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ECONOMICS 615

EMPIRICAL PAPER

THE SHORT-RUN IMPACTS OF THE EURO ON THE EUROPEAN UNION TRADE

I. Introduction:

The European Community integration of economic affairs made major improvements starting from 1990s. The integration started with the Single Market which was formally completed at the end of 1992. The Common market aimed to remove all the barriers to trade and to achieve free movement of goods, services, people and capital amongst the European Union (EU) member states. In the same year, the EU furthered this integration by the Economic and Monetary Union (EMU) which involves the introduction of a single European currency. On January 1, 1999 the euro became the new currency for eleven Member States[1] of the European Union and after the three year transition period of fixed exchange rate regime, physical euro notes and coins were introduced on January 1, 2002.

The impact of the Single Market on EU trade was highly positive. On the other hand the introduction of a common currency has costs and benefits. The most important cost of this new monetary regime is the loss of economic flexibility in the monetary adjustments to asymmetric shocks. The benefits on the other hand come from potential gains in economic efficiency such as elimination of transaction costs and fluctuations of exchange rate causing uncertainty. The latter two are expected to boost trade. However skeptics support that even in a turbulent economic environment trading parties can still hedge against the uncertainty deriving from the exchange rate risk by using financial instruments. However, there is no full insurance against the uncertainty in incomplete markets and additionally hedging is a costly process. Another way to eliminate the fluctuations in exchange rate is to apply fixed exchange rate policies. However, this policy is not as effective as the common currency in promoting trade. The effectiveness of a common currency compared to a fixed exchange rate regime comes from the degree of transparency and commitment. In a common currency area all the prices are in the same currency indicating transparency and commitment implies that it is harder to break up a common currency area than a fixed exchange rate regime.

[1] The eleven member states are Austria, Belgium, Germany, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Finland. Greece had fulfilled the convergence criteria and would join the euro from January 2001.

These potential benefits of the common currency motivated non-euro zone EU countries to consider joining the euro area. HM treasury (2003) considered the possible increase for the UK trade with the euro economies via UK's participation in EMU. These participation considerations rely on the previous literature on currency unions and boards which support a positive impact of such unions on trade. Rose (2000) studies the impacts of currency unions and boards on trade in a large sample of 186 countries, dependencies, territories and so forth. He finds results indicating a three-fold increase in bilateral trade with the currency union members compared to other trading partners. Frankel and Rose (2002) use a similar data set of 200 countries and dependencies. The authors find evidence supporting this tripling effect in bilateral trade with the union members without any trade diversion with the non-union trade partners.

The previous literature supporting high magnitude in trade gains is highly criticized. One of these critiques is the heterogeneity in the sample such as the one that Rose (2000), and Frankel and Rose (2002) used. Both studies had an extremely large sample consisting of small countries and territories engaging in a currency union with one large and developed country. These results are likely to fail for smaller samples consisting of large countries, such as in the European Union. The other critiques were focused on the panel data model employed in these studies. The static gravity model is likely to yield an overestimation when it is used to estimate short-run effects of a currency union in trade.

The following literature in particular on the euro's impact on trade shows that these effects are not so large. Bun and Klaassen (2004) believe that in studying the impacts of the euro on trade, the misspecification of the trend can lead to substantial upward bias. They believe that since the euro dummy in the gravity equation is equal to one only at the end of the period, it may pick up increasing trends in trade which are indeed based by omitted variables. Faruqee (2004) takes account of the possible non-stationarity in the data and employs panel cointegration techniques to obtain more reliable results. His panel OLS and dynamic OLS estimates result in positive moderate

impacts of the euro on trade. Nardis and Vicarelli (2003) also support findings for positive but smaller impacts of the euro on trade among the European countries. They believe that the traditional static gravity models are long-run oriented models and they cannot represent the short-run impact of euro on trade without bias. In order to capture these short-term effects they introduce a dynamic panel data approach.

