JYVÄSKYLÄ UNIVERSITY SCHOOL OF BUSINESS AND ECONOMICS

CURRENCY UNIONS AND TRADE

What is the impact of the euro on trade in the euro area?

Economics

Bachelor Thesis

15.05.2012

Author: Jasse Tykkyläinen

Supervisor: Timo Tohmo

JYVÄSKYLÄ UNIVERSITY SCHOOL OF BUSINESS AND ECONOMICS

Author
Tykkyläinen, Jasse

Topic
Currency Unions and Trade: What is the Impact of the Euro on Trade in the Euro Area?

Subject	**Nature of the work**
Economics	Bachelor thesis
Date	**Number of pages**
15.05.2012	34

Abstract

The aim of this study is to estimate the effect of the euro on trade within the euro area. This has been a relevant question for European politicians ever since the launch of the common currency was agreed on in the Maastricht Treaty in 1992. To analyse the topic the gravity model of international trade augmented with several dummy variables is employed using panel data of 29 developed countries between 1995 and 2010. The estimated aggregate trade effect on the euro zone reaches 10 % in the most preferred regression and is comparable with earlier estimates. However, there is considerable variation in the results when different sample sizes are used. This could be a sign of omitted variable bias that requires further in-depth analysis. Moreover, to help decision-makers correctly estimate the costs and benefits of the common currency additional research on trade effects in individual countries is desirable.

Key words
euro area, international trade, gravity model, monetary union, Rose effect

Repository
Jyväskylä University School of Business and Economics

TABLE OF CONTENTS

TABLES AND FIGURES

1 INTRODUCTION

The economic integration of the European Union (EU) took a major leap forward following the signing of the Maastricht Treaty in 1992. This newfound integration would lead to the formation of the most significant currency union in the world – that of the euro. Year 1999 marked the beginning of the third stage of the Economic and Monetary Union (EMU) as eleven participating countries adopted a common currency [1], thereby voluntary signing over control of their monetary policy to the hands of the independently managed European Central Bank (ECB). After profound consideration of the costs and benefits related to currency union membership, three EU countries decided still to preserve their national currency and wait for the first experiences from the euro area before making further conclusions.[2]

The euro area[3] is a particularly fascinating economic policy experiment since nothing similar has ever been ventured on such a scale anywhere else in the world. In other words, no benchmark exists that could serve as a model for the potential impact of the European currency union on the society, an impact that is in large part economic in nature. Although it is possible to try to foretell the potential consequences on grounds of existing theories applied in rather

[1] These eleven countries were Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. Greece joined two years later in 2001.

[2] The countries left outside were Denmark, Sweden and the UK.

[3] According to the European Union, 'euro area' is the official term to be used in reference to the countries using euro. Nevertheless, in this study the terms 'euro zone' and 'euroland' are considered as equal terminology.

different settings, there exists a great amount of uncertainty in such predictions inasmuch as that the theories are lacking apposite empirical evidence. As a consequence, the launch of the euro has yielded a vast spectrum of research that aims at examining the eventuated effects of the common currency. One of the most important topics to be considered is the effect on trade.

Potential trade effects were discussed in an extensive report by the European Commission[4] (1990) as part of a general analysis of the aggregate economic impacts. The euro was expected to generate both microeconomic and macroeconomic benefits that would outweigh the costs. In particular, the common currency would decrease both transaction costs as well as uncertainty connected with exchange rate fluctuation. Accordingly, intra-euro-zone trade would benefit from greater efficiency and price transparency. The early empirical evidence has proven these hypotheses correct as the euro has evidently led to more trade between members of the monetary union.

The purpose of this study is to assess the previous literature on the euro's trade effects and to employ the most recent data in an econometric model to update the estimate of the impact on trade. In addition to the aggregate effect it is of equal importance to analyse the trade effect in individual euro countries. Even if the euro would augment trade in general, it is unlikely that the increase is similar in all members of the currency union. For political decisions it is necessary to also consider this aspect since the euro countries are in many respects divergent from one another, thus causing some countries to benefit more from the euro than the others.

In academia, the discussion of currency unions and trade has thrived ever since the publication of the sensational findings of Andrew Rose (2000). Rose discovered that trade within pre-euro currency unions was three times as much as trade between countries that did not share a currency, a result now referred to as the 'Rose effect'. The aim of the study was obviously to provide an early idea of what was to happen in Europe after the euro had come into existence. In

[4] Formerly known as the Commission of the European Communities.

this sense, Rose's results were greeted with many doubtful views on their applicability to trade within the EMU. However, in the first studies with euro data Rose (2000) served as a valuable point of reference to the actual estimations for Europe. As a result, Rose managed through his work to raise interest in the trade effects of the euro and also introduced a model that was to become the new standard in studies examining currency unions and trade – the gravity model augmented with dummy variables.

The classical gravity model has been used extensively in trade research as it helps to describe bilateral trade flows particularly well. The first model was adopted from Newtonian physics in the 1960s and adjusted to the needs of economists. In spite of the earlier problems related to the theoretical foundations of the gravity model, recent research has made a handful of further advances to improve its credibility. Since Rose (2000) it has also become common to augment the model with various dummy variables to control for effects such as EU membership in order to estimate the effect of participation in a currency union. Moreover, Glick and Rose (2002) applied the model to panel data to emphasise the role of time in currency union analysis, thereby introducing another feature that has been present in almost all euro literature.

This study will proceed in the following order: section two contains a discussion of the theoretical background relevant to the topic; section three includes a review of a selection of research examining the trade effect of the euro; section four summarises the methods and results from the econometric study conducted to update the previous estimates on the trade effect in the euro area; finally in section five the findings in the previous sections are summarised and further questions worth assessing are proposed.

2 THEORETICAL BACKGROUND: THE GRAVITY MODEL

In the latest literature there has been one model utilised above all others in analysis concerning bilateral trade: the gravity model. The gravity model is often regarded as a chiefly empirical instrument in the economist's toolkit due to the plausible results the model has provided for decades in explaining trade between countries. Some early researchers doubted the vague scientific footing of the model, but today the theories behind 'economic gravity' are widely acknowledged. In actual settings the simplest version of the gravity model is usually augmented with additional explanatory variables that are found relevant for the question on hand. To understand both the theoretical underpinning and the current applications of the gravity model it is necessary to begin by considering the early stages of the development of the model.

