What is the EMU Effect on the UK's Exports to Eurozone Countries?

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ABSTRACT

This paper investigates the EMU effect on the UK's exports to eurozone countries, using pooled data from 1981-2006 between the UK and all EU members at the time when the euro was launched. The results show that EMU led to a decrease in the UK's exports to the countries that adopted the euro as their national currency. That decrease is statistically different from zero.

1. INTRODUCTION

EUROPEAN ECONOMIC AND MONETARY UNION (EMU)[2] is an unprecedented and remarkable monetary experiment that was heralded as a way to bring many benefits to the European Union (EU) members that would adopt the euro as their currency. Among these benefits would be an increase in bilateral trade among these countries that would lead to direct welfare gains for them. According to Baldwin (2006), a paper that provides a review and critique of the early empirical literature on the effects of the euro on trade, the consensus estimate suggests that the euro has indeed boosted trade among eurozone countries by five to ten per cent.

An interesting and important question that has remained largely unanswered in the existing literature on the impact of EMU on trade is: What happened to the bilateral trade between the EU countries that adopted the euro as their currency and those EU countries that did not? This paper attempts to close, at least partially, the gap in the existing literature on the issue by investigating empirically the EMU effect on the UK's exports to eurozone countries.[3] The UK is the largest EU economy that opted out of EMU.

An empirical investigation of the EMU effect on the UK's exports to eurozone countries will contribute to our understanding of the effects of the

euro on trade, on the one hand and, on the other, the mechanisms through which the euro influences trade. Moreover, the results of this investigation will shed additional light on the potential benefits and costs of an EU country's decision to join, or not, EMU.

The rest of the paper is organised as follows: Section 2 offers a brief survey of the literature on the effects of euro on trade. Section 3 discusses the theoretical background of the gravity equation and presents the model used in the analysis. Section 4 explains the empirical methodology employed to investigate the EMU effect on the UK's exports to eurozone countries and discusses the empirical results. The final section provides a summary of the paper and its main conclusions.

2. A BRIEF SURVEY OF THE LITERATURE ON THE EFFECTS OF THE EURO ON TRADE

In recent years, several papers have examined empirically the EMU effect on eurozone trade including: Micco, Stein, and Ordoñez (2003), De Nardis and Vicarelli (2003), Barr, Breedon, and Miles (2003), Flam and Nordstrom (2003 and 2006), and Berger and Nitsch (2008). Without exception, these papers find the euro effect on intra-eurozone trade to be positive and economically significant. HM Treasury (2003), Baldwin, Bertola, and Seabright (2003), and Baldwin (2006) offer a detailed review and discussion of the most significant early empirical work on the euro's trade effects.

Micco, Stein, and Ordoñez (2003) is not only among the first papers to examine the EMU effect on intra-eurozone trade, but is also one of few papers found in the literature that investigate the EMU effect on trade between eurozone countries and other nations. Using information on bilateral trade on 22 developed countries from 1992 to 2002, they estimate a positive and statistically significant impact on the eurozone's trade with non-EMU developed countries. Using an EU country sample only, they estimate a positive but not statistically significant impact on the eurozone's trade with EU countries that opted out of EMU. They conclude that a country's adoption of the euro may just make it a more open economy and, therefore, boost its trade with other nations. In other words, euro adoption acted as unilateral trade liberalisation, rather than as a preferential trade agreement.

Flam and Nordstrom (2003) is another paper that examines the EMU effect on trade between eurozone and other countries. Using bilateral exports rather than an average of bilateral exports and imports as their dependent variable, they find that EMU led to an increase in exports among eurozone members by about 15 percent. They also find that trade between eurozone countries with other nations is boosted by about half that.