In this article I strictly focus on the European Union countries, in particular EU15[2] and the six largest trading partners of EU15. I study the impacts of the euro on intra-and-extra-EU-15 trade both in micro and macro levels: the impact of the euro on bilateral trade of each EU-15 countries and on the aggregate EU-15 trade. To do this I will exploit static and dynamic panel data gravity models and as well as models including lagged effect of trade. This paper has the following structure. In the next section, I discuss the data specifications and sources. Section three exposes the characteristics of the models adopted. Section four and five distributes the regression results for the EU15 country specific bilateral trade and EU15 bilateral aggregate trade respectively. Section six concludes.

II. Data:

The panel data set in this paper is a very homogenous sample concentrated on EU15 and the most important six trading partners of EU15 during the years 1995 to 2002. This period of eight years can be divided into two equal subgroups the first four years with the national currencies of the European Union member states and the last four years with the common currency euro. My aim in choosing a small time dimension is to avoid the problems of overestimating the impact of Euro on trade. Bun and Klaassen (2004) mention that the magnitude of the impact of euro on trade increases with the time dimension, such that Micco et al. (2003) find the lowest estimates by using a sample of

[2] EU15 are Austria, Belgium, Germany, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Finland, Greece, Denmark, Sweden and UK.

1992-2002, and Bun and Klaassen (2002) get the largest estimates from a sample of 1965-2001.

The data for the cross-section identifiers consist of bilateral combinations of 21 countries. These countries are from a very homogenous sample, 15 of the countries are EU members and the rest are the six major trading partners of the EU15: the United States, Japan, China, Switzerland, Russia and Turkey. I use a homogenous sample because heterogeneity is a problem that Rose (2001), and Frankel and Rose (2001) encountered in their studies. The sample in their study was extremely heterogeneous and the countries or territories which are on some kind of a currency union or board with a one big country are mainly small countries or territories. The trade gains of a small country in a currency union can be a lot larger than that of a medium or a large scaled economy. Therefore I believe such a sample may not reflect the trade gains of the EU15 via adopting a common currency.

The variables of interest in my panel data are the gravity equation explanatory variables. In order to create these variables I collected data on GDP, GDP per capita, bilateral trade, euro zone and Free Trade Agreements (FTA). GDP and GDP per capita of the EU countries are obtained from Eurostat of the European Union website. GDP is in millions of euro (at 1995 prices and exchange rates) and GDP per capita is at 1995 prices (including 'euro fixed' series for euro-zone countries).

Bilateral import and export data is obtained from the OECD's International Trade by Commodity Statistics[3]. I calculated bilateral trade as the sum of exports and imports. This trade data is presented in thousands of US dollars, at current prices in the data base. In order to have accuracy in units amongst the variables, I converted trade data into euros at the given exchange rate of the year. Then by using the Harmonised annual average consumer price indices of the euro zone, I converted these current prices into constant prices taking 1996 as the base year.

[3] The bilateral trade data are not available for Belgium and Luxembourg individually; therefore I used the aggregate bilateral data for the Belgium-Luxembourg pair.

I obtained the information on countries adopting euro and the FTA between the EU and non-EU countries from the European Union webpage[4]. All the EU15 countries except Denmark, Sweden and UK are on the euro, and since the establishment of the Single Market in 1992 the EU countries abandoned trade barriers within the union. Amongst the non-EU countries the only two countries who did not have a FTA with the EU for the whole sample period are China and Russia. The bilateral EU-China agreement on WTO signed in Beijing on 19 May 2000, and the Partnership and Co-operation Agreement (PCA) entered into force with Russia on 1st December 1997.