The gravity model was originally formulated in Tinbergen (1962) as an effort to explain "the normal or standard pattern of international trade that would prevail in the absence of discriminating trade impediments". The most basic model makes use of the size of the exporting and importing country and the distance between them in order to explain the amount of trade. This can be formulated as:

$$E_{ij} = \frac{Y_i^{\alpha} Y_j^{\beta}}{D_{ij}^{\theta}}$$

where E_{ij} represents exports from country i to country j, Y_i and Y_j denote the size of the economy of the two countries and D_{ij} is a measure of distance between the countries under consideration. The exponents on the independent variables indicate the possibility that these variables may affect the dependent variable disproportionately.

The basic gravity model describes how countries' exports are positively related to the size of both the exporting and importing country whereas the distance between the countries has a negative effect on the amount of exports. Despite its simplicity the model has historically performed well in portraying bilateral trade flows, which explains its rise in popularity. According to some estimates the gravity model usually predicts between 70 and 80 percent of the variation in trade between two countries (Bergeijk and Brakman, 2010), a figure that is surprisingly high for a model based on only three variables.

In spite of the gravity model's ability to accurately reflect empirical data, its weakness used to lie in its lack of a solid micro-economic foundation. Due to these problems many researchers held a generally sceptical view of the model for much of the 1970s and 1980s. However, thanks to Anderson's (1979) and Bergstrand's (1985) work in formalising the theoretical background of the model it received more acceptance among researchers. Nonetheless, many sceptics were left unconvinced.

The distance variable in the gravity model is expected to affect trade negatively because it represents an approximation of the transfer costs that the exporting country faces. These costs do not only include costs for the physical transportation of goods, but they are also related to factors such as searching trade partners and becoming conversant with the political and legal setting in the destination country. All these issues are expected to become greater trade impediments as the distance increases. On the other hand, the economic size variable is expected to increase trade due to economies of scale. Countries specialise in producing certain goods above others and similarly increase trade to consume a full basket of products (Krugman and Obstfeld, 2009). As a result,

growing production leads to further efficiencies and specialisation, which eventually increases trade between countries.

As the gravity model began to be used again on a more regular basis in the 2000s, it also experienced further theoretical advances that aimed at taking into account relative price indices. These so-called 'multilateral resistance terms', introduced by Anderson and van Wincoop (2003), may intuitively be understood to provide for the effect of international competition on bilateral trade flows. Hence, it is not only the bilateral variables of a country-pair that affect trade, but also the competition faced from other trade partners. This theoretical development has been embraced by many (including Piermartini and Teh, 2005; Baldwin, 2006; Frankel, 2010) and it is considered that "applications of the gravity model have to deal with the multilateral resistance terms, one way or another, in order to be taken seriously" (Bergeijk and Brakman, 2010, p. 13).

Despite the development of the theoretical model, several biases have emerged in empirical studies that utilise the gravity equation. This issue has been analysed in Baldwin and Taglioni (2007). Their criticism (to which they themselves refer as the gold, silver and bronze medal errors[5]) stems from common mistakes in empirical research that have become accepted practise. Due to these mistakes currency union effects are often biased, and Baldwin and Taglioni provide some estimates of the potential biases once the mistakes are controlled for. Their critique has become widely approved in the very recent literature and some of the latest studies on the euro's trade effects have specifically aimed at taking the biases into account (as an example, see Eicher and Henn, 2011).

Still, some problems related to the use of the gravity model remain that may not have been considered sufficiently. One of these is the question of how zero trade flows between countries are handled. The common way in the past has been simply to ignore them or raise them to some small value. Helpman et al. (2008) has responded to this issue and suggested corrective estimation pro-

[5] The three medal errors are related to the model specifications (ignorance of the 'multilateral resistance terms'), estimates of the average trade flows and use of the US price index to adjust the trade flows for inflation.

cedures. Moreover, measuring the distance between countries is another common topic of disputation. Transportation costs may heavily depend on distance measures and variation between product groups tends to be large (Head and Mayer, 2002; Möhlmann et al., 2010). Since both the zero trade flows and distance measures are more severe issues in studies that utilise disaggregate data, they may partly explain why gravity model applications have so far had a strong focus on total trade flows.

In gravity model applications that aim at estimating the trade effect of a currency union the basic hypothesis is that a common currency increases trade between countries sharing the currency. This is due to microeconomic benefits that the shared currency enables. These include the elimination of the cost of exchanging currencies within the monetary union, greater price transparency and welfare gains related to less uncertainty about future exchange rates (De Grauwe, 2003). However, even as these benefits are widely acknowledged it may still be questioned whether they are the actual causes for the increased trade. That is to say, there could exist reverse causality: it is the large amount of bilateral trade that bring about the common currency and not vice versa (Baldwin, 2006). In regressions utilising panel data this 'endogeneity bias' may be partly controlled for by introducing country-pair fixed effect (Micco et al., 2003). This method is therefore used in this study as well.

3 PREVIOUS RESEARCH ON CURRENCY UNIONS AND TRADE

Over the last decade the amount of research related to currency unions and their trade effects has greatly expanded thanks to the introduction of the euro. Even so, currency unions might have drawn much less attention from academia without the publication of the influential study by Andrew Rose in year 2000. Rose applied the gravity model augmented with several dummy variables to estimate the effect of the pre-euro currency unions on trade. His regression results were difficult to believe true: a common currency more than triples trade between members of a currency union. Not only was the result itself remarkable, but also the model used by Rose proved to become the new standard in analysis related to currency unions and trade. In a further study by Glick and Rose (2002) a similar model was employed, but in this case the data set included a time dimension. The panel data approach allowed Glick and Rose to introduce entity and time fixed effects and answer a question particularly relevant to countries considering currency union membership: "How much more do countries within currency unions trade than non-members?" The unique results of these two studies together with the new creative approaches to assess currency union effects yielded a forceful response from other trade economists. This certainly helped to boost interest in the trade effect of the euro.

Finally in 2002 and 2003 the time was ripe to estimate the first impact of the euro on trade. Several researchers started to investigate the issue independ-

ently and many would follow in the next few years. All in all, the early studies did find some evidence in support of the hypothesis that the euro would lead to increased trade between EMU countries, even in such a short time period as three years. However, in comparison to the original Rose effect the findings from the euro zone were rather mild, reaching a positive trade effect that was somewhere between five and ten percent (Baldwin, 2006). The number of investigations multiplied in just a few years but the results mostly replicated the first estimates. In a meta-analysis from Rose (2008)[6] as many as 26 different trade studies from the euro area could be considered. The conclusion of these studies was that the euro had increased trade by at least 8 % and perhaps even 23 %. Based on this wide body of evidence it seems that the European currency union is very different compared to the previous 'currency unions'. As a consequence, the pre-euro literature has not been able to provide more than trivial guidance to the European experience.

