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THE EURO IMPACT  
ON FOREIGN DIRECT INVESTMENT  
IN EMU COUNTRIES

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## **Abstract**

This paper measures the Euro impact on FDI in Economic and Monetary Union countries, an issue of present concern, taking into account the recent trends of this indicator. This relation is tested with Fixed and Random Effects in a gravity model that includes a difference-in-difference estimator, over the period of 1994-2010. It is obtained a negative effect, the Euro decreasing on average inward FDI by 3,389.523 US dollars million in EMU member countries.

Moreover, the paper is approaching a Quantile Regression that provides results of the Euro effect on different percentages of the FDI sample. The outcome of this regression shows that the EMU impact is indeed different across various percentiles, even positive for the first 5% of the FDI data.

**Keywords:** Foreign Direct Investment, Euro, optimum currency area, Quantile regression.

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## 1. Introduction

This paper aims at identifying the Euro impact on Foreign Direct Investment in Economic and Monetary Union (EMU) countries, an issue of present concern. Foreign direct investment is one of the most important economic indicators to consider, taking into account its trend over the last twenty years, as FDI has grown faster than GDP and trade. Hence, the effect of adopting Euro upon FDI is of high importance, considering the economic relevance of this factor.

The moment of 1999, when eleven European Union member countries adopted the Euro, occupies an essential place in economic literature. Numerous studies have been conducted on the impact the Euro has on national economies, and one of the variables of great interest is foreign direct investment. The expected impact is a negative one as discussed in the Literature review part.

Adopting the Euro was seen as the next step to further economic integration in the European Union, and the initiative abounded in benefits for the countries joining the Euro zone, but in the same, the possible drawbacks were also mentioned and discussed.

Beyond its important reflection over the past events, this analysis provides important implications for the future, considering that EU countries currently not EMU members take into account joining the Euro zone. Henceforth, the results presented in this paper are important to decision makers with respect to adopting the Euro, and, as well, by those policy makers within the monetary union which may consider improving the common currency policy in order to fulfil the conditions of an optimal currency zone.

In spite of most articles that have studied the same topic and obtained a positive impact, the current paper intends to improve the analysis mainly by extending the time period analysed. Even though the economic literature abounds of studies on the current subject, most of them refer to short periods, very close to the moment of launching the Euro. Therefore, in this analysis the 1994-2010 period is used – according to data availability, considering that only over a longer term the real effects can be observed.

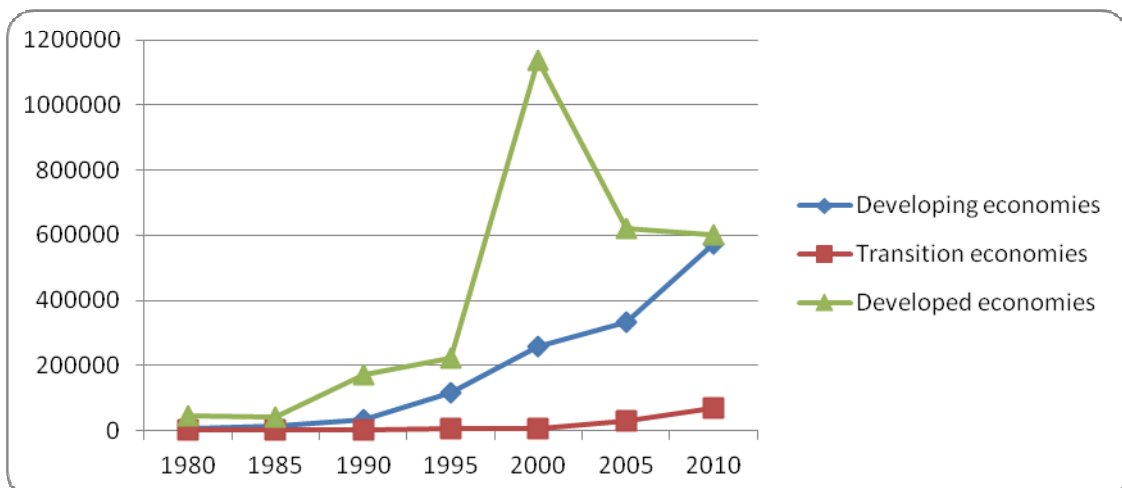
This paper analyses the impact of Euro using a panel data of unilateral FDI flows. A gravity model is regressed and significant factors empirically proven of influencing FDI, such as market size, determined by the GDP, EU membership, an exchange rate volatility measure, geographical distance between the country-pairs, common border etc., are used as explanatory variables. The methodology employed also comprises the difference-in-difference estimator tested in Fixed and Random effects models. Moreover, it is used a Quantile Regression in order to observe the Euro effects on different quantiles of both the lower and upper tail of the FDI sample.