III. The Model:

In this work I exploit the gravity model of international trade to measure the impact of the euro on EU15 bilateral trade. The gravity model of international trade is rooted in Newton's gravitational law which states that attractive force between two bodies is directly related to their size and inversely related to the distance between them. In the trade equation size is measured as the logarithm of the product of the GDP of two countries and distance is measured as the distance between the two countries' capitals. However, such a measure for distance is strongly criticized in the literature because some countries' capitals are not the focal points of trade. Therefore I will not include distance as an explanatory variable. The other control variables for bilateral trade are the logarithm of the product of GDP per capita of the two countries, and two dummy variables controlling for the euro and FTA. The euro dummy is equal to one only if the currency of both of the countries is the euro and the FTA dummy is equal to one only for the period when there is a FTA between two countries.

I exploited five different panel data approaches in the aforementioned gravity equation. Three of these approaches mimic the previous models in the literature. The first

[4] www.europa.eu.int

is a static panel data model similar to that of Frankel and Rose (2002). This panel data equation can be expressed as follows:

$$Ln(trade_{ijt}) = \alpha_{ij} + \beta_1 ln(GDP_{it}GDP_{jt}) + \beta_2 ln(GDPc_{it}GDPc_{jt}) + \beta_3 euro_{ijt} + \beta_4 FTA_{ijt} + \varepsilon_{ijt} \qquad (1)^5$$

Unlike Frankel and Rose (2002), I try to capture cross sectional variation by assuming presence of cross-sectional heteroskedasticity rather than trying to capture it by employing control variables that stay constant over time but change amongst different observations, such as the common language variable. By not including such control variables, I can control for the omitted variables bias in the above model.

In the second approach, I mimic the Faruqee (2004) panel data model by using dynamic OLS method. He supports that this is a necessary method in order to generate reliable estimates when there is possible non-stationarity in the data. In addition to the possibility of a unit root in the data, Faruqee also suggests that bilateral trade, GDP and GDP per capita series are cointegrated. The dynamic OLS model corrects for potential endogeneity bias and residual serial correlation by introducing leads and lags of differenced series to the OLS equation, and it provides interpretable test statistics by adjusting the standard errors. The dynamic OLS model of the gravity equation employed in this paper is as follows:

$$Ln(trade_{ijt}) = \alpha_{ij} + \beta_1 ln(GDP_{it}GDP_{jt}) + \beta_2 ln(GDPc_{it}GDPc_{jt}) + \beta_3 euro_{ijt} + \beta_4 FTA_{ijt} + \beta_5 \Delta ln(GDP_{it}GDP_{jt}) + \beta_6 \Delta ln(GDPc_{it}GDPc_{jt}) + \varepsilon_{ijt} \qquad (3)^6$$

The third model I exploited from the literature is the dynamic panel data approach by Nardis and Vicarelli (2003). The authors believe that previous models in the trade literature do not represent the short-run effects of currency unions on trade. Since the euro is a very young phenomenon, the gravity model should reflect this short-run effect. Further, they support that the short-run is very relevant in the trade analyses, since the

[5] Indicates the model number estimated in section four and five.
[6] Indicates the model number estimated in section four and five.

sunk costs play an important role for trade decisions. Exporters need to bear the sunk cost whenever they decide to move from one place to another, since this is a costly process it creates a barrier to exit. Therefore trade follows a sticky behavior and it depends on previous investment decisions. In order to get consistent estimates of a dynamic model, the authors take the first difference of the model and then calculate the GMM estimators. I follow the same method and the gravity equation I employ in this paper is as follows:

$$\Delta ln(trade_{ijt}) = \beta_1 \Delta ln(GDP_{it} GDP_{jt}) + \beta_2 \Delta ln(GDPc_{it} GDPc_{jt}) + \beta_3 \Delta euro + \beta_4 \Delta FTA + \varepsilon_{ijt} \quad (5)^7$$

I believe the dynamic model will represent my sample the best. Since the euro is a very young phenomenon short-run effects are very important in trade. Additionally, the relatively small time dimension of the panel data is an obstacle to observing the long-run effects. Therefore I create two more models (model 2 and 4) by adding the lagged bilateral trade term as an explanatory variable into the aforementioned model 1 and 3 respectively. In the following two sections I provide the computer estimations of these five models for two different panel data sets.