Since the collection of literature utilising euro data has become extensive only several carefully chosen studies are assessed in this review section. Most of the research has evaluated the aggregate trade effect, and for this reason studies employing disaggregate statistics are excluded from this literature review. Nevertheless, both studies considering the aggregate trade effect on the euro zone and studies evaluating the trade effect on individual EMU members are analysed. This is an important aspect since it is highly probable that the euro does not benefit all the countries equally as some countries could actually experience adverse trade effects.

3.1 European Monetary Union and the Aggregate Trade Effect

The early research on the trade effects in the euro area was partly stimulated by the objective of reducing the original Rose effect and proving it to suffer from

[6] This brief meta-analysis was presented as a panel statement at the fifth ECB Central Banking Conference held on the eve of the euro's ten-year anniversary.

serious upward bias. To extrapolate the results of Rose (2000) to the euro zone was seen fallacious since the set of countries in the original study was significantly dissimilar from the sample of EMU members. This problem was also acknowledged by Rose himself. In Rose's study most of the members of currency unions or exchange rate regimes were both small and poor and often adopted the currency of a much larger country (for instance, the US dollar). This is obviously not the case in the EMU and therefore the different premises of Rose (2000) and the subsequent euro studies serve as an important argument for the potential differences in the trade effect estimations.

One of the first surveys analysing the trade effect of the euro was Micco et al. (2003). Using the panel data approach with fixed effects to answer a policy-oriented question "What are they [EU members that opted out of the EMU] missing?" Micco et al. collect data on 22 industrial countries between years 1992 and 2002. Providing several robustness checks, such as the use of dynamic panel estimations and alternative samples, the study concludes that the effect of the euro on intra-euro-zone trade ranges from 4 to 10 % in the first four years. In additional analysis assessing whether the euro has led to trade diversion from non-EMU countries to the euro area the evidence suggests that such a phenomenon has not taken place. On the contrary, there are actually some signs that the euro has led to increased trade with both EMU members and non-members.

Micco et al. also report trade effects in individual euro states. According to these estimates proof is found that in the first years some of the EMU countries did not benefit from the euro. Greece, Finland and Portugal all receive negative coefficients for their currency union variables that indicate decreased trade with other EMU members. However, for the two latter countries the coefficients are not statistically significant. All in all, after broad examination of the role of individual countries in the aggregate trade effect on the euro zone the study summarises that the evidence for a positive trade effect is strong and does not depend on one or two individual members.

In general, it has been uncommon in the euro literature to assess trade impacts in individual euro countries. Most of the literature has concentrated on the aggregate effect and in some cases endeavoured to improve the earlier models to take into account more complicated factors affecting bilateral trade. Of the few studies addressing the euro effect in individual EMU members Aristotelous (2006) is probably the first following Micco et. al (2003). Using somewhat similar methods as Micco et al., Aristotelous finds statistically significant effects in all other EMU countries except Italy during the time period 1992 – 2003. However, not all of these effects turn out to be positive: Austria, France and Greece seem to have decreased trade with other euro countries due to the euro. Despite these interesting results, the brief paper by Aristotelous does not put much effort to analyse the reasons behind the differing effects. In his short conclusion Aristotelous explains the differences between the countries by the varying degrees of trade openness.

Another paper from Aristotelous concentrates solely on one single EMU member and on the effect of the euro on its exports. Earlier in Micco et al. (2003) and Arisotelous (2006) Greece was reported to have suffered from adverse trade effects after joining the EMU, a discovery analysed further in Aristotelous (2008). Using generalised method of moments (GMM) estimator for data on Greece and its 21 trade partners between 1981 and 2005 Aristotelous (2008) extends the list of studies that report a negative trade effect for Greece. Referring to the theoretical discussion in Baldwin (2006), Aristotelous concludes that the most convincing explanation for the negative trade effect has to do with the unfavourable development of the Greek production costs after adopting the euro. It seems that Greece has lost competitiveness in the euro zone market and is therefore not benefiting from the common currency.

Bun and Klaassen were one of the first researchers to assess the EMU and trade in 2002 and have since their first study continued with the topic in another paper from 2007. By adding a country-pair specific time trend variable into the model Bun and Klaassen (2007) estimates a significantly lower trade effect on the euro area that reaches only 3 %. The main intention of the authors

is to provide evidence that the exclusion of time trends will cause upward bias in impact estimations and for this purpose they use several time periods and data sets to evaluate the potential bias in earlier studies.[7] As a result, Bun and Klaassen demonstrate that the EMU effect has commonly captured part of an upward residual trend that increases the effect of the common currency in studies with longer time spans. The authors conclude that because of these overestimations it is necessary to include time trends into the model.

De Nardis et al. (2008) considers the trade effect with dynamic panel data that involves a lagged dependent variable, a feature that has become increasingly important in the most recent research. This is a consequence of the notion that bilateral trade in the present time period is strongly affected by bilateral trade in the previous period due to sunk costs. These costs consist of, for example, setting up distribution networks in partner countries and investing in export-oriented infrastructures. Additionally, costs related to the accumulation of intangible assets that are of political or cultural nature also form part of sunk costs. The sample in De Nardis et al. (2008) has 23 OECD countries in 1988 – 2004 and calculations are undertaken to estimate both the short-run and long-run impact of the EMU. The study reports a short-run trade effect of approximately 4 % whereas the long-run effect reaches 17 %. These relatively small figures are partly explained by the European integration process characterised by many significant political decisions promoting trade in the past 20 years. Thus, the effect of the euro alone is lower when the earlier political progress of the EU is taken into account.