## 2. Literature review

### 2.1. Theoretical framework

There have been more than thirteen years since the Euro was adopted by eleven EU members and the consequences can now be more properly assessed. EMU was not only a significant step to further economic integration accomplished by the European Union, but has also major effects in the business world where of great concern is the FDI. The following chart highlights its significance, as FDI has known a considerable increase especially in developed and emerging countries over the last decades.

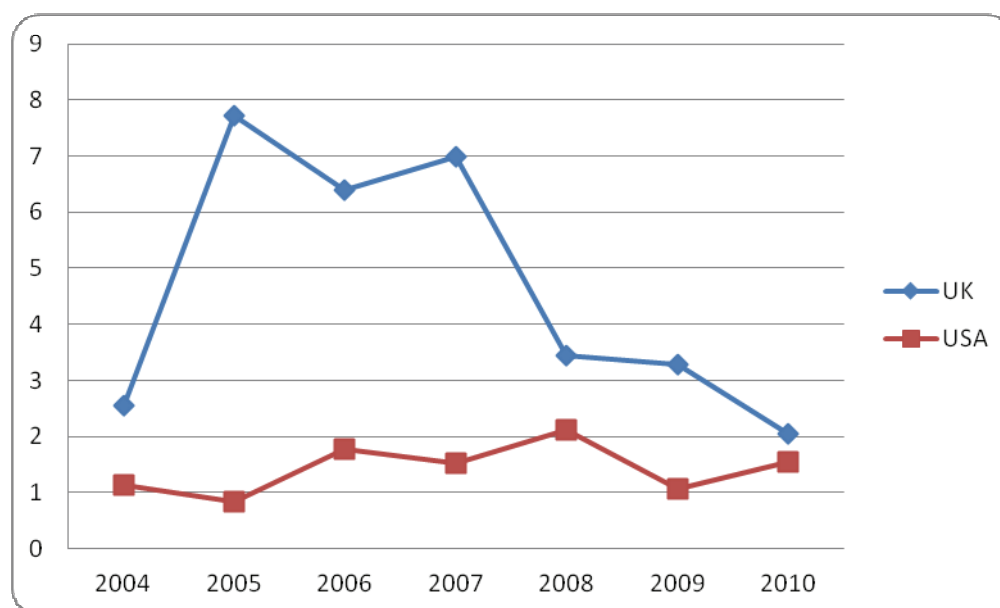
**Figure 2.1. FDI flows 1980-2010, world level**



Source: UNCTAD 2012. Retrieved from <http://unctadstat.unctad.org/TableViewer/tableView.aspx>.

Even though FDI has dropped in the case of developed economies in the last twenty years due to the economic downturns, developing and transition economies have faced a continuous rise. Nonetheless, it is expected that overall foreign direct investment will have an increasing trend over the next years (UNCTAD, “World Investment Report 2012: Towards a New Generation of Investment Policies”, 2012, pp. xi-xvi). Moreover, the economic significance of this indicator has increased exponentially since, for example, the economy of many countries, such as the United Kingdom, highly depends on foreign direct investments. The chart in **Figure 2.2** presents the FDI inflows as percentage of GDP from 2004 to 2010 for the UK and USA, for comparison:

**Figure 2.2. Inward FDI as percentage of GDP**



Source: UNCTAD 2012. Retrieved from: <http://unctadstat.unctad.org/TableViewer/tableView.aspx>.

Therefore, FDI is an important factor to consider by governments taking actions that may affect this variable and joining a common currency area is certainly such a decision.

The topic of Euro impact upon foreign direct investment is not only for historical interest; it presents significant considerations for the future. Existing members and adhering countries to the European Union take into account joining the Euro zone for the much promised benefits, discussed in the following pages. Consequently, the topic is of high interest and presents aspects to be considered from policies' perspective.

After the fulfilment of the Euro convergence criteria (Maastricht criteria), EU members join the EMU and, implicitly, cede their national monetary policy to the European Central Bank. The Maastricht criteria that must be fulfilled are:

- Price stability: the inflation rate should be no more than 1.5 percentage points above the rate for the three EU countries with the lowest inflation over the previous year (the three best performing economies);
- Budget deficit: generally must be less than 3% of the gross domestic product (GDP);
- Debt: the national debt should not exceed 60% of GDP, but a country with a higher level of debt can still adopt the Euro provided its debt level is falling steadily;

Interest rates: the long-term rate should be no more than two percentage points above the rate in the three best performing economies;

- Exchange rate stability: the national currency exchange rate should have fluctuated between certain pre-set margins for two years. (Europa - The EU at a glance - Eurojargon. Retrieved from: [http://europa.eu/abc/eurojargon/index\\_en.htm](http://europa.eu/abc/eurojargon/index_en.htm))

