' effects. This has been done with bilateral intra-EU trade data and estimated with a gravity model including a euro dummy. The overall effect of the euro was estimated to 8.2% and different individual effects have been found statistically significant, indicating that there are winner and losers in the game of the euro.

Keywords

Currency unions, EMU, euro, individual effects, intra-EU, gravity model, trade, trade effects.

Bachelor's Thesis January 2013

Supervisor: Maria Persson

LUND UNIVERSITY
School of Economics and Management

Acknowledgments

I would like to take this opportunity to express my most sincere gratitude to my supervisor Maria Persson for her guidance, well-thought advices and patience when not only one, but two econometric data programs did their best to put an end to my thesis. I also want to thank Kristoffer Blomqvist and Pierre Andersson for their econometric help and willingness to act as discussion partners.

Table of Contents

Abbreviations

CU	Currency Union
ECB	European Central Bank
ECU	European Currency Unit
EMI	European Monetary Institute
EMS	European Monetary System
EMU	Economic and Monetary Union
ERM	European Exchange Rate Mechanism
ESCB	European System of Central Banks
EU	European Union
EU-27	The 27 EU Member States in 2012
EZ	Eurozone
EZ-17	The 17 EZ Member States in 2012
GTC	Gross Trade Creation
OCA	Optimum Currency Area
PTA	Preferential Trade Agreement

Introduction

One of the main arguments behind the Economic and Monetary Union (EMU) and the implementation of the euro was that it would *increase trade*. With the same currency it was argued that the transaction costs of trading would decrease and thus lead to increased trade among the countries adopting the euro. Quite a few studies have tried to assess the trade effects of the euro, and most tend to find statistically significant positive effects. With the ongoing economic crisis in Europe and the Eurozone (EZ) together with the questioning of the euro's survival, one cannot help to wonder if these unambiguously positive effects may differ among the respective Member States. On the one hand we have Members like Greece, on the verge of bankruptcy, and on the other Members like Germany fighting with all means for the survival of the euro. Is it not possible that the euro has had different effects for these two countries? Why is Germany so keen on keeping the euro alive? Previous research has been focusing on the overall effect of a common currency in general and the euro in particular. Only one study has been conducted on the individual Member State effects of the euro, and it was published in 2006. Since then five new Member States have joined the EZ and adopted the euro as their currency. The new members consist of the former Eastern block states Estonia, Slovakia and Slovenia, as well as the small Mediterranean islands of Malta and Cyprus. I think that with the passing of time and new members joining the EZ there are new insights to be learned. I believe the time is high to assess these effects and to raise question about the success of the euro in order to make well-informed decisions about its future.

The purpose of this paper is divided into two parts.

1. To re-assess the overall trade effects of the euro with a larger sample group and a greater time span than previous research.
2. To assess whether the trade effect varies among Member States and compare these effects across countries.

I expect the trade effect to be overall positive for the EZ as a whole in accordance with both theory and previous research. However, on specific Member State level it is more

difficult to draw any conclusions hence I will leave this as an empirical question and let the results lead the discussion.

To examine the effects of the euro I will use a gravity model with the addition of an euro dummy. With this model I will be able to isolate the effect of the euro and control for other trade affecting variables such as GDP, population size, and distance. The gravity model creates a counterfactual outcome of what would have been without the introduction of the euro. Thus, the model gives an indication of what would have been, which is used to estimate the effect the euro has had compared to a situation where it does not exist.

The EZ sample consists of the 17 countries that have adopted the euro as their national currency, excluding Belgium and Luxembourg[1] making a total of 15 countries in the EZ sample. The total sample group consists of the EU-27 again excluding Belgium and Luxembourg, making a total of 25 countries in the total sample group. The reason for the EU-27 is to control for any effects due to political economy, which would have great influence on trade.

The paper is organized as follows. Firstly a short background of the EMU, followed by a theory presentation, previous research in this field, my empirical strategy along with a presentation of my model and the data used, my empirical results, and lastly, a summary along with conclusions.

2. A Brief Background of the EMU

The idea of an Economic and Monetary Union (EMU) has been a part of the EU for a long time. It dates back to 1969 when the European Commission set out the need for "greater co-ordination of economic policies and monetary cooperation" (Barre Report, 1969) as well as the decision made by the Heads of State or Government in 1969 to come up with a plan to create an Economic and Monetary Union. In 1970 a blue print for an Economic and Monetary Union was published, called the Werner Plan, aimed at

[1] The reason for excluding Belgium and Luxembourg is the ambiguity in the data over these countries. Up til 1999 they were counted as one economic area, and available data has no consensus in the presentation of these countries after 1999. To avoid complications in my study I have chosen to exclude these two instead.

establishing an EMU before 1980. The ultimate goal for the Werner Plan was to "achieve full liberalisation of capital movements, the total convertibility of Member States' currencies and the irrevocable fixing of exchange rates" (European Commission, 2011). Due to the international crisis caused by the change of the USD into a floating currency as well as the rising oil prices, the Werner Plan and the EMU were never implemented, but the wheels were set in motion.

In March 1979, another step in the direction towards a single currency was taken. Efforts were made to decrease the volatility of the members' exchange rates and increase monetary stability within the EU. The European Monetary System (EMS) was introduced as a result of this. The EMS referred to the concept of fixing all national exchange rates, while leaving some room for adjustments. The exchange rates were all fixed to a weighted average of all the participating nations currencies. The "average exchange rate" was called the European Currency Unit (ECU). The participating countries were allowed to have their own national currency vary ±2.25 % from the ECU (although Italy was allowed a more generous allowance of variation). The EMS did make a lot of progress for the convergence of the European economies and to achieve and maintain exchange rate stability.

The introduction of the Single Market in 1985 brought the EU members even closer. Despite all that had already been done, the presence of transaction costs in intra-EU trade still persisted and it was realized that all benefits of the Single Market would not fully be exploited as long as these costs still existed. To be able to fully take advantage and utilize all benefits from the internal market, a single currency was viewed upon as a necessity.