One of the latest papers in the trade effect literature is from Jeffrey Frankel (2010). Frankel provides an update to earlier studies by using data that reaches year 2006 and attempts to explain why the research performed with euro data has reported such different outcomes from those presented in Rose (2000). Frankel discovers a similar trade impact in the euro area to the results from

[7] They test their own data set for the time period 1967 – 2002 and 1992 – 2002 (same time period as in Micco et al., 2003). In addition, they use the data set of Glick and Rose (2002) and find that the original estimation of a trade effect of 86 % is decreased to only 25 % when time trends are included into the model.

previous studies but interestingly enough the impact has not remained constant over time. Between 1999 and 2004 there is an upward trend in the trade effect that fades away during 2005 and 2006. This is explained in the paper by the relatively young age of the euro. In a comparison with Rose's results Frankel concludes that the country size does not make a difference with respect to the trade effect but the size of the sample could be a potential source of differences.[8]

Since the list of trade effect literature assessing euro data has been expanding rapidly over the last decade, several meta-analyses of the studies have been published. Andrew Rose summarises much of the pre-2008 research in a brief meta-analysis that he presented as a panel statement at the fifth ECB Central Banking Conference. Rose (2008) does not aim at assessing any quality issues related to the 26 different studies he has collected but instead provides a plain estimate of the average trade effect in these papers. According to the collection of studies the euro has increased trade within the euro zone by at least 8 % and perhaps even 23 %. What is more, on account of the short age of the currency union the impact is expected to increase in the future.

3.2 Summarising Previous Literature

As has become evident from the selection of literature discussed in this chapter, a great amount of work has been done to investigate the trade effect of the euro. Despite the fact that the great majority of the studies have assessed the aggregate impact on the euro zone, some papers have also found it worthwhile to analyse the effect on individual members. What is more, many papers have aimed at not just updating the trade effect estimations by employing the latest data, but to develop the models used in earlier research as well as to improve the robustness of the estimates. The body of euro literature has proliferated at such a rapid pace that it has even become feasible to conduct meta-analyses of

[8] For comparison, the sample in Rose (2000) includes 92 'countries' (i.e. both countries and official dependencies or territories) whereas most studies with euro data have considered only the most developed countries with sample sizes limited to approximately 30.

the studies. There remain many views of the exact means of how the euro affects trade but the bottom line of the literature is that the impact of the euro is positive though differences between countries exist.

The results of the studies discussed in this chapter are summarised in the table below. It should be noted that the papers assessed are not entirely comparable with each other due to differences in the samples and estimation methods. The table is compiled merely to summarise the previous literature and to offer a straightforward way to see all the studies at one glance. The reported EMU effect in the table is the most preferred estimate by the author(s) of each study. However, in cases where the most preferred regression is not explicitly stated by the author(s), the EMU effect is the most representative estimate for the study in question.

TABLE 1 Selection of Studies Assessing the Euro's Trade Effect

Author(s)	**Last year in the sample**	**EMU effect**	**Estimation method(s)**	**Other findings**
Micco et al. (2003)	2002	4 – 10 %	fixed and dynamic effects	Overall effect + effect on individual members.
Aristotelous (2006)	2003	6 %	fixed effects	Overall effect + effect on individual members.
Aristotelous (2008)	2005	–23 %	dynamic effects	Effect on Greek exports.
Bun & Klaassen (2007)	2002	3 %	fixed effects	Introduces country-specific time trends.
De Nardis et al. (2008)	2004	4 – 17 %	dynamic effects	Both short- and long-run effects.
Frankel (2010)	2006	15 %	fixed effects	Comparison with other currency unions.
Rose (2008)	–	8 – 23 %	meta-analysis	Analysis of 26 different euro studies.

4 EURO'S TRADE EFFECT

The aim of this paper is to estimate the effect of the euro on trade between members of the currency union compared to trade between countries that do not share the euro as a common currency. To analyse this issue the basic gravity model of international trade augmented with dummy variables is employed using panel data of 29 developed countries between 1995 and 2010. Since previous literature has almost exclusively reported positive trade effects related to the introduction of the euro, it is reasonable to expect the positive trend to have persisted. In other words, the basic hypothesis is that the euro zone countries benefit from the common currency by trading more with each other than any other country-pairs, ceteris paribus. However, it is by no means sure that all the members of the third stage of the EMU are profiting from the euro, a phenomenon assessed to some degree in surveys by Aristotelous (2006 and 2008) as well as Micco et al. (2003). The calculations related to the trade effects in individual countries are presented in the appendix of this study to provide further insight into the complexity of the costs and benefits of currency unions.

4.1 Model Specifications

As has become common in international trade research, the gravity model is applied to explain bilateral trade between countries. This study is no different

in the basic methodology. Besides the variables representing the economic mass (calculated as a sum of GDPs in the country-pair) and the distance (calculated as a weighted distance between the biggest cities in the country-pair), two additional dummy variables are incorporated into the model: dummies representing shared membership in the European Union and in the euro area. To assess the aggregate effect of the euro on intra-euro-zone trade these four variables are of fundamental importance in the model specifications. Nevertheless, in previous literature it has been common to include further controls into the model. Examples of such controls are exchange rate volatility, EU trend and dummies for shared language(s). However, within the scope of this study it is appropriate to assess the trade effect with the simpler model. Furthermore, by using panel data some of the additional control variables become unnecessary as they are embodied in the year and country-pair dummies. These dummies cancel out factors that either do not change over time (e.g. common language) or are present in all country-pairs (e.g. worldwide business cycle trends).

All in all, the model employed in the econometric analysis of this study is of the following form:

$$\ln(T_{ijt}) = \beta_0 + \beta_1 \ln(Y_{it} + Y_{jt}) + \beta_2 \ln(D_{ij}) + \beta_3 EU_{ijt} + \beta_4 EMU_{ijt} + \varepsilon_{ijt}$$

where *ln* denotes natural logarithm, *i* and *j* indicate the two countries in each country-pair, *t* represents the time period, *T* is the value of total trade (sum of imports and exports), *Y* is the value of GDP, *D* is the distance between the two countries, *EU* is a dummy variable for shared EU membership and *EMU* is also a dummy variable that identifies country-pairs in which the euro is the mutual currency. More specifically, the dummy variable *EU* obtains value 1 if both countries are EU members in the specific time period. Employing the same reasoning, the dummy variable *EMU* obtains value 1 if both countries share the euro as a common currency in the specific time period. In other words, all country-pairs in which neither of the two countries is an EU (EMU) member or one

country is an EU (EMU) member and the partner country is a non-member, the value of the *EU* (*EMU*) dummy variable becomes 0.

Holding other factors constant, the following hypotheses of the potential effects of the explanatory variables on bilateral trade can be drawn based on the relevant economic theory and the results of previous studies:

(a) GDP is expected to affect trade *positively*: As GDP of either of the countries in a country-pair increases (decreases) the amount of trade between the countries increases (decreases).

(b) Distance is expected to affect trade *negatively*: As the distance between two countries increases (decreases) the amount of trade between the countries decreases (increases).