Once the criteria are met, the joining countries enter the common currency zone. The underlying theory, namely *the optimum currency area*, describes a geographical zone with one currency or several currencies pegged to each other. Accordingly, the currencies can fluctuate only against the rest of the world. Mundell, the first that published the theory in 1961, highlights the benefits of a single currency zone (Mundell, 1961, pp. 657-665):

- The minimization of exchange rate risk. However, this benefit is relatively small in EMU, less than half of 1 per cent of the Eurozone GDP.
- The elimination of transaction costs;
- The centralised control of unemployment and inflation, variables normally affected by the shifts in demand between country-pairs with different national currencies;
- The increased usefulness of money: a single currency zone increases price transparency, decreases price discrimination within the zone, leading to a general fostering of competition. Hence, a common currency area affects mainly the trade between the member-states of the zone, as also documented empirically (Flam and Nordström, 2006).

These theoretical benefits are all endorsed in the Euro zone and can also be added the lower interest rate implying cheaper mortgages.

Nonetheless, there have to be considered also the drawbacks of a single currency area in the case of the EU. Even before being adopted the common currency presented some concerns, among which can be mentioned the risk of one member country to leave the Euro zone or the entire union to collapse.

Those doubting of the *optimum currency area theory* underline the losses from a single monetary policy, leading to more important shortfalls than the promised benefits. The most significant concern is related to the asymmetric shocks, meaning shocks that affect only one member. For dealing with these shocks must be taken measures at the currency area level, applying them in countries that do not face the



problem, and also by countries that may not have the experience to deal with specific issues of one the members.

In the case of a common currency area in the EU, there are several shortcomings that may deter such a union to attain the benefits aimed for. Some of these drawbacks are:

- The language and cultural barriers that discourage mainly the labour mobility, an important factor of a successful *optimum currency area*. The single currency works for the United States because of labour mobility, common language, transferability of pensions etc., across a large geographical territory. The European countries have different economic performances and cultural background, and more difficulties arise from here in the path to economic integration.

- European Union countries are at different stages of the economic cycle that require different monetary and fiscal measures.

- One of the most cited disadvantages is the loss of national sovereignty.

- The costs incurred by changing to Euro, such as institutional expenses, and also the price convergence costs (Ireneusz Pszczółka, 2008, pp. 220-221, and “Special Report: Pros and cons, BBC News, 1997)

Relying on theory, it is by natural instinct to question if the Euro zone is an *optimal currency* one.

Firstly, the conditions of an *optimal currency zone* as listed by Mundell, (1961) are:

- Member countries achieved real convergence;
- They respond similarly to external economic shocks;
- Countries have sufficient flexibility in product markets and labour markets to deal with these shocks, which involve geographical mobility of labour and wage, and price flexibility in factor markets;
- Member countries are prepared to make use of fiscal transfers to flatten some of the regional economic imbalances within the currency union (Mundell 1961, pp. 657-665).

Taking into account the above conditions, it may be clearly stated that the Euro zone is not an *optimal currency area*. Firstly, there are important similarities within the core group of EU countries, referring here to Germany, France and the Netherlands, but the bordering nations present important structural differences, such as Ireland, Greece, Spain etc. Moreover, the responsiveness to interest rate changes varies across members, and there are significant barriers to labour mobility. There are still many aspects to be

improved in order for the Euro area to become an *optimal currency zone*, among which can be mentioned the response to asymmetric shocks and the elimination of the structural changes between the countries.

By contrast, there is a common currency area that has been working properly so far, namely the CFA franc, which is pegged against the Euro. Established in 1945, it represents the common currency area of fourteen African countries<sup>1</sup>, former French colonies. As well as the EU, the CFA zone is composed of countries with important differences in economic, political and cultural aspects. These dissimilarities are reflected by different values of GDP per capita, population density, geographical location and abundance of endowments (Gurtner, 1999, pp. 35).

Francois J. Gurtner (1999) conducts a study on the CFA compliance with the *optimum currency area* criteria. The researcher highlights that this system has a stable and convertible currency that, along with the pooling of reserves, have stimulated exchange rate and price stability. CFA members have successfully acquired the capital resources necessary for boosting the production. Moreover, member economies gained control and discipline over the balance of payments and budget decisions, and as such, African countries have not printed money whenever they had financial difficulties (Gurtner, 1999, p.33).

Fielding and Shields (2005) highlight other gains achieved by the CFA member states. The results of their study show that the common currency has increased the bilateral trade but only among the landlocked countries. Based on this outcome, the authors suggest that the capacity of a common currency to reduce trade barriers is conditioned by geographical characteristics (Fielding and Shields, 2005, p. 1068).