The first stage of the EMU as we know it today started 1st of July 1990 with the free movement of capital coming into force. This was seen as a logical first step towards a common currency. The preparations for the single currency began with the meeting of the Council of Economic and Finance Minsters in July 1990 where the Monetary Committee presented a report recommending a single monetary policy and a single currency. 11 Member States, with only the UK opposing, supported the recommendation. It did not however come into force until November 1993 when the Treaty of Maastricht was finalized. The Maastricht Treaty formalized the Maastricht

convergence criteria[2]. These criteria were designed to guarantee that the Member States economies where to be ready and suitable for adopting the Single currency, and were to be implemented during stage two. With the finalization of the Maastricht Treaty the "Member States confirmed their political will to realize an Economic and Monetary Union" (European Commission, 2011) and it marks the ending of stage one.

The second stage of the EMU stretches from 1st of January 1994 to 31st of December 1998. During this period Member States were required to fulfil the Maastricht convergence criteria. This meant converge their economic and monetary policies to ensure economic stability of prices and public finances. The European Monetary Institute (EMI) was founded in 1994 and its purpose was to coordinate the convergence in monetary policy among the Member States' national banks. In May 1998, 11 Member States met the convergence criteria. In June 1998, the European Central Bank (ECB) and the European System of Central Banks (ESCB) replaced the EMI.

The third and final stage of creating the EMU started the 1st of January 1999 with the irrevocable fixing of the Member States' national exchange rates and the introduction of the single currency, the euro. The euro was initially only used on foreign-exchange markets and for electronic payment usage till the 1st of January 2002, when the first euro notes and coins started replacing all national currencies in the Member States. Within two months after the implementation of euro coins and notes, by the end of February 2002, all national currencies of the new EZ ceased to be a legal mean of payment. Those that adopted the single currency in 1999 were Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain. They were later on followed by Greece in 2001, Slovenia in 2007, Cyprus and Malta in 2008, Slovakia in 2009, and finally Estonia in 2011, ultimately making up the EZ-17 we see today. The third stage has theoretically not ended yet, and will not end until all EU Member States

[2] The Convergence criteria are (1) Price Stability; "the inflation rate of a given Member State must not exceed by more than 1½ percentage points that of the three best-performing Member States in terms of price stability during the year preceding the examination of the situation in that Member State", (2) Government Finances; annual government deficit to GDP must not exceed 3% and government debt to GDP must not exceed 60%, (3) Exchange Rates; must be a member of the European Exchange Rate Mechanism (ERM) for a minimum of 2 years, (4) Long-Term Interest Rates; "the nominal long-term interest rate must not exceed by more than 2 percentage points that of, at most, the three best-performing Member States in terms of price stability" (European Commission, 2011).

have adopted the euro. Two nations have exemptions to this, the UK and Denmark. The other eight remaining EU members, that do not have the euro, yet have convergence criteria to fulfil before being allowed to join the EZ. The special case of Sweden is worth noting as well. In 2003 Sweden had a referendum whether to adopt the euro or not, resulting in the people wanting to keep the Swedish Krona. Sweden was then denied an opt-out like the ones for the UK and Denmark. In order to stay outside the EZ and keep the Swedish Krona, Sweden left the ERM. By being outside the ERM, Sweden fails to meet the convergence criteria of being an ERM member for a minimum of 2 years and is therefore not eligible for adopting the euro and may keep its own currency without breaking any of the EU rules.

Table 1 presents a summary of the EMU history and the most important years.

Table 1. EMU History

Year	*Happening*
1969	Barre Report, Commission sets a need for greater co-ordination
1970	Werner Plan
1979	European Monetary System
1985	Single Market
1990	Start of stage 1
	Free movement of capital
1993	Maastricht Treaty
	End of stage 1
1994	Start of stage 2
	European Monetary Institute
1998	11 Member States meet the Convergence Criteria
	European Central Bank and European System of Central Banks replaces the EMI
	End of stage 2
1999	Start of stage 3
	Euro introduction in 11 Member States
2001	Greece joins
2002	Euro as official mean of payment
2007	Slovenia joins
2008	Cyprus and Malta join
2009	Slovakia joins
2011	Estonia joins

Table 2 displays all the EU-27 Member States, when they joined the EU, and if they have adopted the euro, when it was introduced.

Table 2: EU Membership and Euro Introduction

Country	*EU Membership*	*Euro Introduction*
Austria	1995	1999
Belgium	Founder	1999
Bulgaria	2007	-
Cyprus	2004	2008
Czech Republic	2004	-
Denmark	1973	-
Estonia	2004	2011
Finland	1995	1999
France	Founder	1999
Germany	Founder	1999
Greece	1981	2001
Hungary	2004	-
Ireland	1973	1999
Italy	Founder	1999
Latvia	2004	-
Lithuania	2004	-
Luxembourg	Founder	1999
Malta	2004	2008
Netherlands	Founder	1999
Poland	2004	-
Portugal	1986	1999
Romania	2007	-
Slovakia	2004	2009
Slovenia	2004	2007
Spain	1986	1999
Sweden	1995	-
United Kingdom	1973	-

Note that Belgium and Luxembourg are presented in this table but will not be part of the empirical sample.

3. The Theory of Currency Unions

The predominant theory of the costs and benefits associated with a currency union (CU) is the Optimum Currency Area (OCA) described by Mundell in 1961. In short the theory characterizes currency unions with microeconomic benefits and macroeconomic costs. The losses are mainly associated with the loss of an independent central bank and thus the loss of an important macroeconomic policy instrument, an instrument very much needed when adjusting for exogenous shocks (Ricci, 2008). The most important benefits

according to Mundell's theory are "(1) the elimination of transaction costs, and (2) a better performance of money as a medium of exchange and as a unit of account" (*ibid*). The Commission of the European Community (1990) refers to these benefits as "the elimination of exchange rate related transaction costs and the suppression of exchange rate uncertainty". The Commission divides these transaction costs into two sub-categories; (1) external or financial costs as well as (2) in-house costs. The "external or financial" costs are costs associated with the cost households and firms have to pay to financial intermediaries when exchanging currencies. These are direct costs to both private persons and firms. Added to the "external or financial" costs are the costs for the banking system when handling multiple currencies. The "in-house" costs can be described with four different aspects; (1) when a firm has to handle several currencies, more personnel and time need to be devoted to this task; (2) firms may make financial losses due to cash being held longer than otherwise needed, explained as "interest costs on debit positions" (European Commission, 1990, pp 67); (3) multiple currencies delay the debiting and crediting of bank accounts; (4) opportunity costs may incur due to firms trying to avoid exposure of the risks associated with foreign exchange (Commission, 1990).