(c) Shared EU membership is expected to affect trade *positively*: Countries belonging to the EU trade more with each other than other pairs of countries.

(d) Shared EMU membership is expected to affect trade *positively*: Countries sharing the euro as a common currency trade more with each other than other pairs of countries.

The coefficient of interest in this study is first and foremost the coefficient indicating the effect of EMU membership on trade, that is to say β_4. However, regressions without any dummy variables are also reported to demonstrate the power of the basic gravity model in explaining bilateral trade. All the regressions are estimated using ordinary least squares (OLS) estimators with fixed effects despite the fact that dynamic models employing generalized method of moments (GMM) estimators have become increasingly popular in recent research. Nevertheless, it is appropriate to restrict the analysis in this paper to OLS regression and acknowledge the dynamic models as important alternatives that have gained popularity in the euro's trade effect literature.

4.2 Data Description

A balanced panel data set is used to investigate the trade effect of the euro. The data set includes statistics of 29 developed countries that are relatively homogeneous in terms of their economic and social conditions. This has been an important rationale for choosing the countries in the sample because the higher the heterogeneousness of the group of nations the higher the risk of omitting factors that cannot be accounted for but that do have a significant effect on bilateral trade.[9] Altogether the sample consists of 22 current members of the European Union and seven non-members.[10] Of the EU members 10 countries adopted the euro as the currency was first introduced in 1999 whereas Greece, Slovenia and Cyprus became members of the euro zone later in 2001, 2007 and 2008 respectively.[11]

The time span of the data set consists of sixteen years between 1995 and 2010. The annual bilateral trade data is collected from STAN Bilateral Trade Database by Industry and End-use category provided by OECD on their website. Since the data on this site is free of charge only for the time period 1995 – 2010 this has been partly restricting the choice of years in this study. On the other hand, however, the available time period suits the purpose of the study sufficiently and it should be possible to provide pertinent results regarding the trade effect of the euro. Since the trade data on OECD's website is reported in thousands of current US dollars it is necessary to adjust the figures for inflation. For this purpose the annual average numbers of the US Consumer Price Index

---

[9] Especially in the pre-euro research the apparent heterogeneousness of the countries sharing a currency may have caused omitted variable bias. Partly for this reason many of the researchers analysing the initial trade effect of the euro criticised the use of the original 'Rose effect' in describing the European experience. A popular paper that has assessed this and many other issues related to the early research in the euro zone is Baldwin (2006).

[10] The EU members in the sample include Austria, Belgium/Luxembourg, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and the UK. The non-members include Australia, Canada, Japan, Korea, Norway, Switzerland and the USA. Since Luxembourg used to be included in the trade data of Belgium these two countries are treated as one nation in the sample.

[11] Estonia has also adopted the euro in 2011 but since this is outside the time period of this study it is not possible to measure the trade effect of the euro in Estonia.

(CPI) found on the website of the US Bureau of Labor Statistics are used to convert the trade flows into constant 2000 US dollars.

Measures of Gross Domestic Product (GDP), the variable representing the economic mass in the gravity model, are provided by the World Bank on their website (World Development Indicators). The data is already transformed into constant 2000 US dollars and needs no other adjustments to allow for comparison between countries. Distance measures, the second fundamental explanatory variable in the original gravity model, have been calculated by Mayer and Zignago (2011) and are available on the website of CEPII, a French international economics research institute. Mayer and Zignago provide four different bilateral measures of distance of which two are derived from a formula introduced in Head and Mayer (2002). The formula utilises city-level data to measure the distance between different countries by weighting the distances between the biggest cities by their population share of the overall population of each country. The distance measures calculated using this formula have been selected for this study.

Data on the dummies denoting mutual EU and EMU membership (or more precisely, involvement in the third stage of the EMU) are compiled by the author of this paper based on data of the enlargement process of the EU and EMU. The exact timetable and participants of each enlargement round can be found on the official website of the European Union and the European Commission. There have been three enlargements in the EU since 1995 as 15 new members have joined the Union (of which 11 are included in the sample of this study). The enlargements have usually taken effect at the beginning of the year, but in 2004 the new EU members joined the Union first in May. Despite this exceptional schedule the newcomers are regarded as members of the EU for the whole year of 2004. For all other enlargement rounds in both the EU and EMU it has been self-evident to determine in which year each country has been a member.

4.3 Estimating the Aggregate Trade Effect of the Euro

Using the model and data introduced in the two previous sections the aggregate impact of the euro on trade may now be estimated. The results of this analysis are presented in Table 2. In regression (1) the data set is treated as cross-sectional data where each country-pair in each year is an entity on its own. Only the two most basic gravity model variables, GDP and distance, are included in the regression. The estimated coefficients are in line with the assumptions regarding the explanatory power of the economic mass and distance in measuring bilateral trade: GDP has a positive effect on trade whereas distance affects trade negatively. Both of these measures are statistically significant at the 1 % level. What is more, almost 64 % of bilateral trade is explained by using only these two variables, a figure that comes close to the estimate of Bergeijk and Brakman (2011) discussed earlier in chapter two.

TABLE 2 Regression Analysis of the Aggregate Trade Effect of the Euro

Regressor	**(1)**	**(2)**	**(3)**	**(4)**
Ln real GDP	1,442*** (0,014)	1,409*** (0,014)	3,554*** (0,098)	1,537*** (0,219)
Ln distance	–1,167*** (0,018)	–0,991*** (0,019)		
EU member		0,637*** (0,033)	0,517*** (0,035)	0,421*** (0,036)
EMU member		0,452*** (0,036)	0,010 (0,030)	–0,076*** (0,028)
Country-pair effects?	no	no	yes	yes
Time effects?	no	no	no	yes
Observations	6496	6496	6496	6496
Adjusted-R^2	0,636	0,661	0,766	0,815

Source: Author's own econometric calculations.

Note: Statistical significance levels are denoted in the following manner: * significant at 10 %; ** significant at 5 %; *** significant at 1 %. Robust standard errors are in parentheses. In cases where the data set is treated as panel data standard errors refer to robust clustered standard errors, the clusters being the country-pairs.