Barr, Breedon, and Miles (2003) assess whether EMU had significant economic effects by comparing EU countries that adopted the euro with those that did not. In their analysis, they used a methodology that controls for the fact that the decision to join EMU was not random, but was more likely to be

made by countries whose prospects of trading with other EMU members were already high. They find that EMU had a positive and significant effect on bilateral trade among eurozone countries. They also estimate that had the UK adopted the euro its trade (i.e. the sum of its exports and imports) could have been substantially higher.

The above discussion brings to light three important points: first, only two papers, Micco *et al* (2003) and Flam and Nordstrom (2003) attempt to investigate empirically the EMU effect on trade between eurozone countries and other nations. Both papers find this effect to be positive and economically significant. Second, both papers estimate the EMU effect on eurozone trade with other nations using very few data points after the launch of the euro in 1999. The sample period of both papers ends in 2002. Using only three years of data to estimate the EMU effect on eurozone trade can generate, at best, preliminary results. Third, there is no paper in the empirical literature that looks at the EMU effect on trade between eurozone countries and individual EU members that opted out of EMU, like the UK. In other words, there is no paper that examines whether the positive EMU effect on trade between the eurozone and other nations as a whole, reported by Micco *et al* (2003) and Flam and Nordstrom (2003), is widespread across non-EMU countries. These three observations demonstrate that the existing empirical literature on how the euro influences trade between eurozone countries and other EU nations that opted out of EMU is, at best, incomplete and requires additional work. With that in mind, this paper attempts to investigate empirically the EMU effect on the UK's exports to eurozone counties. To the best of our knowledge, no other paper has attempted to do so.

In order to examine the EMU effect on the UK's exports to the eurozone, this paper utilises data from 1981-2006 between the UK and all EU members at the time when the euro was launched. The beginning and ending of the sample time period were determined by the availability of trade data. Please note that the sample time period in this paper ends in 2006 instead of 2002 as in the case of the Micco *et al* (2003) and Flam and Nordstrom (2003) papers. The inclusion of four additional years in our sample will allow us to obtain a more reliable estimate of the EMU effect on the UK's exports to eurozone countries.

Limiting the countries included in the sample to EU members is very useful because the EU membership is, as Baldwin (2006, p. 38) puts it, 'an extremely complex thing-one that involves literally thousands of laws, regulations, and practices that affect trade within the EU and with third nations, most of which are unobservable to the econometrician since they are difficult or impossible to quantify.' Put differently, including EU members only in the study reduces the need to account for certain unobservable or difficult to quantify factors that influence trade flows between EU members and other nations, thereby making this paper's estimates of the EMU effect on the UK's exports to eurozone countries more reliable.

3. Model specification

Since Tinbergen (1962) developed the gravity equation, gravity-type models have been used extensively to explain what drives bilateral trade between countries, primarily because such models provide 'some of the clearest and most robust empirical findings in economics' (Leamer and Levinsohn 1995, p. 1384). Unsurprisingly, the gravity equation's empirical success induced curiosity about its theoretical underpinnings which, in turn, led to the development of a number of theories, some without economic content, to explain it. Anderson (1979) is perhaps the first paper that provides strong theoretical foundations for the gravity equation. He derives it from the properties of expenditure systems based on constant elasticity of substitution (CES) preferences. While preserving the CES preference structure, Bergstrand (1985) derives the gravity equation from a general equilibrium model of world trade. Bergstrand (1989) extends the microeconomic foundations of the gravity equation presented in Bergstrand (1985), by incorporating into the analysis relative factor endowment differences and non-homothetic tastes. He demonstrates how the gravity equation fits with the Heckscher-Ohlin model of inter-industry trade and the Helpman-Krugman-Markunsen models of intra-industry trade. Deardorff (1998) also demonstrates that a simple gravity equation can be derived from standard trade theories such as the Heckscher-Ohlin model. More recently, Anderson and van Wincoop (2003) show how a simple gravity equation can be derived by manipulating a CES expenditure system. Their main contribution to the literature, however, is to rewrite the gravity equation in a simple symmetric form, relating bilateral trade to size, bilateral trade barriers, and multilateral resistance variables.