IV. Estimation Results for bilateral trade for EU15 countries:

In this section I provide the estimation results of the five models discussed in section three. The panel data in this section consists of 15 European Union countries and 6 non-EU countries for the time period 1995-2002. The number of cross-sections for bilateral variables is 175. The dependent variable is the bilateral trade between an EU country and another EU country or the bilateral trade between an EU and a non-EU country. The first is referred as the intra-EU15 bilateral trade for the member states and the latter as the extra-EU15 bilateral trade for the member states. Regression results are provided in Table I.

[7] Indicates the model number estimated in section four and five.

Table I

Estimation Results for Bilateral Trade of EU15 countries

Dependent Variable: Bilateral trade

	1) static model	2) Dynamic model	3) DOLS	4) DOLS	5) first differenced
GDP	0.73611	0.013291	-0.129784	0.006625	
	(0)	(0)	(0.3242)	(0)	
GDPc	0.469847	-0.016027	1.274793	-0.013134	
	(0)	(0)	(0)	(0)	
Euro	0.46945	-0.009769	-0.010686	-0.00941	
	(0)	(0)	(0)	(0.62)	
FTA	0.198679	0.011211	-0.023524	0.113623	
	(0)	(0.0026)	(0)	(0)	
Trade(-1)		0.97927		0.988994	
		(0)		(0)	
ΔGDP			1.037992	0.040604	0.294025
			(0)	(0)	(0.0001)
ΔGDPc			-0.819889	1.304751	1.125055
			(0.0221)	(0)	(0)
Δeuro					-0.014763
					(0)
ΔFTA					-0.083625
					(0.001)

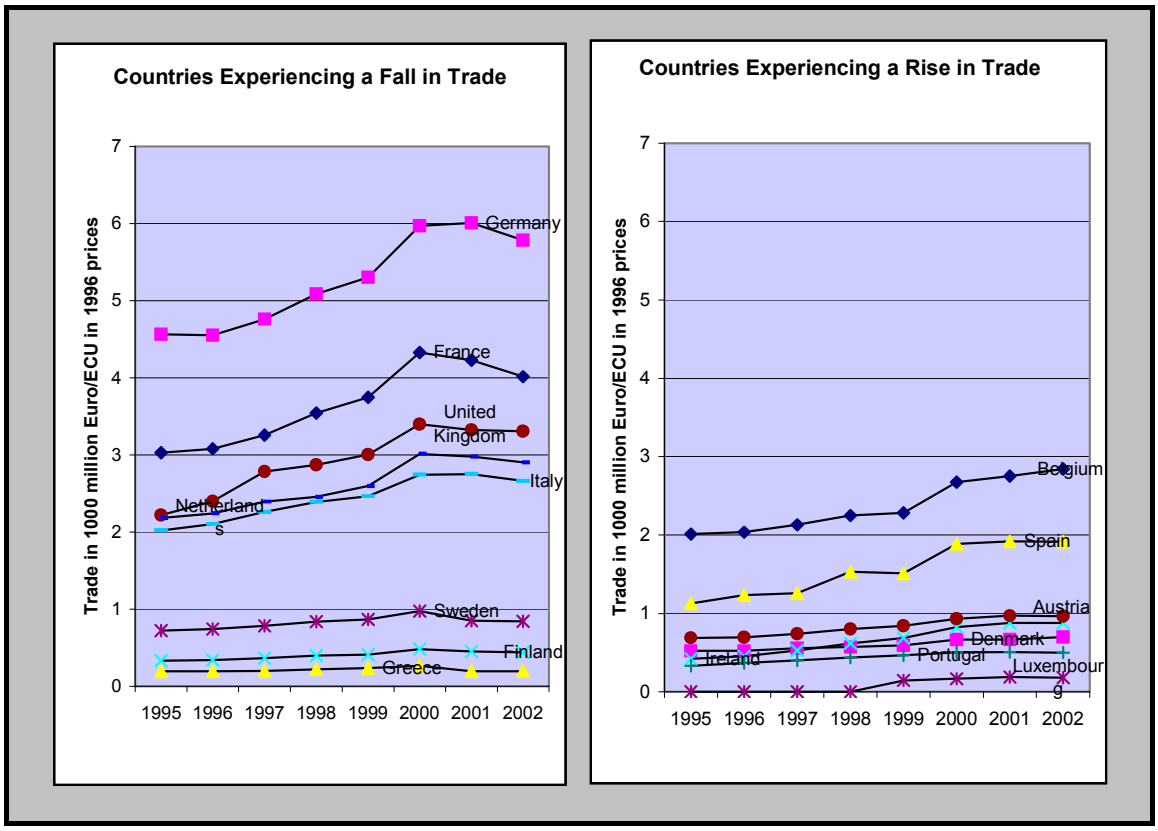
1) model (common intercept crosssection weights)
2) model (common intercept crosssection weights)
3) model (fixed effects crosssection weights)
4) model (no intercept crosssection weights)
5) model (no intercept crosssection weights)

