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Euro's Trade Effect: Homogeneity Versus Heterogeneity in the Euro Zone

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Abstract- We used an improved gravitational equation to experiment with as many samples and relevant time intervals as possible - from the most homogeneous samples (EU 15) with shorter periods, to less homogeneous samples (EU 25/27) but with longer periods of time, in order to observe the evolution of the euro trade effect over time, along with the enlargement of the EU and the Euro Zone, thus best estimating the euro trade effect that is to be experienced by Romania when joining the Euro Zone. The result is not surprising: with the inclusion of recent EU and Euro Zone accession waves, the euro trade effect is drastically reduced, so that when Romania and Bulgaria are also introduced into the EU sample, the estimated Rose effect for the euro recorded the lowest values and loses its statistical significance completely.

Keywords: *Currency Union, Euro Zone, Gravitational Equation, Trade Effect, Rose Effect.*

Introduction

The monetary adventure that took place at the level of the European continent has generated a lot of talks especially about its feasibility and the extent to which the states that have decided to join the Euro Zone have been tempted to take this brave step. It has been over 25 years since Europeans use the single currency, they feel the positive and the negative effects of this decision, they are nostalgic for their traditional national currencies and, recently, they figured out those things not made on time nor correct.

In relation to the Euro Zone, the theories and political doctrines of recent years are being developed (the trend favoring the reform of the Euro Zone has propelled Macron as president of France, some Italian political forces want to win the 2018 elections promising to withdraw from the Euro Zone, some politicians from other countries struggle to be pro or against the single currency). The business plans of major or smaller companies are also based on the expectations of the medium-term rate of the European currency and the citizens of the planet associate the European Union with this monetary symbol.

On the margins of the European Monetary Experiment, an important specialized literature has emerged and developed. From all the papers dealing with topics related to monetary integration

at European level, groups of loyal supporters of the beneficial effects of endowing our continent with a single, powerful currency meant to compete successfully with the almighty US dollar have emerged.
Alongside the pro -euro group, the euro - skeptic group, which attributes much of the economic troubles of some of the EU member countries to the monetary integration experiment, has also emerged. The views on the effects of the European Monetary Union are grouped around those who argue that the level of monetary integration is still small, asymmetric and they call for progress in the fiscal pillar, but also around those who complain that it has gone too fast before many of the states which have adopted the common currency have been properly prepared.
This paper adds to the quest of finding out whether the Eastern European countries should join the euro and if countries such as Romania will gain from joining the Euro Zone in terms of bilateral trade.

Literature Review

Considering the importance of the euro today, when the euro is used by more than 336 million people, and the lives of another 200 million people living in non-euro areas are directly or indirectly touched by monetary policy, it was only a matter of time before the specialists in the field decided to measure the impact of joining the Euro Zone, particularly the euro trade effect.
From the many existent studies, we have selected those that we considered the most relevant for our purpose. The criterion for selecting these studies was the use of the gravitational model, complemented by the analysts' effort to try to estimate the effect of the introduction of the euro both between EMU members and between them and the rest of the world.
Most papers in this field estimated positive, substantial and statistically significant positive trade effects. Flam's conclusion (2009) is that empirical results associate EMU countries with a 10-30% trade over the period 2002-2006 compared to 1995-1998 and trade between non-EMU countries. If reference is made to trade between countries using the euro and those outside the EMU, the effect is halved.
One of the most influential papers in which the euro trade effect has been estimated can be considered the one elaborated by Micco, Stein and Ordonez (2003) who, although using a rather small sample, conclude that countries using the euro have consistently higher trade relative to countries outside the Euro Zone.
One of the findings based on personalized radiography of the most suggestive analytical contributions in this area is that we are witnessing a gradual increase of the euro trade effect for the 1998 - 2002-time frame. In other words, a statistically significant correlation coefficient is first obtained in 1998, and then gradually increased in level and significance by 2002.
One possible explanation lies in the fact that both currency unions and federal trade arrangements are likely to create significant and positive trade effects even before they are actually created. This makes sense if it is considered the "first-come-first-take advantage": once the negotiations have been completed, if businesspeople feel a new market opportunity, it is normal to react quickly to try to gain a competitive advantage.
The above-mentioned authors estimate an increase in the percentage euro trade effect of 6% for EU-15 between 1992-2002, after introducing country-specific fixed effects in the gravitational equation. These results were subsequently updated by Jeffrey Frankel (2008). He found that, although the euro trade effect is statistically significant in the period 2003-2006, the coefficients

of interest gradually lose the previous upward trend. The coefficients estimated for the currency union were estimated at 0.16 and 0.13 for the years 2001 and 2002 respectively, after which they were stagnated by 2006.