In regression (2) the data set continues to be treated as cross-sectional data. However, now there are two more variables in the model, the EU and EMU membership dummies. Including these dummies has only a minor effect on the coefficients of the GDP and distance variables but the dummies themselves do affect the amount of trade at a statistically significant level. The coefficients of the dummy variables indicate a substantial impact on trade when both countries belong to the EU or to the EMU. Two countries in the European Union are trading 89 % more with each other than any other country-pairs whereas two countries sharing the euro trade 57 % more.[12] These are very large estimates and it is highly probable that they are suffering from omitted variable bias. As a result, the two latter regressions in the table treat the data set as panel data to introduce controls for fixed effects. These fixed effects either do not change over time but are specific to each country-pair (country-pair effects) or do change over time but are common to all country-pairs (time effects.)[13]

After country-pair effects are added to the model the outcome of the estimated regression changes remarkably. First of all, in regression (3) the distance variable is dropped out because it is part of the country-pair effects that do not change over time. Other potential factors included in the country-pair effects are for instance common trade history, common language(s) and common border shared by two countries. The impact of the size of the economy is now approximately one and half times greater than it was earlier in regression (1), but it still preserves its statistical significance. The effect of the EU membership, on the other hand, decreases by approximately 22 %-points (from 89 % to 67 %). Most importantly, however, the impact of the common currency fades away almost completely and loses its statistical significance. Rather surprisingly, it now seems that the euro zone nations do not trade more with each other compared to other pairs of countries, ceteris paribus.

---

[12] These percentages are calculated in the following manner: (e^0,637) – 1 ≈ 89 % for EU effects and (e^0,452) – 1 ≈ 57 % for EMU effects.

[13] It should be noted that for the sake of clarity the country-pair dummies and year dummies are not reported in the table since their exact values are not relevant for the analysis of the trade effect of the euro.

In addition to country-pair effects the next regression introduces further controls into the model in the form of time effects. In regression (4) there are year dummies controlling for factors such as economic fluctuations caused by business cycle trends. In the particular case of business cycles, some of their effects are already accounted for by changes in the GDP but there is still additional variation that cannot be explained this way. As was the case with country-pair effects, adding time effects changes the coefficients considerably. This time the impact of the GDP diminishes close to the estimates obtained in regressions (1) and (2) and the effect of EU membership shrinks further by 15 %-points (from 67 % to 52 %). As these coefficients continue to be statistically significant at the 1 % level, the coefficient of the EMU dummy variable also becomes statistically different from zero. However, the effect of the currency union is now surprisingly negative. In other words, the euro hinders trade between countries sharing the same currency compared to other country-pairs. Since the negative trade effect is against almost all previous findings it seems plausible that there is either some inaccuracy in the model or the data set contains serious errors. If this was not the case then according to regression (4) the euro has decreased trade within the euro area by approximately 7 %.

When the sample of this study is compared with those used in previous research, an important difference becomes apparent. There are eight new EU countries from Eastern European included in the sample, countries that have usually been ignored. As was discussed in the section describing the data, it is important to assess only developed countries that are relatively similar to each other. This is important because the risk of omitting variables that affect trade may increase as the countries become more heterogeneous. For instance, some of the relatively less developed countries in the sample may be lagging behind the highly industrialised countries with regard to their business promoting institutional environment. If so, it is be reasonable to assume that the less developed countries are able to increase trade as these conditions improve, whereas the highly industrialised countries may not have the possibility to do this (at least not on such a scale as the less developed countries). In a time span of 16

years this sort of development could be a notable 'trade booster' for the less developed countries, thereby distorting the statistical trade effect of the euro.

Despite the fact that the new EU members from Eastern Europe have been gaining on the welfare gap to the richer industrial countries ever since the collapse of the Soviet Union, it may still be too early to consider them economically homogeneous with highly developed countries like Germany, Japan and the USA. Therefore, there looms the risk of omitting consequential yet unmeasurable factors affecting trade in country-pairs where an Eastern European EU member is involved. Hence, these factors would not be present in all of the pairs of countries. Since the hiding factors distinguishing the new EU members from the other developed countries evolve over time dissimilarly in different countries, it is not possible to control for them with fixed effects. On these grounds it is justified to estimate the euro's trade effect with another sample that excludes the newest EU members in order to see if this has any effect on the regression estimations.

TABLE 3 Regression Analysis of the Aggregate Trade Effect of the Euro

Regressor	**(3)**	**(4)**	**(5)**	**(6)**
Ln real GDP	3,554*** (0,098)	1,537*** (0,219)	3,240*** (0,088)	1,433*** (0,208)
Ln distance				
EU member	0,517*** (0,035)	0,421*** (0,036)		
EMU member	0,010 (0,030)	–0,076*** (0,028)	0,044 (0,030)	0,097*** (0,027)
Country-pair effects?	yes	yes	yes	yes
Time effects?	no	yes	no	yes
Observations	6496	6496	3360	3360
Adjusted-R^2	0,766	0,815	0,767	0,871

Source: Author's own econometric calculations.

Note: Statistical significance levels are denoted in the following manner: * significant at 10 %; ** significant at 5 %; *** significant at 1 %. Robust standard errors are in parentheses. In cases where the data set is treated as panel data standard errors refer to robust clustered standard errors, the clusters being the country-pairs.

This comparison between the two samples is done in Table 3 (regressions (3) and (4) are rewritten to facilitate the analysis). As the eight new EU members are dropped out of the sample the number of observations is decreased from 6496 to 3360.[14] Regression (5) is similar to regression (3) in all other respects but for the sample size. Since there is no country in the new sample that has joined the EU between 1996 and 2009 the EU dummy will be controlled for by the country-pair effects. The smaller sample size does not change the results dramatically: economic mass affects trade by approximately the same amount as in the larger sample and EMU membership has only a minor trade effect which is not statistically significant. The next step is to include dummy variables controlling for time effects to see if this changes the situation.

As time effects are added into the model with the smaller sample, the effect of the euro on trade becomes statistically significant. In contrast to the similar model in regression (4), the effect is no longer negative but instead turns to be positive in regression (6). A coefficient of 0,097 eventuates in approximately 10 % more trade between EMU members than in any other country-pairs. It appears that the euro has a positive impact on trade when the sample consists of homogeneous developed countries and the relatively poorer nations are excluded. Such a strong dependence on the sample of countries could indicate that there are various factors affecting bilateral trade that cannot be controlled for. As a consequence, research on currency unions and trade is admittedly challenging in its own right.

When the results of regression (6) are compared with previous studies the euro's trade effect seems to have stayed stable. Several studies were collected in Table 1 and the 10 % impact on trade in regression (6) complements this list. Special emphasis should be placed on surveys from Micco et al. (2003), Aristotelous (2006) and Frankel (2010) since these have employed estimation methods closest in similarity to this study. Dynamic models have traditionally reported smaller trade effects although being positive as well.