The suppression of exchange rate uncertainty refers to the theory that risk-adverse agents will reduce their trade if the risk of financial losses increase due to changes in exchange rates (*ibid*). Since most trade between agents do not take part at the same time, the delivery and the payment are not necessarily made simultaneously, there is a risk for the exporter that by the time s/he receives the payment, the exchange rate has changed and the currency has depreciated. The same risk goes for the importer, that the exchange rate has change in his/hers disfavour, the goods being more expensive than when the initial contract was drawn. To solve for this risk, agents hedge for future exchange rate risks, which incurs costs for the agents. Since economic theory assumes agents to be risk-averse, the more uncertainty in the international market, the less international trade will take place.

The manners in which a common currency reduces transaction costs as well as uncertainty and risk in the international market is easiest described by the removal of the border effect. The border effect can be described with two neighbouring regional areas that share a common border but have to different currencies (i.e. an American state with

USD sharing a border with a Canadian province with CAD). It is reasonable to assume that they do not trade as much with each other as they do within their own regional area. This is due to transaction costs related to cross-border trade, which constitute barriers to trade. If the two regions were to join the same currency union, these transaction costs would become zero and the cross-border trade would be able expand to the same level as the domestic trade. The costs of exchanging currencies will vanish. The cost inflicted on firms due to more personnel and time devoted to the different currencies will be removed (at least for firms trading within the new currency union). The commitment to one single currency will remove all the uncertainty characterizing international trade due to exchange rate fluctuations. There would no longer be a border effect inflicting on trade. Therefore, in theory the adoption of a single currency, should lead to increased trade between the two countries.

Intuitively the theory is quite straightforward. When adopting the same currency as one's trading partner, all risk involving exchange rate fluctuations and plausible financial losses due to these fluctuations, will vanish and thus the risk and uncertainty embedded in international trade will be heavily reduced. When the risk is reduced the trade will naturally increase.

Furthermore, according to the Commission (1990), the countries that would gain the most from the adoption of the euro will be small and middle sized economies, due the notion that small economies generally engage in more trade relative large economies which are to a greater extent more self-sufficient. Therefore, opening up to the new larger internal market, will relatively affect the small economy to a greater extent than the large economy. Economies with poor financial institutions will also gain more from the euro due to greater reduction in the uncertainty associated with exchange rate fluctuations.

Thus, the most important benefits from a currency union are the reduction of transaction costs, which occur due to uncertainty aspects, exchange rate fluctuations, as well as the direct cost inflicted on firms and households when dealing with multiple currencies.

4. Previous Research

The literature of currency union effects as it is today started with Rose (2000). After a long period of trying to detect the effects by measuring the volatility of exchange rates, Rose took the commonly known gravity model and added a dummy variable checking for the presence of a common currency between a country-pair. Rose started his article with a seemingly straightforward question, answering it with a very straightforward answer:

> *"Question: What is the effect of a common currency on international trade? Answer: Large." (Rose 2000)*

He estimated that a common currency would increase trade between two countries about three times. The unexpectedly large effect found by Rose (2000) started a lively debate among researchers whether effects of this magnitude are reasonable. One major concern with his findings was that the shared currencies in his data were mostly between poor and small countries (e.g. the East Caribbean dollar), or several small and poor countries adopting a currency of a large developed country (e.g. the islands of Kiribati, Nauru, and Tuvalu adopting the Australian dollar, also referred to as Dollarization). Since Rose was trying to estimate the effect of a currency union in general, and his sample countries were in many ways very different from the EZ Members, it is argued that the study is not suitable as an example for the EZ.

Subsequent years several articles were published, all trying to estimate the "real" trade effect of a common currency and in particular the effects of the euro. Micco, Stein and Ordoñez (2003), and de Nardis and Vicarelli (2003) used a more direct approach trying to detect the trade effect of the euro. Micco, Stein and Ordoñez (2003) asked what "is the impact of a currency union on those countries that adopt it". They used a gravity model, but in a way that adequately controls for unobserved heterogeneity that otherwise can lead to biased results. They capture unobserved heterogeneity by including country pair fixed effects. With this methodology, they find the euro's effect to be 4-10% on trade within the EZ.

De Nardis and Vicarelli (2003) point out that reversed causality can be a problem when estimating the effects of a common currency on trade. In other words, it is possible that countries adopt a common currency because they already trade a lot, and if that is the case, there is a causal link going from the dependent variable (trade flows) to the independent variable (common currency). Obviously, this is problematic. To remedy this problem, De Nardis and Vicarelli (2003) include lagged trade flows as an additional explanatory variable. Interestingly, this methodological innovation does not change the conclusion that the euro increases trade (the authors find a 10% increase in trade).

Bun and Klaassen (2002) used a slightly different approach by taking export values instead of import values as the dependent variable but did draw the same conclusion as both Micco *et al.* and de Nardis and Vicarelli. They found that the euro increased trade in the first year by 4 %, and they calculated it to increase trade by 40 % in the long-run. In 2007 Bun and Klaassen changed their opinion with a new article downsizing the euro's effect to only 3 %. They found that there was an upward trend in the residuals from the models previously used and therefore extended the standard gravity model by including a time trend that may have different effects across country pairs to correct for this unwanted trend.

In 2007, Flam and Nordström used bilateral direction-specific trade flows, namely export flows, unlike Micco *et al.* (2003) who used an average of bilateral export and import flows. They found a fairly high effect of 28 % (although nothing in comparison to Rose's original 300%) increased trade within the EZ. They found that not only had the euro had a positive effect on intra-EZ trade, but also had a positive effect on trade between euro countries and non-euro countries.