Prior to Frankel (2008), a first update of the analytical results reached by Micco, A., Stein, E. and Ordoñez (2003), was conducted by Berger and Nitsch (2008). These analysts reviewed and completed the data used in Micco, Stein, and Ordoñez (2003) adding information about the year 2003. It could be noted that, as the analytical period is extended, and the statistical information is updated, the magnitude of the euro trade effect increases significantly.

Another critical examination of the estimates from Micco, Stein, and Ordoñez (2003) can be found in a study by Gomes et al. (2006). These analysts take into consideration a longer time frame, namely 1980-2003, and identify another long-term factor (besides the euro trade effect) that determines the changes that have occurred at the level of bilateral trade between member states participating in a currency union. From these studies it can be deduced that Micco, Stein, and Ordoñez (2003) did not actually identify the effects of the common currency on trade, but rather they observed an increase in the trade flows over the period under review without clearly revealing whether this positive evolution was really the effect of the Euro Zone and not generated by other factors that influenced the evolution of the European economy during that period.

An almost similar opinion on this vulnerability attributable to the abovementioned authors is also found in Baldwin and Taglioni (2006), Bun and Klaassen (2007) and Berger and Nitsch (2008), which confirm the conclusion we have drawn.

The work developed by Baldwin and Taglioni (2006) can be considered an emblematic work for the insistence with which its authors lean on some of the specific aspects that arise in the process of using the gravitational equation. They believe that the term identified by Anderson and van Wincoop (2003) known as multilateral trade resistance and the influence of cultural and geographical distance, should vary over time. Unfortunately, the same authors confirm the fact that the fixed effects for the pairs of countries analyzed show many effects on transaction costs (including the effect of the euro), so that when entering parameters that vary over time, concurrently for the destination country, the origin countries and the pairs of countries, the effect of the euro on trade becomes negative and unreasonably high.

Another perspective we consider relevant to the euro trade effect phenomenon is what we find in the work of Flam and Nordstrom (2003). We have reason to argue that this study contains one of the most valuable analyses that has been done so far in the sense that the authors use a database that has far less methodological deficiencies than those used in the studies previously analyzed.

This paper, which we regard as an important analytical benchmark, avoids one of the errors related to the econometric model used (metaphorically labeled as the silver mistake) by using unidirectional bilateral flows instead of the average export and bilateral imports, as suggested by Anderson (1979). It also avoids the main reported methodological error (found in the literature in its metaphorical version as the golden mistake) as well as the bulk of the problems generated by the omitted variables by including fixed effects for each pair of countries.

An important analysis from Flam and Nordstrom (2003) is based on annual data panels for 10 countries using the euro as a treated group and 10 non-euro countries (of which 5 are European) as a control group. In doing so, the said authors estimate a euro trade effect of 15% among the Euro Zone members for the whole period until 2002.

The euro trade effect drops to 8% when analyzing trade between countries that use the euro with countries that do not use the euro as compared to trade between countries that do not use the euro.

To respond to the challenges stemming from the sensitivity of the process of establishing a causal relationship between the functioning of a monetary union and the evolution of trade, the effects of the euro on the volume of annual trade are estimated to yield positive and statistically significant results since 1998. If we look closely at the dynamics of the euro trade effect (both as an aggregate index and as a percentage), we can see a strong causal relationship between the advancement of the monetary integration process at European level and the dynamics of bilateral trade within participating countries to this monetary integration experiment.

In Baldwin, Skudelny and Taglioni (2005), the data is grouped in longitudinal sections, so they get the answer to the following question: *do countries that belong to the same monetary union have grater bilateral trade than the rest of the countries?*

If we look at things from such a perspective, the estimated results can be divergent with those that were obtained in the panel-based studies, studies that answer this question: *are countries trading more when adhering to a monetary union?*

Baldwin, Skudelny and Taglioni (2005) estimated a range of coefficients ranging between 19% and 112% for intra - Euro Zone trade and between 22% and 24% for trade between Euro Zone countries and non -Euro Zone countries.