---

[14] The dropped out countries are Czech Republic, Cyprus, Estonia, Latvia, Lithuania, Hungary, Poland and Slovenia.

5 CONCLUSIONS

The purpose of this study has been to analyse the effect of the euro on trade in the euro area. This question has been addressed by a vast array of literature due to its immense importance to the countries in the European Union. Currently the euro area consists of 17 members, but there are still 10 countries in the EU that have up to this point decided to opt out of the monetary union. Since the long-run desire of the European integration process is to introduce the euro in the whole EU, it is necessary to continue the analysis of the cost and benefits of the common currency. Within this framework the trade effects have a crucial role to play.

The econometric analysis conducted in this study concludes that the euro has increased trade within the euro area by approximately 10 % between 1995 and 2010. This result is comparable with much of the previous literature that has generally reported a positive impact on trade. However, it should be noted that in this paper the positive trade effect is obtained only after the eight East European EU members are left out of the original sample. That is to say that considerable differences exist between the results of the regressions where different samples have been used – a phenomenon also noted by Frankel (2010). Notwithstanding the difficulties in examining the cause of this variation, the possibility of serious omitted variable bias connected with certain country groups cannot be excluded. This issue is left for analysis in the future research as it falls beyond the scope of this study.

Even when the conclusion here states that the euro has had a positive impact on trade, the result should be considered merely as a preliminary estimate. The econometric analysis presented in this paper intentionally ignores many of the more complex features related to trade effect analysis in order to centre the focus on the most fundamental aspects of the topic. On this account, the main purpose has been to demonstrate the general application of the gravity model in trade research. As the analysis has shown, even a highly complex issue such as the trade effect of a common currency may be analysed with a simple model to reach applicable results. Nevertheless, further work is required to improve the credibility of these suggestive estimates of the trade impact on the euro area.

Since most of the literature to date has assessed the general trade effect of the euro, there is certainly a need for more assessment of the exact effects in individual countries. It is surprising how little attention this has drawn from researchers since it is by no means certain that the EMU benefits all the members equally. Therefore the question of the specific trade effects on individual countries entails great political relevance. A brief insight into this issue is provided in the appendix of this paper. Furthermore, it is also desirable for future research to assess industry level effects. Hopefully this aspect increases popularity as more disaggregate data becomes available.

REFERENCES

Anderson, J. 1979. A theoretical foundation for the gravity equation. *American Economic Review* 69(1), 106 – 116.

Anderson, J. & van Wincoop, E. 2003. Gravity with gravitas: a solution to the border puzzle. *American Economic Review* 93(1), 170 – 192.

Aristotelous, K. 2006. Are there differences across countries regarding the effect of currency unions on trade? Evidence from EMU. *Journal of Common Market Studies* 44(1), 17 – 27.

Aristotelous, K. 2008. What is the effect of EMU on Greece's exports to the Eurozone? *South-Eastern Europe Journal of Economics* 6(1), 39 – 51.

Baldwin, R. 2006. The euro's trade effects. ECB Working Paper No. 594.

Baldwin, R. & Taglioni, D. 2007. Trade effects of the euro: a comparison of estimators. *Journal of Economic Integration* 22(4), 780 – 818.

Bergeijk, P. van & Brakman, S. 2010. Introduction: the comeback of the gravity model. In Bergeijk, P. van & Brakman, S. (edit.) *The Gravity Model in International Trade*. New York: Cambridge University Press, 1 – 26.

Bergstrand, J. 1985. The gravity equation in international trade: some microeconomic foundations and empirical evidence. *Review of Economics and Statistics* 67(3), 474 – 481.

Bun, M. & Klaassen, F. 2007. The euro effect on trade is not as large as commonly thought. *Oxford Bulletin of Economics and Statistics* 69(4), 473 – 469.

De Grauwe, P. 2003. *Economics of Monetary Union*. New York: Oxford University Press.

De Nardis, S., De Santis, R. & Vicarelli. 2008. The euro's effects on trade in a dynamic setting. *The European Journal of Comparative Economics* 5(1), 77 – 85.

Eicher, T. & Henn, C. 2011. One money, one market: a revised benchmark. *Review of International Economics* 19(3), 419 – 435.

European Commission. 1990. One market, one money: an evaluation of the potential benefits and costs of forming an economic and monetary union. European Economy 1990 No. 44.

European Commission. 2012. Economic and financial affairs: the euro. http://ec.europa.eu/economy_finance/euro/ (Visited in April 2012)

European Union. 2012. The history of the European Union. http://europa.eu/about-eu/eu-history/ (Visited in April 2012)

Frankel, J. 2010. The estimated trade effects of the euro: why are they below those from historical monetary unions among smaller countries? In Alesina, A. & Giavazzi, F. (edit.) *Europe and the Euro*. Chicago: University of Chicago Press, 169 – 218.

Glick, R. & Rose, A. 2002. Does a currency union affect trade? The time-series evidence. *European Economic Review* 46(6), 1125 – 1151.

Head, K. & Mayer, T. 2002. Illusory border effects: distance mismeasurement inflates estimates of home bias in trade. CEPII Working Paper 2002 No. 1.

Helpman, E., Melitz, M. & Rubinstein, Y. 2008. Estimating trade flows: trading partners and trading volumes. *The Quaterly Journal of Economics* 123(2), 441 – 487.

Krugman, P. & Obstfeld, M. 2009. *International Economics: Theory and Policy*. Boston: Pearson Education.

Mayer, T. & Zignago, S. 2011. Notes on CEPII's distances measures: the GeoDist database. CEPII Working Paper 2012 No. 25.

Micco, A., Stein, E. & Ordoñez, G. 2003. The currency union effect on trade: early evidence from EMU. *Economic Policy* 18(37), 317 – 356.

Möhlman, L., Ederveen, S., De Groot, H. & Linders, G. 2010. Intangible barriers to international trade: a sectoral approach. In Bergeijk, P. van & Brakman, S. (edit.) *The Gravity Model in International Trade*. New York: Cambridge University Press, 224 – 251.

OECD. 2012. STAN bilateral trade database by industry and end-use category. http://stats.oecd.org/ (Visited in April 2012)

Piermartini, R. & Teh, R. 2005. Demystifying modelling methods for trade policy. WTO Discussion Paper No. 10.

Rose, A. 2000. One money, one market: the effect of common currencies on trade. *Economic Policy* 15(30), 9 – 45.