Following convention, this paper uses the following augmented gravity equation in order to estimate the EMU effect on the UK's bilateral exports to eurozone countries:

$$\ln(X_{ijt}) = ß_1\ln(X_{ijt-1}) + ß_2\ln(D_{ij}) + ß_3\ln(Y_{it}\ Y_{jt}) + ß_4 RER_{ijt} + ß_5 VOL_{ijt} + ß_6 EU_{ijt} + ß_7 EU\text{-}Trend_{ijt} + ß_8 EMU_{jt} + DU + \varepsilon_{ijt} \quad (1)$$

where 'ln' is the natural logarithm, i refers to UK, j refers to an EU member other than UK, t refers to year, and ε is the error term. The dependent variable (X_{ijt}) denotes the value of UK exports to EU country j in period t measured in real British pounds. It is calculated by dividing UK exports by the UK GDP price deflator (base year is 2000). Using bilateral exports as opposed to the average of bilateral exports and imports as a dependent variable allows us to look at whether the euro puts non-eurozone countries' exporters at a disadvantage in the eurozone. This is an issue that concerns all non-eurozone countries including the UK. It is worth noting that the basic gravity theory also suggests the use of direction-specific trade flows as opposed to average trade as a dependent variable.

The first explanatory variable included in equation (1) is the lagged dependent variable. According to De Nardis and Vicarelli (2003), it must be included in equation (1) to capture the fact that developed countries trading a great deal with each other will continue to do so because of entrance and exit barriers due to sunk costs. For that reason, real UK exports to developed countries in year *t* are expected to be influenced positively by their lagged values.

The next two independent variables in equation (1) are variables which are typically found in every gravity equation. Because their definition and interpretation are standard, only a brief discussion of these variables is offered. The variable, D_{ij}, represents the great circle distance in kilometres between London, the capital of the UK, and the capital of country *j*. It is viewed as a proxy for transportation costs and, thus, its sign is expected to be negative. The variable, Y_{it} Y_{jt}, is the product of the UK's real GDP and country *j*'s real GDP, both measured in British pounds at constant 2000 prices and exchange rates. It is included in equation (1) to capture the effect of economic size on trade. In gravity-type models, trade flows are positively influenced by the economic size of the origin and destination countries ('mass effect' usually proxied by real GDP). The coefficient sign for the product of UK's and country *j*'s real GDP is expected to be positive because economically larger countries are expected to trade more.

RER_{ijt} is the real exchange rate measured by the nominal exchange rate, adjusted by the UK's and country *j*'s GDP price deflators. A real appreciation of the British pound relative to country *j*'s currency (i.e. an increase in the RER) will make British products more expensive in country *j* and, as a result, British exports to that country will decline.

VOL_{ijt} is the exchange rate volatility between the British pound and country *j*'s currency at time *t*. It is measured by the moving standard deviation of the first difference of monthly natural logarithms of the bilateral nominal exchange rate at year *t*. Traditional trade theory suggests that exchange rate volatility would depress trade because exporters would view it as an increase in the uncertainty of profits on international transactions, under the assumption of risk aversion.

EU_{ijt} is a dummy variable included in equation (1) to capture the impact on UK exports of the fact that a number of countries joined the EU after 1981, the beginning of the sample period of this study. Specifically, it takes the value of one from 1986 and onwards when country *j* is Spain and Portugal and the value of zero otherwise. When country *j* is Austria, Finland, and Sweden, the EU dummy variable takes the value of one from 1995 and onwards and the value of zero otherwise. Its sign is expected to be positive because countries belonging to the same regional trade association trade more.