A fairly large body of research has been dedicated to the overall trade effect of the euro but there is still a large gap in the research when assessing the individual effects. The only study made to this date is by Aristotelous (2006). He found the overall effect of the euro to be positive, just like the rest of the literature, but found that there were winners and losers in the game of the euro. Austria, France, and Greece were found to have experienced a negative and statistically significant effect from the euro. The second part of my study is much influenced by Aristotelous (2006). It replicates his study with a gravity

model but with some alterations as well as improved with a larger data set and again a greater time span.

To summarize, the literature regarding the effects on trade of a currency union seems to be pointing in the same direction. Adopting one single currency will, according to previous research, increase trade within the currency union. The following empirical analysis will use new data to test this conclusion.

5. Empirical Strategy

To assess the trade effects of the euro, I will use a gravity model. The gravity model is a standard tool in international trade and has been used by many economists estimating different trade effects (i.e. Rose 2000, Micco *et al.* 2003, Flam and Norström 2003, Aristotelous 2006). Anderson and Wincoop (2003) as well as Baldwin (2006) have demonstrated the theoretical ground of the gravity model and argued for its proficiency. The model I use here is following the one used by Aristotelous (2006) with some alterations, i.e. Aristotelous used an EU trend, which I instead account for in year-specific dummies as well as the usage of country-pair specific dummies. I use year and country-specific dummies instead. According to the gravity model, trade flow between two economies will be a result of different economical factors such as GDP, population size, and distance together with a number of dummy variables such as common language, common border, landlocked, members of the same PTA, common colonizer, etc.

The specific baseline model I have chosen for my study is described as follows:

$$(1)\quad ln(X_{ijt}) = \beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(POP_{it}) + \beta_4 ln(POP_{jt}) + \beta_5 ln(DIST_{ij}) + \beta_6\, LANG_{ij} + \beta_7\, CONTIG_{ij} + \beta_8\, EU_{ijt} + \beta_9\, EU1_{ijt} + \beta_{10}\, EMU_{ijt} + \mu_{i(j)} + \lambda_t + \varepsilon_{ijt}$$

where *ln* is the natural logarithm, *i* the importing country, *j* is the exporting country, *t* is a year within the time period 1995-2011. *Xijt* is the dependent variable, which denotes the value of bilateral trade in thousands of US dollar between country *i* and country *j in* period *t* (for all $i \neq j$).

The first independent variable in equation 1 is *GDPit*, which is the real GDP for country *i* at time *t*. The second independent variable is *GDPjt*, which is the real GDP for country *j* at time *t*. These two variables represent the economic size of the two countries and as larger economies are expected have an absolute larger trade, both coefficients are expected to be positive. The third and fourth independent variables are *POPit* and *POPjt*. These refer to the population size in the importing country *i*, and the population of the exporting country *j*, respectively, at time *t*. The larger a country's population size, the less is a country expected to trade. This stems from the larger the population size at a constant GDP level, the smaller the per capita level of GDP, thus the less wealthy a country is. The coefficients of the population variables are therefore expected to be negative. The fifth independent variable is *DISTij*, which is the distance from country *i's* economic centre to country *j's* economic centre. This variable primarily captures transport costs. The greater the distance, the higher the transport costs, and thus the more expensive trade will be. Therefore, the distance between two countries is expected to reduce trade and accordingly the coefficient is expected to be negative.

In addition to these continuous explanatory variables, the model also includes a set of dummy variables that capture various trade costs. The first is *LANGij*, which will take the value of 1 if country *i* and country *j* have a common (official) language, and 0 if they do not. A common language is viewed upon as a facilitator for trade since it will reduce transaction costs due to costs such as for translations, as well as uncertainties that can occur due to language barriers. Thus, a common language should increase trade. The parameter is therefore expected to have a positive sign. The second dummy variable is *CONTIGij*. It takes the value of 1 if country *i* and country *j* share a common border, and will otherwise take the value of 0. A common border should facilitate trade since it narrows down the distance and thus transport costs between the two countries, and consequently its sign is expected to be positive.

The next dummies are designed to capture the effects of a preferential trade agreement (PTA) and a currency union. The first dummy *EUijt*, will take the value of 1 if both countries are members of the EU at time *t*, and the value of 0 otherwise. It will capture the effect on trade imposed by the EU. If two countries are members of the same PTA they are expected to trade more, thus the parameter for the EU dummy is expected to be

positive. The fifth dummy is *EU1ijt*. It will take the value of one if only one of country *i* and country *j* is a EU member at time *t*. If both or neither is a member, it will take the value of 0. It is plausible that when only one country is a Member of the EU it may have effects on trade. Important to note here is that all sample countries today are Member States of the EU, making the time dimension important. It captures whether or not a country has already joined the EU or not and its effect on trade.

The variable of main interest is the *EMUijt* dummy. This will take the value of 1 if both countries have adopted the euro as their currency at time *t*, and the value of 0 if only one or none of the two have adopted the euro. For example, the EMU for Austria and Cyprus will take the value of 0 for all *t* between 1995-2003. For all *t* between 2004-2011, the EMU for Austria and Cyprus will take the value of 1 since Cyprus adopted the euro in 2004. This is the most important parameter in the first part of the analysis, as it will determine the overall trade effect of the euro. It is expected to be positive since, as stated in the theory section, a common currency will decrease transaction costs and reduce uncertainty and thus increase trade flows, *ceteris paribus*.

I also include a set of fixed effects to control for unobserved heterogeneity. μ_{i0} represent country-specific effects for all countries (disregarding whether the country is an importer or an exporter). These country-specific effects capture all country-specific features that are not controlled for by the included explanatory variables but nevertheless affect the trade levels for the specific country. For example, one country may have a significantly higher level of trade facilitation than others and may therefore be a more sought after trading partner due to lower transaction costs. I also include a set of time-fixed effects, λt, which captures unobserved heterogeneity that varies over time but is constant for all trading countries. For instance, one would expect trade in 2008 to be less for all countries due to the financial crisis. By including time-fixed effects, this decline in trade will be accounted for and not falsely thought of as an effect of the euro. Lastly, the model includes and error term, ε_{ijt}.