* p-values are reported in the paranthesis
** all errors are White Heteroskedasticity-Consistent Standard Errors
*** in model 5 the dependent variable is Δtrade

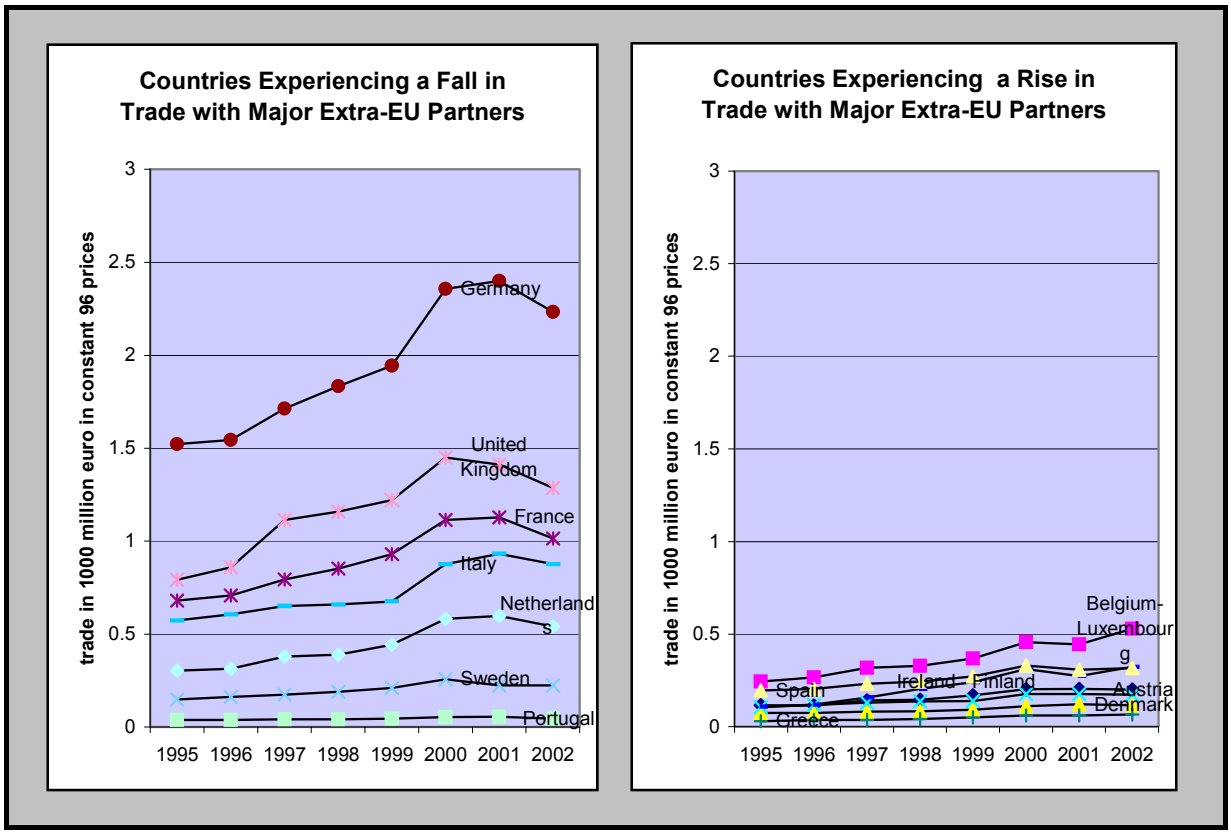
Looking at the regression results, one can see that the coefficient of GDP is consistent with the gravity equation, except model 3 which is statistically insignificant. This indicated that bilateral trade is directly related to the size of the countries. However, the regression results do not provide the same consistent results on the coefficients of GDP per capita and the FTA variables. The inconsistency in FTA agreements can potentially be caused by the selection of the data. In the panel data all the countries except Russia and China are in a FTA with the EU15 for the whole sample period, and China and Russia enter into a FTA with the European Union in a time period that coincides with the entrance of the euro.