Rose, A. 2008. Optimal currency areas – academic views: panel statement. In Maćkowiak, B., Mongelli, F., Noblet, G. & Smets, F. (edit.) *The Euro at Ten – Lessons and Challenges.* Frankfurt: European Central Bank, 251 – 262.

Tinbergen, J. 1962. *Shaping the World Economy: Suggestions for an International Economic Policy.* New York: The Twentieth Century Fund.

US Bureau of Labor Statistics. 2012. Consumer price index: all urban consumers. ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt (Visited in April 2012)

World Bank. 2012. World databank: world development indicators (WDI). http://databank.worldbank.org/ (Visited in April 2012)

APPENDIX: EURO'S COUNTRY-LEVEL TRADE EFFECTS

In addition to the aggregate trade effect, it is beneficial to know how the euro has affected trade in individual EMU members. These calculations are displayed in Table 4 on the next page. The model is the same as in the previous analysis on the aggregate trade effect except that now there are separate dummies for each member of the euro zone. As a result, the equation is written as:

$$\ln(T_{ijt}) = \beta_0 + \beta_1 \ln(Y_{it} + Y_{jt}) + \beta_2 \ln(D_{ij}) + \beta_3 EU_{ijt} +$$
$$\delta_1 EMU\text{-}AT_{jt} + \delta_2 EMU\text{-}BE_{jt} + \delta_3 EMU\text{-}FI_{jt} + \delta_4 EMU\text{-}FR_{jt} +$$
$$\delta_5 EMU\text{-}DE_{jt} + \delta_6 EMU\text{-}GR_{jt} + \delta_7 EMU\text{-}IE_{jt} + \delta_8 EMU\text{-}IT_{jt} + \delta_9 EMU\text{-}NL_{jt} +$$
$$\delta_{10} EMU\text{-}PT_{jt} + \delta_{11} EMU\text{-}ES_{jt} + \delta_{12} EMU\text{-}CY_{jt} + \delta_{13} EMU\text{-}SI_{jt} + \varepsilon_{ijt}$$

Using similar reasoning as earlier each EMU dummy variable receives value 1 if the specific country for which the dummy is assigned to shares the euro with the partner country in the given time period.[15] For example, $EMU\text{-}FI_{jt}$ is given value 1 in each year after 1999 when Finland is trading with another euro country, say for instance with Germany. On the other hand, the dummy variable receives value 0 when Finland is trading with any non-member.

The regressions in Table 4 are comparable to those presented earlier in Tables 2 and 3: regression (7) treats the data as cross-sectional data whereas regressions (8) to (11) introduce country-pair and time effects, indicated below the EMU coefficients. Regressions (10) and (11) employ the smaller sample that excludes the eight East European EU members. Once again, the sample size and the fixed effects have a notable impact on the regression estimates. However, in the most preferred regression (11) the results are more or less comparable with those in Aristotelous (2006) where similar estimation methods were used. All in all, the analysis indicates that the trade effect of the euro varies remarkably between countries even if the general effect on the euro area is positive.

---

[15] The country codes stand for the following EMU members: AT = Austria, BE = Belgium/Luxembourg, FI = Finland, FR = France, DE = Germany, GR = Greece, IE = Ireland, IT = Italy, NL = Netherlands, PT = Portugal, ES = Spain, CY = Cyprus and SI = Slovenia.

TABLE 4 Regression Analysis of the Country-Level Trade Effect of the Euro

Regressor	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
Ln real GDP	1,390*** (0,015)	3,585*** (0,101)	1,531*** (0,230)	3,265*** (0,089)	1,402*** (0,224)
Ln distance	–0,968*** (0,020)				
EU member	0,651*** (0,034)	0,505*** (0,036)	0,420*** (0,037)		
Benchmark: EMU-all ***(not part of the regression)***	***0,452**** ***(0,036)***	***0,010*** ***(0,030)***	***–0,076**** ***(0,028)***	***0,044*** ***(0,030)***	***0,097**** ***(0,027)***
EMU-Austria	–0,084* (0,044)	–0,019 (0,027)	–0,046* (0,027)	0,015 (0,028)	0,053** (0,026)
EMU-Belgium	0,806*** (0,048)	0,068 (0,065)	0,044 (0,064)	0,108 (0,066)	0,149** (0,066)
EMU-Finland	0,155*** (0,044)	–0,157*** (0,060)	–0,126** (0,050)	–0,149** (0,064)	–0,061 (0,052)
EMU-France	0,110** (0,055)	–0,074** (0,031)	–0,170*** (0,027)	–0,030 (0,028)	–0,050*** (0,019)
EMU-Germany	0,409*** (0,058)	0,187*** (0,046)	–0,003 (0,037)	0,218*** (0,043)	0,104*** (0,032)
EMU-Greece	–0,074 (0,061)	0,000 (0,050)	–0,014 (0,052)	–0,013 (0,039)	0,002 (0,030)
EMU-Ireland	0,142*** (0,046)	–0,134 (0,100)	0,006 (0,084)	0,017 (0,092)	0,193** (0,077)
EMU-Italy	0,321*** (0,047)	0,199*** (0,045)	0,002 (0,036)	0,185*** (0,042)	0,078** (0,030)
EMU-Netherlands	0,611*** (0,034)	–0,027 (0,040)	–0,055 (0,038)	–0,028 (0,036)	0,011 (0,034)
EMU-Portugal	0,178*** (0,039)	–0,059 (0,055)	–0,097** (0,045)	–0,099*** (0,028)	–0,054** (0,025)
EMU-Spain	0,628*** (0,047)	–0,068** (0,031)	–0,000 (0,029)	–0,003 (0,028)	0,121*** (0,027)
EMU-Cyprus	–0,915*** (0,170)	0,107 (0,090)	0,011 (0,077)		
EMU-Slovenia	–0,797*** (0,085)	0,042 (0,086)	–0,046 (0,076)		
Country-pair effects?	no	yes	yes	yes	yes
Time effects?	no	no	yes	no	yes
Observations	6496	6496	6496	3360	3360
Adjusted-R^2	0,667	0,768	0,816	0,773	0,875

Source: Author's own econometric calculations.

Note: Statistical significance levels are denoted in the following manner: * significant at 10 %; ** significant at 5 %; *** significant at 1 %. Robust standard errors are in parentheses. In cases where the data set is treated as panel data standard errors refer to robust clustered standard errors, the clusters being the country-pairs.