The second part of my analysis is dedicated to the individual Member States' effects. Equation 2 is based on the model used by Aristotelous (2006), and is intended to account for these individual effects and is designed as follows:

$$(2)\ ln(X_{ijt}) = \beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(POP_{it}) + \beta_4 ln(POP_{jt}) + \beta_5 ln(DIST_{ij}) + \beta_6\ LANG_{ij} + \beta_7\ CONTIG_{ij} + \beta_8\ EU_{ijt} + \beta_9\ EU1_{ijt} + \gamma_1\ EMU\text{-}AUT_{(i/j)t} + \gamma_2\ EMU\text{-}CYP_{(i/j)t} + \gamma_3\ EMU\text{-}DEU_{(i/j)t} + \gamma_4\ EMU\text{-}ESP_{(i/j)t} + \gamma_5\ EMU\text{-}EST_{(i/j)t} + \gamma_6\ EMU\text{-}FIN_{(i/j)t} + \gamma_7\ EMU\text{-}FRA_{(i/j)t} + \gamma_8\ EMU\text{-}GRC_{(i/j)t} + \gamma_9\ EMU\text{-}IRL_{(i/j)t} + \gamma_{10}\ EMU\text{-}ITA_{(i/j)t} + \gamma_{11}\ EMU\text{-}MLT_{(i/j)t} + \gamma_{12}\ EMU\text{-}NLD_{(i/j)t} + \gamma_{13}\ EMU\text{-}PRT_{(i/j)t} + \gamma_{14}\ EMU\text{-}SVK_{(i/j)t} + \gamma_{15}\ EMU\text{-}SVN_{(i/j)t} + \mu_{i(j)} + \lambda_t + \varepsilon_{ijt}$$

The equation is identical with equation 1 except in the sense that the overall euro dummy *EMUijt* has been replaced by 15 dummy variables that each represents one of the EZ members (Belgium and Luxembourg excluded for previously stated reasons). These will take the value of 1 if both countries in a trading country-pair have adopted the euro at the time *t*, regardless which is the importer and which is the exporter. Otherwise it will take the value of 0. The index of (i/j) indicates that the variable represents the Member State both as an important and as an exporter. For example, the *EMU-AUTt* will take the value of 1 if, and only if, the trading partner has adopted the euro at the same time *t* as Austria. Take Austria and Slovenia, the dummy will take the value of 0 for all *t* between 1995-2006, and the value of 1 for all *t* between 2006-2011. Austria adopted the euro in 1999, but since Slovenia did not adopt it until 2007, the dummy will only take the value of 1 from 2007 and onwards. The parameters of the specific EZ members' dummies will capture the effect of the euro on each individual member, relative all other members. These will be the main focus in the second part of the analysis, where these individual trade effects will be discussed.

The model will be estimated with a least-square regression using heteroskedasticity consistent standard errors. The usage of robust standard errors is consistent with praxis within the empirical gravity literature. Usually a correction for zero trade values is needed but due to the specific sample of only EU Member States where trade exists between all

country-pairs, there are no zero trade values and this does not need to be corrected for. For information about data sources see the Appendix[3].

6. Empirical Results

The empirical results are divided up into two parts, the first one being the baseline regression and the second part being robustness analyses.

6.1 Baseline Results

In accordance with the two main aspects of this study I have divided the baseline results into two parts, the first presenting the result of the overall trade effect of the euro, and the second presenting the result for the individual effects.

6.1.1 Trade Effects of the Euro

The result from the baseline regression of equation 1 is presented in table 3.

Table 3. Baseline Regression Equation 1

Country/Variable	*Equation 1*
ln GDP_i	0,833 (0,000)***
ln GDP_j	1,032 (0,000)***
ln $Population_i$	-1,660 (0,000)***
ln $Population_j$	-1,786 (0,000)***
ln Distance	-1,302 (0,000)***
Common Language	0,722 (0,000)***
Contiguity	0,371 (0,000)***
EU	0,666 (0,000)***
EU1	0,368 (0,000)***
EMU	0,079 (0,006)***
Country Specific Effect	Yes
Year Specific Effect	Yes
R-squared	0,91
Observations	9864

Source: Author's econometric results

Notes: White's heteroskedasticity consistent standard errors have been used. P-values are reported in parenthesis; ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

[3] There are missing values for Ireland's GDP level during 1995-1999, Spain's import level in 2011, Bulgaria's import level in 1995, and Slovakia's import level during 1995-1996.

Starting with the control variables, their coefficients all have the expected sign. The GDP level of both the importing and the exporting country give positive effects on trade, implying the greater the economic size, the greater the trading flows will be. The population variables have negative signs reflecting that trade is declining with increasing populations due to a fall in per capita GDP levels. The distance variable too has a negative sign, which is expected due to the greater the distance, the higher the transport costs, and thus the lower the trade. They are all statistically significant at a 1% level and in accordance with what previous research have presented.

The standard gravity model dummies of Common Language and Contiguity both have the expected signs. The coefficients of the two are positive reflecting that a shared common language and/or a shared border will increase trade between a country-pair. Both the EU and the EU1 has positive signs meaning that if both countries are EU Member States it will increase trade, as well as when only one of the two is a member. This means that the EU makes overall trade easier, both for intra-EU[4] trade as well as for extra-EU trade[5]. All dummy variables are statistically significant at a 1% level.

It should be noted that country-specific as well as year-specific dummies were included in the model but are not presented in the table due to the little importance they individually bring to the analysis.

The key variable in equation 1 is the EMUijt, reflecting the overall effect on trade within the EZ. The variable is both positive and statistically significant (at 1% level) as expected. The EMU coefficient of 0.079 reflects an 8.2%[6] impact on trade. This means that the overall trade effect of the euro on the EZ's intra-trade is 8.2%. This is consistent with the expectations that a common currency should increase intra-CU trade and the result of 8.2% is consistent with the results from previous research, i.e. Micco *et al.* (2003) estimated 4-10% and de Nardis and Vicarelli (2003) estimated a 10% effect on trade.