The variable of interest in this regression is the coefficient on the euro dummy. In all the five models, except model one, the coefficient on the euro dummy indicates a negative sign and all the coefficients, except the one in model 4, are statistically significant. The coefficient in the first model is very similar to the expected Frankel and Rose (2002) coefficients. The difference comes in the magnitude of the coefficient. Frankel and Rose (2002) estimate much larger coefficients for the euro dummy. This difference can be explained by the insight from Bun and Klaassen (2004) that the magnitude of the coefficient of this variable increases with the sample size. Frankel and Rose (2002) employ a much larger sample, from 1970-1995 and the difference in the size of the euro coefficients supports another finding for Bun and Klaassen's (2004) statement, that the euro coefficient is upward biased. The negative sign of the euro coefficient in the other four models do not follow the sign of the euro coefficient in the literature. However, the recent models in the literature estimate a smaller and smaller impact of the euro on trade. Further, I believe that the trend in the data supports the estimated negative coefficients. Graph I and II depict this trend in the data.

Graph I: EU Member States Total Trade with the EU15



Graph II: *EU Member States Total Trade with the USA, China, Japan, Switzerland, Russia and Turkey*



The above two graphs depict the intra and extra EU15 trade by the member states of the European Union during the time period 1995 to 2002. In both graphs the charts on the left hand side show the countries which experienced a fall in trade by the introduction of euro bonds and coins, and the charts on the right hand side display the countries which experienced a rise in intra-EU15 trade in the aforementioned time period. Looking at the above two graphs one can see that there is gradual increase in trade in all the economies until the year 2000. All the large economies of the EU15 and some small EU15 countries experienced a fall in both intra and extra EU trade during the years 2001 and 2002. On the other hand only the small EU15 countries experienced an increase in trade.

Another interesting result depicted in the above graphs is that the magnitude of the fall in trade by large economies is larger than the magnitude of the rise in trade in

small economies. I believe this result is very consistent with respect to the previous results in the field. Such that Frankel and Rose (2001) pointed out that currency unions or currency boards will yield an increase in trade. The authors included only small scale economies in their sample. If we were to exclude the large EU15 economies from the sample, we would have obtained very similar results to the Frankel and Rose (2001) study. On the contrary, one can see that the previous literature results indicating a rise in trade due to currency boards or unions does not hold for large economies. However, we should not take this result as a strong indicator against the literature supporting positive impacts of currency unions on trade. The euro is a very new phenomenon and it is very likely that the large economies of the European Union are experiencing the transformation costs to a single currency. More robust results require larger time periods.