Other interesting papers in this field are: Barr et al. (2003) - authors use quarterly panel data up to the first quarter of 2002 for 11 countries using the euro to record their economic flows and their trade and six European countries that do not use the euro and they estimate a Rose effect for the euro of 29%; de Nardis and Vicarelli (2003) - using panel data over a shorter period of time they estimated a Rose effect of 6% when comparing the trade of countries using the euro with the rest of the cases; Berthou and Fontagné (2008) - data on the exports of all French firms between 1999-2002 resulting in an euro trade effect on the French trade of 19% compared to trade with countries that do not use the euro; Brouwer et al. (2008) – analyzed the effect of the euro on trade and FDI for 10 EU countries if they joined the Euro Zone.

All these previous works proved to be extremely useful for our research as they helped us identify those optimal estimation techniques and configure the appropriate methodological architecture for accurately using the gravitational equation in a superior form, borrowing what is recommended and what has proven to be appropriate.

Methodology and results

This section is dedicated to the EU-15-member countries, the most homogeneous sample analyzed in this paper, for the relevant time periods to be mentioned below. The results for the EU 15 are presented in Table 2, below, using a gravitational equation that can be described as follows:

$$\ln TE_{ijt} = \beta_0 + \beta_1 \ln PGDP_{ijt} + \beta_2 \ln PGDPPC_{ijt} + \beta_3 CU_t + \beta_4 FTA_t + \beta_5 EXRATEVOL_t + \beta_6 BORDER$$
$$\beta_7 \ln DISTANCE + \beta_8 COM\_LANG + YEARDUMMIES \quad (1)$$

A detailed explanation of these variables is included in Table 1, below.

Table 1. Explanations of the variables included in equation (1)

TE_{ijt} - Nominal exports from country *i* to country *j* measured in US dollars deflated by US CPI
$PGDP_{ijt}$ - The product of the two countries' nominal GDPs in constant 2000 US dollars
$PGDPPC_{ijt}$ - The product of the two countries' nominal GDP per capita in constant 2000 US dollars
CU_t - Binary variable equal to 1 if country *i* and country *j* use the same currency.
FTA_t - Binary variable equal to 1 if country *i* and country *j* have a bilateral free trade agreement
$EXRATEVOL_t$ - Exchange rate volatility between country *i* and country *j* measured as the standard deviation of the monthly first differences of the natural log of the bilateral exchange rate in the five years preceding year *t*
$BORDER$ - Binary variable which equals 1 if country *i* and country *j* share a land border
$DISTANCE$ - Distance measured in kilometers between country *i* and country *j*
COM_LANG - Binary variable which equals 1 if country *i* and country *j* have a common official language

Source: authors' own interpretations.

The originality we bring is derived from the significantly higher number of observations related to the treated group (37%) for the period 1993 - 2015. We included 15 countries in the treated group and 3 countries in the control group: Denmark, Sweden and the UK. For the post-2004 period there are only 15 EU countries and 12 Euro Zone states. Unlike the full database for all 182 countries, this sample is 100% balanced and there are no missing values, generating for the longest period (1993-2015) a total of 57,960 complete observations.

We have estimated a euro trade effect (often referred to as the euro Rose effect) for the entire period of 0.146, which implies a 15.7% percentage of trade flows generated due to monetary integration. It is also worth mentioning that, for the most relevant period (1993-2004), the effect of creating trade due to monetary integration is 23.5%. The last two columns demonstrate that, by introducing country-specific and pairs of country-specific fixed effects, the trade-related effect due to monetary integration for the EU 15 drops to 0.098 and 0.059 (a 10.3% respectively 6.1%). Very interesting to note, through this exercise, is that when the 15 members of the sample are the only members of the EU (1993-2004), the effect is much greater. However, the euro Rose effect for the 15 members decreases significantly when new members join the EU and the EMU. This may be justified by the fact that the new members of the EMU, whose euro trade effect is not surprised in this exercise, are sufficiently attractive to the 15 members that the euro Rose effect between them and the new members is much higher than the effect of creating trade within the EU15.