---

[4] Intra-EU trade refers to trade within the EU.

[5] Extra-EU trade refers to when a Member State is trading with a non-Member State.

[6] Formula for interpreting dummy coefficients: Gross Trade Creation (GTC) = $100(e^{\beta} - 1)$ where β is the dummy coefficient.

6.1.2 Trade Effects for Individual Euro Countries

The second focus of this study is the estimation of individual euro trade effects. Thus the key variable in equation 2 is the EMU(i/j)t, which accounts for these individual effects. The results are presented in table 4.

Table 4. Baseline Regression Equation 2

Country/Variable	*Equation 2*
ln GDP_i	0,757 (0,000)***
ln GDP_j	0,956 (0,000)***
ln $Population_i$	-2,117 (0,000)***
ln $Population_j$	-2,242 (0,000)***
ln Distance	-1,318 (0,000)***
Common Language	0,731 (0,000)***
Contiguity	0,377 (0,000)***
EU	0,656 (0,000)***
EU1	0,362 (0,000)***
EMU Austria	0,137 (0,002)***
EMU Cyprus	0,359 (0,007)***
EMU Estonia	-0,321 (0,031)**
EMU Finland	0,295 (0,000)***
EMU France	-0,201 (0,000)***
EMU Germany	-0,396 (0,000)***
EMU Greece	0,293 (0,000)***
EMU Ireland	0,026 (0,673)
EMU Italy	0,068 (0,079)*
EMU Malta	0,458 (0,000)***
EMU Netherlands	-0,231 (0,000)***
EMU Portugal	0,279 (0,000)***
EMU Slovakia	-0,187 (0,066)*
EMU Slovenia	-0,229 (0,001)***
EMU Spain	0,122 (0,003)***
Country Specific Effect	Yes
Year Specific Effect	Yes
R-squared	0,911
Observations	9864

Source: Author's econometric results

Notes: White's heteroskedasticity consistent standard errors have been used. P-values are reported in parenthesis; ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

The gravity model variables and dummies all have the expected sign and are of similar magnitude as in the results of equation 1.

All EZ-specific coefficients are statistically significant at the 1% level except Ireland (not statistically significant at any level), Italy (only statistically significant at the 10% level), and Slovakia (only statistically significant at the 10% level). The notion of Ireland not being statistically significant can be a result from the lack of observations. As stated in the previous section, there were no records to be found on Irelands GDP level for 1995-1999, and this may be causing the insignificancy.

Starting with the absolute trade effects from equation 2, both negative and positive effects are present. Malta and Cyprus have had the two largest trade effects, in absolute terms 58.1% and 43.2% respectively. The countries that have had the lowest trade effects are Germany, with a trade effect of -32.7%, and Estonia, with an effect on trade of -27.5%. These negative trade effects are in theory very unexpected to find since theory clearly states that a common currency should increase trade. These results indicate that some of the EZ Member States actually have experienced lower trade flows than the reference trade in a situation without the euro. However, when the model allows the EMU parameter to vary for a large number of countries, the reference trade against which one compares the effect is less well-defined. This meaning there is a degree of ambiguity in how to interpret these estimates. In order to not make any assumptions without verifications I will not focus on the precise magnitude of each estimated coefficient, but instead use the coefficients as a way to assess the *relative* ranking of these individual effects. Thus the sign of the estimate is of less importance, the main aspect is how they relate to each other.

Regardless of interpreting the results as absolute or as a ranking list, the results from equation 2 imply that Malta and Cyprus are the two economies that have reaped the most benefits from joining the EMU and adopting the euro, whilst Germany and Estonia have gained the least from the euro.

It is important to try to identify why these effects differ across countries. I will discuss plausible explanations for why I believe these countries are the greatest winners and losers, respectively.

According to theory small and middle-sized countries should gain the most from adopting the euro due to greater relative propensity to trade. However, the effect of the economies size is already accounted for in the GDP variable. Thus to explain why these small economies, Malta and Cyprus, are the ranked the highest, we have to look at other aspects characterizing small economies, which the GDP variable does not capture. Plausible explanations could be that small countries may tend to have less well-developed financial institutions as larger ones. This aspect would make it more beneficial for the small economy to join the EZ and thus get a more credible and stabile currency, which would increase trade.

The lowest ranking country, Germany, stands in great contrast to Malta and Cyprus, being one of the utmost trading nations in the EU. To evaluate why Germany ends up as the lowest ranked Member, I believe history to have had great influence. Post World War II, Germany has been an eminent trading nation and a major player in the global trading market, and the D-mark was one of the most stabile currencies in the 1990's. These historical attributes of the German economy leads to the conclusion that the German economy was already trading to a very high extent, that the extra trade benefits created by the euro, did not add all that much. Compared with other EZ Members, Germany may not need the euro as badly to keep high trade flows, and thus being ranked as the country benefiting the least from the euro introduction.

The second lowest ranked country, Estonia, adopted the euro very recently, as late as in Estonia in 2011. It is plausible to suspect that the very short trade records of the euro are not enough to actually find the increasing trade flows for Estonia. It is reasonable that it might take a few years for the euro to affect a country's trade flow enough to create large positive flows.

6.2 Robustness Results

To test the robustness of my model I have performed two types of robustness analyses, testing for the most common errors discussed in previous research. Firstly by changing the start-year of the euro, and secondly by testing for a reversed causality.

6.2.1 Robustness with Different Start-Year

The results from the first robustness analysis, equation 1 and 2, are presented in table 5.