V. Estimation Results for bilateral trade for EU15 countries:

The panel data I used in this section for estimating the five models of the gravity equation of international trade consists of 20 country pairs[8] for the period 1995-2002. The dependent variable is the bilateral trade between the EU15 and an EU member state or the bilateral trade between the EU15 and a non-EU country. The first is referred as the aggregate intra-EU15 trade and the latter is referred to as the aggregate extra-EU15 trade. In these panel data regressions I observe the impact of the euro on the aggregate intra-and-extra-EU15 trade. Regression results are provided in Table II.

[8] 14 country pairs for the EU15 (Belgium and Luxembourg are taken as one observation) and 6 non-EU countries.

TableII:

Estimation Results for Aggregate EU15 Bilateral Trade

Dependent Variable: Bilateral trade

	1) static model	2) Dynamic model	3) DOLS	4) DOLS	5) first differenced
GDP	1.619995	0.283853	1.30438	0.003369	
	(0)	(0)	(0.3242)	(0.7829)	
GDPc	-0.448683	0.730183	-3.00893	-0.000285	
	(0)	(0)	(0)	(0.9656)	
Euro	-0.063531	-0.008242	-0.431188	-0.012529	
	(0)	(0)	(0)	(0.20)	
FTA	-7.242158	0.076031	1.721201	0.060697	
	(0)	(0)	(0.0014)	(0)	
Trade(-1)		0.13622		1.001573	
		(0.0003)		(0)	
ΔGDP			-1.831261	0.266255	0.73829
			(0.4888)	(0)	(0)
ΔGDPc			-2.188426	1.00315	1.774682
			(0.42)	(0)	(0)
Δeuro					-0.052107
					(0)
ΔFTA					-0.093316
					(0)

1) model (common intercept cross section weights)
2) model (fixed effects cross section weights)
3) model (no intercept cross section weights)
4) model (common intercept cross section weights)
5) model (cross section constant cross section weights)

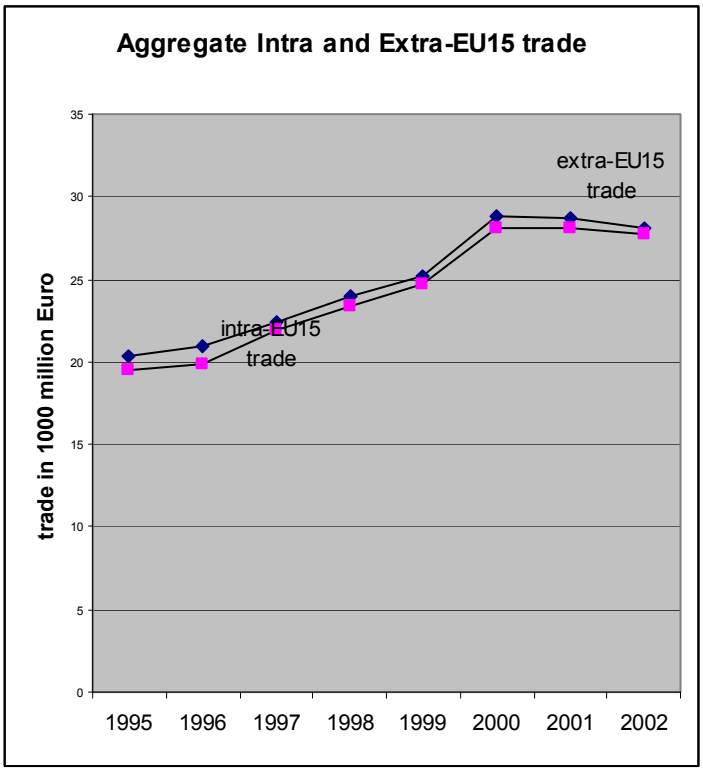
* p-values are reported in the paranthesis
** all errors are White Heteroskedasticity-Consistent Standard Errors
*** in model 5 the dependent variable is Δtrade

The above regression results for the aggregate EU15 bilateral trade depicts very similar results to that of the country specific bilateral EU15 trade presented in section IV. Looking at the coefficients of GDP, one can see positive coefficients for all the variables and significant estimates for the first two and the last model. As I discussed in section IV the positive coefficient on GDP is consistent with the gravity equation of trade. All the coefficients of GDP per capita are negative and significant except model 2 (positive estimate) and model 5 (negative but not significant). This negative coefficient is also consistent with the gravity equation results in the literature. This panel data set yields more consistent results also for the coefficient of FTA dummy. Three of the five models

predict a rise in trade with the FTA. I believe the discrepancy in the sign can be related to the same reason that I discussed in section IV, that is except for two countries in the data set all the other countries have FTA with the EU15 for the whole sample.