$EU\text{-}TREND_{ijt}$ is a trend variable designed to capture the effect of the change in the nature of the UK's EU membership on its trade with other EU countries. Including such a variable in equation (1) is necessary because the

nature of EU membership changed over time. A case in point is the Single Market Programme (SMP), a radical liberalisation that has been gradually phased in since 1986, with all of it completed by mid 1990s. The sign of the *EU-Trend* variable is expected to be positive because the changes in the nature of EU membership over the years resulted in a closer and deeper relationship between EU member countries.

EMU_{jt} is the eurozone dummy variable that takes the value of one during the years for which country *j* adopted the euro as its national currency and the value of zero otherwise. Specifically, it is set equal to one from 1999-2006 when a country pair involves the UK and Austria, Belgium-Luxemburg,[4] Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, or Spain. When a country pair involves the UK and Greece, it takes the value of one from 2001-2006 only. Given the definition for the EMU_{jt} variable, its coefficient ($ß_8$) captures the EMU effect on the UK's exports to eurozone countries. A priori, its sign is expected to be ambiguous. A positive sign for '$ß_8$' will suggest that EMU boosted UK exports to eurozone countries, whereas a negative sign will suggest that EMU led to a decrease in UK exports to eurozone countries.

The mechanisms though which EMU can boost trade among its members[5] can also be used to shed light on whether the effect of EMU on UK exports to eurozone countries will be positive or negative. The simplest story used to explain why EMU boosts trade among its members deals with the reduction in bilateral trade costs associated with the adoption of a common currency. If, indeed, the reason why EMU increases intra-eurozone trade is a reduction in trade costs, then 'the euro's introduction is like discriminatory trade liberalization among Eurozone members and this should lead to supply switching from non-Eurozone to Eurozone suppliers' (Baldwin 2006, p. 41). Under such circumstances, EMU should lead to a decrease in UK exports to eurozone countries, a phenomenon that is loosely referred to in the literature as trade diversion. If, on the other hand, currency unions lead to greater openness with third nations as pointed out by Rose (2000) and Micco *et al* (2003), EMU will boost trade between eurozone countries and other nations, including the UK. In that case the EMU effect on UK exports to eurozone countries will be positive.

The last variable in equation (1), *DU*, is a set of dummies designed to approximate the Anderson and van Wincoop resistance index. We introduce a dummy for each year in the sample. These dummies take a value of one for bilateral exports from the UK to all trading partners in the relevant year, and the value of zero otherwise. De Nardis and Vicarelli (2003) approximate the Anderson and van Wincoop resistance index similarly.

The data used in the calculations of the variables in equation (1) are obtained from the International Financial Statistics CD-ROM, except for UK exports and distances. UK exports are collected from the International Monetary Fund's *Direction of Trade Statistics* online service (http://www.imfstatistics.org/DOT/logon.aspx). Great Circle distances are obtained from the

U.S. Department of Agriculture web site (http://www.wcrl.ars.usda.gov/cec/java/lat-long.htm).

4. Estimation procedure and empirical results

The presence of a lagged dependent variable in equation (1) makes it a dynamic panel model. In a dynamic panel model, least squares estimators would yield consistent estimates only when the time series dimension of the panel data is large. Econometric studies have shown that through Monte Carlo simulations the time series dimension is large enough when it is around 40 years. Since the time series dimension of the panel data in this paper is not large enough, both a pooled least squares and a fixed effects estimation are inappropriate to estimate equation (1) as they would yield biased and inconsistent estimates. In order to generate unbiased and consistent estimates for equation (1), a Generalised Method of Moments (GMM) estimator along the lines suggested by Arellano and Bond (1991) and Arellano and Bover (1995) is used. Such an estimation procedure is commonly used in the literature to estimate dynamic panel data models as in this case.