Table 5. Robustness Regressions

Country/Variable	*Equation 1*	*Equation 2*
ln GDP_i	0,834 (0,000)***	0,757 (0,000)***
ln GDP_j	1,034 (0,000)***	0,956 (0,000)***
ln $Population_i$	-1,667 (0,000)***	-2,117 (0,000)***
ln $Population_j$	-1,793 (0,000)***	-2,242 (0,000)***
ln Distance	-1,302 (0,000)***	-1,318 (0,000)***
Common Language	0,722 (0,000)***	0,731 (0,000)***
Contiguity	0,371 (0,000)***	0,377 (0,000)***
EU	0,659 (0,000)***	0,656 (0,000)***
EU1	0,366 (0,000)***	0,362 (0,000)***
EMU	0,077 (0,006)***	
EMU Austria		0,137 (0,002)***
EMU Cyprus		0,359 (0,007)***
EMU Estonia		-0,321 (0,031)**
EMU Finland		0,295 (0,000)***
EMU France		-0,201 (0,000)***
EMU Germany		-0,396 (0,000)***
EMU Greece		0,293 (0,000)***
EMU Ireland		0,026 (0,673)
EMU Italy		0,068 (0,079)*
EMU Malta		0,458 (0,000)***
EMU Netherlands		-0,231 (0,000)***
EMU Portugal		0,279 (0,000)***
EMU Slovakia		-0,187 (0,066)*
EMU Slovenia		-0,229 (0,001)***
EMU Spain		0,122 (0,003)***
Country Specific Effect	Yes	Yes
Year Specific Effect	Yes	Yes
R-squared	0,910	0,911
Observations	9864	9864

Source: Author's econometric results

Notes: White's heteroskedasticity consistent standard errors have been used. P-values are reported in parenthesis; ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively. The start-year of the euro has been moved to a year prior to the official year of joining the EZ.

As argued by Micco *et al.* (2003), the actual decision about joining the final stage of the EMU did not happen over night. It is within reason to assume that one year prior to the actual adoption, the economy started reaping benefits from the euro. Micco *et al.* (2003) used a sample only consisting of economies joining in 1999 plus Greece, and thus they

used 1998 as an overall start-year and 2000 for Greece. In table 5 the start-year has been moved to one year earlier for each and all Members, leading to 1998 for all that adopted in 1999, 2000 for Greece, 2006 for Slovenia, 2007 for Malta and Cyprus, 2008 for Slovakia, and 2010 for Estonia. If the results would change notably, it would indicate that the effects of the euro in table 3 and 4 might not be reliable.

All gravity model variables are slightly changing but well within reason for the robustness to hold. The important variable is the EMU which here takes the value of 0.077 indicating a percentage change of 8.00%. The coefficient is statistically significant at the 1% level and the minor difference of 0.2% is not enough to question the results in Table 3. Thus, the robustness test indicates accuracy of the baseline model.

The individual effects all have the same coefficients at the same significance level as in Table 4, which again confirms the robustness of the model.

6.2.2 Reversed Causality Regression

The second robustness analysis performed is in accordance with de Nardis and Vicarelli's study in 2003. They checked for reversed causality by adding an extra independent variable in the model. They included lagged import flows, testing for up to three years lag. I performed a test with a similar addition, but with the limitation of only one lagged period. The *ln Import Flow (lagged)* is the import flow variable lagged one period, thus, the import flow of i.e. 2005 is added as an independent variable describing the import flow of 2006. By doing this, one is trying to capture the effect of history. The lagged variable is supposed to capture the effect on this year's trade due to the trade flow during the year before. This reversed causality test is designed to estimate if large trade flows is what fosters a currency union and not the other way around, that the currency union is the cause of the large trade flows.

The results from this regression are presented in table 6.

Table 6. Reversed Causality Regression

Country/Variable	*Reversed Causality*
ln Import Flow (lagged)	0,537 (0,000)***
ln GDP_i	0,756 (0,000)***
ln GDP_j	0,873 (0,000)***
ln $Population_i$	-0,902 (0,000)***
ln $Population_j$	-0,969 (0,000)***
ln Distance	-0,637 (0,000)***
Common Language	0,335 (0,000)***
Contiguity	0,185 (0,000)***
EU	0,332 (0,000)***
EU1	0,191 (0,000)***
EMU	-0,022 (0,241)
Country Specific Effect	Yes
Year Specific Effect	Yes
R-squared	0,91
Observations	9793

Source: Author's econometric results

Notes: White's heteroskedasticity consistent standard errors have been used. P-values are reported in parenthesis; ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively. A one-year lag of the import flow is added as an independent variable to check for reversed causality.

-

The key variable in this regression is once again the EMU. Here, although it is negative it is also statistically insignificant. The notion of the EMU variable being statistically insignificant is interesting on its own. It implies that when accounting for historical trade flows, the euro may actually not have an effect on trade at all. This may certainly be of great importance when deciding on the euro's future. Since it implies that the positive effects that have been argued for may not actually be an effect of the euro, but rather that countries have joined the euro because they trade a lot with other euro countries, and thus the euro itself would be superfluous when it comes to its effect on trade.

As a side note to the last robustness test, logistic and probit regressions were made with the EMU dummy as the dependent variable. These results are presented in table 7.

Table 7. Probability to Join a CU

Country/Variable	*Logit*	*Probit*
ln Import Flow (lagged)	0,346 (0,000)***	0,183 (0,000)***

Source: Author's econometric results

Notes: White's heteroskedasticity consistent standard errors have been used. P-values are reported in parenthesis; ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively. The dependent variable is set as EMUijt

The two regressions test for the likelihood to join a CU when increasing the import flow. They both showed that when increasing the bilateral trade flow between a country-pair, the likelihood of the two joining the same CU increases. This result indicates that reversed causality may indeed be a problem, and further research would be welcome to shed light on this issue.

Taking the second part of the robustness analysis into account with the unexpected results of equation 2 in the baseline regression, one cannot help to question if a model without the historical aspect is the right way to estimate these kinds of effects. The negative aspects of the individual effects may be caused due to omitted variables and thus the model may prove to be unfit for the study. These are ones again indications that more research is much needed.