The coefficient of the euro dummy is the most interesting result for this paper. All the models except model four result in negative and significant coefficients in this variable. This indicates that introduction of the euro as the common currency indeed had a negative influence on the EU15 aggregate trade. Looking at Graph III, we can observe the same trend in the data.

Graph III



The above graph presents the time trend in the aggregate intra-and-extra-EU15 trade. Looking at the graph, one can see that there is a steady rise in EU15 trade until the

[9] Intra-EU15 trade are in 1995 constant prices and extra-EU15 trade are in 1996 constant prices.

year 2000. At 2001 and 2002 the European Union experiences a fall in trade. This result is very consistent with the results in the previous section. Since the largest scale EU economies lost in trade in higher magnitude and only smaller economies of the EU15 gained in trade by euro in a smaller magnitude the final effect of the euro on the aggregate EU15 trade resulted as a fall in trade.

Even though the data and the empirical evidence support a negative impact of the currency union on EU15 trade, one should not strongly rely on these results. First of all, the euro experience is very new and there is not enough data to fully observe the real impact of the euro on the European Union. It is very likely that the European countries are experiencing the transformation costs to a single currency by the launch of the euro. Secondly, the fall in trade during the years 2001 and 2002 can be related to some other factors that I have not controlled for in this regression. The economic and political conditions of the non-EU trading partners may have a negative impact on EU trade. Some of the possible factors as a potential for this negative impact are the September 11 attack to the United States, Japanese economic stagnation, and the two major financial crises in the Turkish economy. Finally, European Union countries are among the countries that already trade extensively with each other. The completion of the Single Market in 1992 and fixing the exchange rate of the member states in 1999 may have resulted in a highly positive impact on trade which might have outrun the gains in trade by the launch of euro notes and coins in 2002.

I. Conclusion:

In this study, I looked at the effects of common currency amongst the countries that already have a pervasive amount of trade with each other. I studied the impact of the euro first on the country specific bilateral trade on the EU15 countries and then on the aggregate EU15 trade. In order to study the impact of the euro on the first specification, I employed a panel data set consisting of 175 cross sections for bilateral variables for the

period 1995-2002. For the second specification, I used a smaller panel data set consisting of 20 cross sectional units for the same time period. I exploited five different panel data models of the gravity equation for both of the specifications. These panel data models ranged from static to dynamic panel data equations. Even though panel sets and the panel data equations varied amongst each other, they commonly indicated a negative impact of the euro on the European Union trade.

Even though the negative impact of the euro on trade has strong support from the empirical evidence, this effect may still not reflect the true effect of the euro. One of the main drawbacks of my study is due to the time dimension. The euro is a very new phenomenon, and therefore relying on this information may yield underestimates of the impact of the euro on trade. Additionally some of the variables that I did not control for in this regression may cause a similar negative impact. Some of these omitted variables may come from the international environment, such as the economic and political conditions of the major non-EU trade partners. Other omitted variables that may overemphasize the negative impacts of the euro may be rooted in the internal environment. The Single Market and the transition costs of launching a new currency may be some of these disregarded internal variables. The impact of the euro on promoting bilateral trade might have been overrun by the effects of the Single Market in raising the EU trade. Additionally the transition costs of the euro may limit the positive effects of implementing the euro in its first years. Therefore the negative effects of the euro on trade may be misleading for the time period. It may require more years of the euro experience to have stronger support on this evidence.

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