Table 1: Empirical estimates of the EMU effect on the UK's Exports

Method of Estimation	*Panel GMM*	*Panel GMM*
Lag log real UK exports (-1)	0.618 (0.037)*	0.618(0.037)*
Log product real GDP	0.166 (0.044)*	0.171 (0.055)*
Real Exchange Rate	-0.027 (0.007)*	-0.027 (0.009)*
Exchange Rate Volatility	-0.381 (0.092)*	-0.378 (0.096)*
EU Membership	0.039 (0.028)	0.039 (0.028)
EU Trend Variable	0.001 (0.002)	0.001 (0.003)
EMU	-0.045 (0.023)**	-0.0444 (0.024)***
Non-EMU		0.0076 (0.027)
J-statistic	298	297

Source: Author's calculations.
Notes: * denotes statistical significance at the one per cent level, ** at the five per cent level, and *** at the ten per cent level. The coefficients for the dummies used to approximate the multilateral resistance index are not reported.

Table 1, results column 1, reports the GMM estimation results of equation (1) along with some standard statistics. The dynamic panel model is estimated using panel data comprised of 416 observations (13 x 26). Thirteen is the number of the cross-sectional observations, each representing an EU member[6] at the time the euro was launched; and 26 refers to the time-series dimension of the data covering the period 1981-2006.

Since the focus of this paper is on the EMU effect on UK exports to eurozone countries, the coefficient estimates for the other independent variables presented in table (1) are discussed only briefly. The coefficient estimate for the lagged dependent variable (X_{ijt-1}) is found to be positive and statistically significant at the one percent level. The positive sign suggests that there is a 'persistent effect' in UK exports to eurozone countries, as expected. De Nardis and Vicarelli (2003), among others, also find that the 'persistent effect' explains a large part of bilateral trade among developed countries.

The coefficient estimate for economic size (Y_{it} Y_{jt}) has the expected sign and is statistically significant at the one percent level. This result supports the standard prediction of gravity models that economically larger countries trade more. The coefficient estimate for the real exchange rate (RER_{ijt}) is negative and statistically significant at the one percent level suggesting that a real appreciation in the value of UK's currency leads to a decrease in UK exports. The coefficient estimate for exchange rate volatility (VOL_{ijt}) is negative and statistically different from zero.[7] Stockman (1995) examines the relationship between exchange rate uncertainty and the volume of intra-EU trade, and finds that the impact of exchange rate uncertainty on trade is negative and statistically significant. For those interested in the effects of exchange rate uncertainty on trade, McKenzie (1999) provides a comprehensive review of the literature on this topic. The coefficient estimates for both the EU membership and EU-Trend variables are found to be positive, as expected, but not statistically significant.[8]

The coefficient of interest in this study is $ß_8$ which captures the EMU effect on UK exports to eurozone countries. It is found to be negative, a result that suggests that EMU led to a decrease in UK exports to eurozone countries. This decrease is statistically different from zero at the five percent level. The decline in UK exports to eurozone countries could be explained using Baldwin's (2006) theoretical arguments. If EMU increases trade among its members because of the reduction in bilateral trade costs associated with the adoption of the euro as a common currency, then adopting the euro would work like 'discriminatory trade liberalization' among eurozone countries. As a result, exports from non-eurozone countries to eurozone countries would decline because non-eurozone suppliers will have a cost-disadvantage relative to eurozone suppliers in eurozone markets. Put differently, the negative EMU effect on UK exports to eurozone countries could be explained by supply switching from UK suppliers to eurozone suppliers.

Micco *et al* (2003) and Flam and Nordstrom (2003) found that the eurozone's total trade with non-eurozone countries was boosted by the euro's

adoption. Their finding is not necessarily inconsistent with the key finding of this study. EMU could very well lead to an increase in overall trade (sum of exports plus imports) between the UK and eurozone countries, if UK imports from eurozone countries increased by a larger amount than the decrease in UK exports to eurozone countries. An empirical examination of the impact of EMU on UK imports from eurozone countries, however, would be the subject of further research.