Table 2. European Roses – Eu 15 sample

Estimation Techniques	OLS 1993-2015	OLS 1993-2004	OLS 1993 - 2007	Fixed effects 1993 - 2015	
				Country	Country pair
GDP	0.897***	0.921***	0.954***	1.067***	0.931***
	(0.003)	(0.016)	(0.015)	(0.005)	(0.003)
GDP/capita	0.123***	0.205***	0.124***	0.654	0.114***
	(0.004)	(0.025)	(0.025)	(0.013)	(0.005)
CU	**0.146*** **	**0.211*** **	**0.051** **	**0.098** **	**0.059*** **
	(0.026)	(0.041)	(0.025)	(0.034)	(0.018)
FTA	0.116***	0.003	0.006	0.008	0.004
	(0.038)	(0.011)	(0.022)	(0.030)	(0.015)
ExRate_Vol	0.213***	-0.269	-0.395	-1.343**	0.074
	(0.670)	(0.226)	(0.268)	(0.533)	(0.085)
BORDER	0.086***	0.133	0.042		
	(0.030)	(0.142)	(0.149)		
DISTANCE	-0.969***	-1.063***	-1.135***		
	(0.008)	(0.043)	(0.038)		
Com_lang	1.33***	0.528***	0.775***		
	(0.025)	(0.157)	(0.137)		
Euro Rose Effect (%)	**15.7%**	**23.5%**	**5.2%**	**10.3%**	**6.1%**
No. obs.	57,960	30,240	37,800	57,960	57,960
No. CU=1 (%)	37%	30%	37%	37%	37%
R^2	0.86	0.86	0.86	0.84	0.88

** significant at 10%*
*** significant at 5%*
****significant at 1%*
Note: Robust standard errors in parentheses
Constant terms as well as year dummies are not reported

Source: authors' own calculations.

To verify this reasoning, we have run the same regressions including post-2004 Euro Zone accession waves. Thus, we proceeded to a further verification of the extent to which the EMU trade effect requires time to reach the maximum potential by choosing relevant periods with various time intervals.

The specific situation for the EU 25 has been analyzed for a 23-year time horizon (1993-2015), using 165,600 observations, of which 16% correspond to the treated group. The results obtained using equation (13) are summarized in Table 3.

The distance factor is large enough that the omission of the term relative price issue generates serious repercussions. As a result, the inclusion of binary variables for each pair of countries is also essential for this sample.

In Table 3 it can be noticed that the trade-induced effect of countries' participation in the EU-25 monetary union during the period 1993-2015 is well below that of the EU-15 for the same period of around 11.5%. When fixed effects apply to country pairs, the effect is reduced to only 5% and loses its statistical significance.

Also, from Table 3, the last three columns, it can be noticed that the euro trade effect is even greater as the time intervals are longer. The effect achieved for the 5-year interval increases from 3% to almost 5% and for the 10-year interval, the trade creation effect is more than 9%.

Table 3. European roses – EU 25 sample

Estimation Techniques	**1993-2015**	**Fixed effects – country pair**			
		1993-2015	**2-year intervals 1993 - 2015**	**5-year intervals 1995 - 2015**	**10-year intervals 1995 - 2015**
GDP	0.879*** (0.007)	-1.746*** (0.151)	-1.896*** (0.214)	-1.912*** (0.305)	-1.953*** (0.376)
GDP/capita	0.377*** (0.025)	3.08*** (0.142)	3.127*** (0.2)	3.366*** (0.292)	3.311*** (0.363)
CU	**0.108*** (0.023)**	**0.049*** (0.011)**	**0.032** (0.019)**	**0.047 (0.034)**	**0.087* (0.049)**
FTA	-0.294*** (0.032)	0.245*** (0.025)	0.239*** (0.038)	0.23*** (0.055)	0.347*** (0.075)
ExRate_Vol	-0.017*** (0.006)	-0.016*** (0.003)	-0.015*** (0.004)	0.002 (0.006)	-0.014 (0.009)
BORDER	0.427*** (0.039)				
DISTANCE	-1.017*** (0.013)				
Com_lang	0.799*** (0.046)				
Euro Rose Effect (%)	**11.5%**	**5%**	**3%**	**4.8%**	**9.1%**
No. obs.	165,600	165,600	86,400	36,000	21,600
No. CU=1 (%)	16%	16%	16.2%	16.9%	14.7%
R^2	0.82	0.35	0.38	0.51	0.61

** significant at 10%*
*** significant at 5%*
****significant at 1%*
Note: Robust standard errors in parentheses
Constant terms as well as year dummies are not reported

Source: authors' own calculations.