7. Summary and Conclusion

The purpose of this paper has two parts. The first being to re-assess the overall trade effect of the euro with a larger data set and a greater time span compared to previous research. The second part being to estimate and compare individual Member State trade effects to conclude if one could see winners or losers when it comes to the introduction and adoption of the euro. This has been done with the usage of bilateral intra-EU trade together with a gravity model, which included an EMUijt dummy, capturing the overall effect in the first analysis, and country-specific EMU(i/j)t dummies, capturing the individual effect in the second analysis.

I found the general trade effect to be positive, around 8%, in accordance with much of the literature today. However, when controlling for reversed causality this effect vanishes, implying that the euro would not have a significant effect on trade after all. This result should be read with caution but is still a result of great importance.

My results for the individual effects indicate that Members have experienced different trade effects from adopting the euro. I chose to interpret the results as a ranking list, due to the less well-defined reference trade. This ranked Malta and Cyprus as the biggest winners and Germany as the biggest loser. Plausible explanation for these rankings may

be underdeveloped financial institutions in Malta and Cyprus, and historical relevance in the case of Germany. The result of Germany not being higher ranked is indeed notable since Germany is commonly thought of as the saviour of the euro and thus often expected to benefit extensively.

An interesting question is why Germany is fighting for the future survival of the euro, if the German economy does not benefit all that much from it? There is no easy answer to this question. My results are not saying that Germany is not benefiting at all from the euro, more that the effect on trade may not be as large as first expected. Perhaps, due to the lack of research, the Member States' governments may not know the real individual trade effects. Or maybe Germany is fighting for the euro's survival just because of the simple explanation that it may be the only Member who can. Another reason may be pride. Germany as one of the founders of the EU and one of the advocates for the creation of the Single currency may be fighting for the euro's survival for the reason of not admitting defeat. These are speculations at best and an exhortation to conduct more research in this area.

The contradiction to the common view presented in these results combined with the reversed causality results should increase the willingness to devote more time and resources to learn more. It should be in every EZ Member's government's interest to know more about the individual effects and how the euro is actually affecting their particular country. Therefore it is perplexing why this field has been given so limited attention. To get greater knowledge about the individual effects and more in-depth reasons for what determines who benefits the most, as well as if there is an overall euro effect at all, much more research is needed.

As to conclude this paper I would like to say that this although shallow study, has shown that there are, in relative terms speaking, winners and losers in the game of the euro.

References

Aristotelous, K. (2006). Are There Differences Across Countries Regarding the Effect of Currency Unions on Trade? Evidence from EMU. *Journal of Common Market Studies*, Vol. 44, No. 1, pp. 17-27.

Baldwin, R. (2006). The Euro's Trade Effects. *Working Paper Series*, No 594.

Bun, M.J.G. and Klaassen, F.J.G.M. (2002). Has the Euro Increased Trade? *Tinburgen Institute Discussion Paper*, Vol. 108, No. 2.

Bun, M.J.G. ad Klaassen, F.J.G.M. (2007). The Euro Effect on Trade is not as Large as Commonly Thought. *Oxford Bulletin of Economics and Statistics*, Vol. 69, No. 4, pp. 473–496.

Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). (2012). *GeoDist*. [Online] Available at: http://www.cepii.fr/anglaisgraph/bdd/distances.htm

De Nardis, S. and Vicarelli, C. (2003). Currency Unions and Trade: The Special Case of EMU. *Review of World Economics*, Vol. 139, No. 4, pp. 625–49.

Eicher, T.S. ad Henn, C. (2009). One Money, One Market: A Revised Benchmark. *IMF Working Paper*, WP Vol. 186, No. 9.

European Commission. (2011). *Towards a Single Currency: A Brief History of EMU*. [Online]. Available at: http://europa.eu/legislation_summaries/economic_and_monetary_affairs/introducing_euro_practical_aspects/l25007_en.htm

European Commission (1990). One Market, One Money. *European Economy*, No 44.

Flam, H. and Norström, H. (2007). The Euro and Single Market impact on trade and FDI. *CESifo Working Paper Series*, No. 1881.

Micco, A., Stein, E. and Ordonez, G. (2003). The Currency Union Effect on Trade: Early Evidence from the European Union. *Economic Policy*, Vol. 18, No. 37, pp. 315–56.

Mundell, R.A. (1961). A Theory of Optimum Currency Areas. *American Economic Review,* Vol. 51, No. 4, pp. 657–65.

Organization for Economic Co-operation and Development (OECD). (2012). *Monthly Statistics*. [Online] Available at: http://stats.oecd.org/Index.aspx?QueryName=266&QueryType=View&Lang=en

Rose, A.K. (2000). One Money, One Market: Estimating the Effect of Common Currencies on Trade, *Economic Policy*, Vol. 30, pp. 7–46.

Rose, A.K. and Stanley, T.A. (2005). Meta-analysis of the Effect of Common Currencies on International Trade. *Journal of Economic Surveys*, Vol. 19, No. 3, pp. 347–65.

World Bank. (2012). *World Development Indicators*. [Online] Available at: http://data.worldbank.org/data-catalog/world-development-indicators

Appendix

Variable	Definition	Source	Reference
ln GDP_i	The natural logarithm of the GDP level in the importing country for every year t, measured in US dollar at constant 2000 prices	World Bank (2012)	World Development Indicators
ln GDP_j	The natural logarithm of the GDP level in the exporting country for every year t, measured in US dollar at constant 2000 prices	World Bank (2012)	World Development Indicators
ln $Population_i$	The natural logarithm of the population in the importing country for every year t	World Bank (2012)	World Development Indicators
ln $Population_j$	The natural logarithm of the population in the exporting country for every year t	World Bank (2012)	World Development Indicators
ln Distance	The natural logarithm of the distance between the economical centres in the importing and exporting countries	CEPII (2012)	GeoDist
Common Language	Official language	CEPII (2012)	GeoDist
Contiguity	Common border	CEPII (2012)	GeoDist
EU	Importer and exporter EU Member States in year t	EU (2012)	Towards a Single Currency
EU1	Only one of importer and exporter EU Member States in year t	EU (2012)	Towards a Single Currency
EMU	Importer and exporter EZ members in year t	EU (2012)	Towards a Single Currency