The fundamental finding of this paper, that EMU led to a statistically significant decrease in UK exports to eurozone countries, raises the following interesting question: what happened to the UK's exports to Denmark and Sweden, the other two EU members that opted out of EMU? In order to answer this question, equation (1) is re-estimated by including in it a new dummy variable called *Non-EMU*$_{jt}$. The *Non-EMU*$_{jt}$ dummy variable takes the value one from 1999-2006 when country *j* is Denmark and Sweden and zero otherwise. The GMM estimates of the modified equation (1) are also presented in Table 1, column 2. The coefficient estimate for the Non-EMU dummy is found to be positive but statistically insignificant, a not so surprising finding given that nothing changed the trade relationship between the UK and Denmark and Sweden from 1999-2006. The coefficient estimate for the EMU dummy, however, is still found to be negative and statistically significant, though at the ten percent level. This result confirms our earlier finding that EMU led to a decrease in UK exports to eurozone countries. The other coefficient estimates for the modified equation (1) are remarkably similar to the empirical estimates of the original equation (1) presented in results column 1 of Table 1.

5. Summary and conclusions

This paper investigates the EMU effect on UK exports to eurozone countries, using panel data from EU countries for the period 1981-2006. The empirical findings of this paper suggest that economic size, real exchange rate, and exchange rate volatility are statistically important determinants of UK exports to eurozone countries. Additionally, they provide strong statistical support for our a priori expectation that developed countries (like the UK) trading a great deal with other developed countries will continue to do so.

The main contribution of this paper to the literature, however, is the finding that the EMU effect on UK exports to eurozone countries is negative. In other words, the results suggest that EMU led to a decrease in UK exports to eurozone countries. The decrease is statistically different from zero. The negative EMU effect on UK exports to eurozone countries could be explained by supply switching from UK suppliers to eurozone suppliers, who end up with relatively lower trade costs because of the adoption of the euro.

The main finding of this paper can also be interpreted as suggesting that the euro put UK exporters at a disadvantage in eurozone markets, at least

in the short-run. The critical question, however, is whether EMU will put UK exporters at a greater disadvantage in eurozone markets over the long-run. The answer to that question is most likely to be yes because the number of firms in the eurozone that are engaged in exporting to other eurozone markets is expected to increase considerably over time. As Baldwin (2006) points out, most EU firms are not engaged in trade. They sell only in their local markets due in part to their aversion to exchange rate uncertainty. According to Baldwin (2006, p. 65), 'such uncertainty is a nuisance to giant companies like Nestlé and Fiat, but to small and medium firms it is a very real barrier.' The permanent elimination of exchange rate volatility between eurozone countries removes that very real barrier for these firms which, in turn, will make it much easier for them to export their products to other eurozone countries. Undoubtedly, this will increase competition for UK exporters to eurozone markets over the long-run.

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ENDNOTES

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2. In this paper, the term 'EMU' refers only to the introduction of the euro on foreign-exchange markets and for electronic payments on January 1, 1999 and the subsequent introduction of euro notes and coins. The introduction of the common currency was initially launched in eleven countries: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxemburg, the Netherlands, Portugal, and Spain. Greece joined the group on January 1, 2001.

3. The terms 'EMU effect' and 'euro effect' are used interchangeably in this paper.

4. Trade figures for Belgium and Luxembourg were combined in a single total prior to 1998; rather than lose valuable observations, this study treats Belgium and Luxembourg as if they were a single country.

5. For a detailed discussion of the mechanisms through which the euro can influence intra-eurozone trade, see Micco *et al* (2003, p. 322) and HM Treasury (2003, p. 16-20).

6. The EU countries included in the study are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and Sweden. Recall that Belgium and Luxembourg are treated as one country for the purpose of the analysis.

7. Exchange rate volatility is also measured by the moving standard deviation of the first difference of monthly natural logarithms of the bilateral real exchange rate at year *t*. Its coefficient estimate is also found to be negative and statistically different from zero.

8. Please note that there is no discussion for the coefficient estimate for the distance variable (ln*D*) because the variable does not vary over time and, when differenced, all of its values become zero.

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