Since we considered the 1993-2015 period to be a profoundly asymmetric one, for the EU-15 sample, the period was reduced unhindered at 1993-2004, with 6 years of pre-euro and 6 years post-euro and for the EU-27 sample we selected four years prior to the adoption of the euro and 4 years after the adoption of the euro at intervals of 5 years each: 1980, 1985, 1990, 1995 and 2000, 2005, 2010, 2015.

The 27 countries generate 351 pairs of countries involved in bilateral trade. The data set consists of eight years, with monthly frequency, generating 67,392 complete observations.

Table 4. European Roses – EU 27 sample

Estimation Techniques	OLS	Fixed effects - country	Fixed effects – country pair
GDP	0.843***	0.933***	0.939***
	(0.003)	(0.003)	(0.003)
GDP/capita	0.090***	0.116***	0.125***
	(0.005)	(0.005)	(0.005)
CU	**0.134*** **	**0.059** **	**0.039**
	(0.051)	**(0.026)**	**(0.057)**
FTA	-0.085***	-0.089***	-0.092***
	(0.025)	(0.017)	(0.028)
ExRate_Vol	0.097	-0.979***	-1.182***
	(0.068)	(0.072)	(0.059)
BORDER	0.212***	0.359***	0.362***
	(0.039)	(0.035)	(0.046)
DISTANCE	-1.218***	-1.099***	-1.095***
	(0.007)	(0.008)	(0.008)
Com_lang	0.842***	0.973***	0.949***
	(0.030)	(0.030)	(0.033)
Euro Rose Effect (%)	**14.33%**	**6.10%**	**4.00%**
No. obs.	67.392	67.392	67.392
No. CU=1 (%)	15%	15%	15%
R^2	0.86	0.85	0.86

** significant at 10%*
*** significant at 5%*
****significant at 1%*
Note: Robust standard errors in parentheses
Constant terms as well as year dummies are not reported

Source: authors' own calculations.

The first column of Table 4. reproduces the estimated coefficients when using a conventional gravitational equation for eight years at 5-year intervals throughout the 1980-2015 period using equation (1).

As can be seen from Table 4, the estimated coefficients are consistent with what is standard in the literature, being statistically significant and economically reasonable. There is only one exception, namely that the exchange rate volatility coefficient is positive in the first OLS regression.

Even if the EU27 is a homogeneous sample, it is recommended to check for unobservable factors specific to each country and pairs of countries that could distort the results. Therefore, Table 4. shows the results for three different types of estimation techniques. The coefficient estimated

by the OLS regression of the CU binary variable shows a Euro-Rose effect of 14.33% and is statistically significant.
After the introduction of country pair fixed effects, the euro trade effect falls to just 4% and completely loses its significance.

Conclusions

In our quest to best identify the euro Rose Effect, experimenting with as many samples and relevant time periods as possible - from the most homogeneous samples (EU 15) with shorter periods, to less homogeneous samples (EU 25, EU 27/28) but with longer periods of time – had a two folded purpose: firstly, identifying which is the sample that can be used to create the strongest control group in order to apply the difference in differences methodology in further analyses and, secondly, observing the evolution of the Euro-Rose effect over time, along with the enlargement of the EU and the Euro Zone, thus getting closer to the real euro Rose effect that is to be experienced by Romania when joining the Euro Zone.
The result is very clear and not at all surprising: with the inclusion of recent EU and Euro Zone accession waves (after 2004), the euro trade effect is drastically reduced.
Thus, when Romania and Bulgaria are also introduced into the EU sample (after 2007), the estimated Rose effect for the euro recorded the lowest values. This confirms the view that the euro trade effect has been "consumed" by the first countries, and the latest states that will join the Eurozone can benefit only from the "last remnants" of this effect.
However, at this stage of integration, it cannot be ruled out that, on the contrary, the effect is gradually diminishing with the enlargement of the EU and the EMU, precisely because the last members of EMU have the status of members for very little time, and the currency union trade effect for these states has not reached the full potential.
The EU-25/27 samples are losing homogeneity in comparison to EU – 15 sample, but the evolution of the euro trade effect which considers the newest EU member states accession waves is likely to best answer the question raised in this paper: *how much is Romania expected to gain in terms of bilateral trade from joining the Euro Zone, if any?*
We conclude that Romania has very little to gain from joining the Euro Zone in terms of bilateral trade, at least in the first few years since we showed that the argument for the euro strengthens as time passes.

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