The same topic is studied by Xiaodan and Yoonbai (2009), who obtained that a common currency may lead to a stable low inflation if the currency is strongly pegged against another strong currency. Though this is the case of the CFA, the authors find that the members of this African currency union are affected by strong country-specific shocks, due to the high differences between the economies. The trade among the member countries and between CFA zone and outside countries has not grown significantly, and though the common currency has survived for so long, the economic convergence among the countries is still fragile. However, the CFA Franc zone “is one the most successful agreements among the many in sub-Saharan Africa” (Gurtner, 1999, pp. 33) and an example of an effective common currency area.

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<sup>1</sup> The CFA franc member countries are: Benin, Burkina Faso, Ivory Coast, Guinea Bissau, Mali, Niger, Senegal, Togo, Cameroon, Central African Republic, Chad, Republic of Congo, Equatorial Guinea, Gabon.

## 2.2. Empirical research: FDI and currency zones

*The optimum currency area* is a topic much discussed and analysed, especially in the academic arena. Most of the articles that studied this topic chose to analyse it in the EMU zone because it is the common currency area with the most important linkages with the world economy and with significant worldwide implications. Such a step taken in the EU does not affect only Europeans but the global economy taking into account the economic and financial power of the Euro countries.

Though it is expected a negative Euro effect on FDI, most of the articles that studied this relation found a positive impact. Even in such cases, the size of the impact differs, due to different methodologies, periods of time analysed, and countries chosen. Among these research papers is the one conducted by Sousa and Lochard, (2011) who used a gravity model with bilateral FDI and found that the introduction of Euro raised FDI stocks inside the Euro zone by approximately 31%. The impact is, according to the study, increasing over time and varies throughout the EMU member states. As such, the effect is higher for the less advanced Euro zone members. The authors of this paper justify this asymmetric effect by stating that the less developed EMU members would benefit more from the reduced transaction costs.

The methodology employed by the authors is following three steps through which the authors are constructing a gravity model aimed at explaining the outward FDI stocks from home to host countries. Firstly, they study how the payoff of a multinational company is related to a foreign investment project and how it is affected by monetary integration. Then, they study the influencing factors for a multinational to make an investment in a given country. Thirdly, according to the *discrete choice theory*, the authors determine how much the foreign investment represents out of the company's total investments.

Overall, the article sustains a positive impact of the Euro on FDI. However, the authors acknowledge that the positive effect may be caused by the Single Market Program (SMP), as also proved empirically by Flam and Nordström (2007). The findings of the latter paper suggest that actually EMU members have not received more investments than if they would have different currencies. As such, the authors assert that FDI was actually affected by the SMP, and not by being a member of the common currency area.

However, both papers highlight the overlap between Euro zone countries and countries participating in the Single Market Program that causes identification problems. When controlling for SMP, Sousa and Lochard (2011) still found a positive EMU effect.

The researchers obtained, as expected, a positive EU membership effect, even when controlling for the SMP. Accordingly, joining the European Union rises on average bilateral FDI by about 35%. Moreover, it is found that EMU countries have invested more in non-Euro members after 1999, which is only a one-way relationship – there is no increase in investment flows from non – euro countries to the Euro area.

The main contribution of this study is the finding according to which the studied effect varies across the Euro countries. The numbers revealed in this paper sustain that in the analysed period the intra-EMU FDI increased by 31% and the non-Euro countries benefited the most. The authors motivate their result by the reduction in transaction costs. However, as mentioned before, this has mainly affected trade and not FDI. As previously mentioned, there are aspects due to which actually the FDI inside the Euro zone has decreased and for which the EMU countries turned to investing into non-Euro states due to cheaper costs, the latter fact being documented also by Sousa and Lochard (2011).

One of the most cited articles on the current topic is “The Effect of the Euro on Foreign Direct Investment”, Pavlos Petroulas, (2004) which finds that Euro increases intra-EMU inward FDI by 17%, the FDI from Euro countries to non-members by 9%, and the FDI from non-members to EMU zone by 12%. The researcher analyses the equity and other capital estimation of FDI, on a panel data of 18 countries covering the 1992-2001 period.

The author discusses some strong arguments in favour of the common currency as it eliminates the exchange rate variability, and thus, it reduces uncertainty, stimulating international investment and trade. A common currency facilitates the business environment by easing the cost and pricing decision. The author concludes that the exchange rate stability along with reduced transaction costs, effects of the common currency, is an important factor that stimulates trade and investments, hence FDI (Petroulas, 2004, pp. 2).

The researcher’s main finding is that EMU had a significant positive impact on FDI for its members. Petroulas (2004) obtains a concentration of foreign investment, implying that for some countries the Euro effect on FDI is higher. Therefore, he finds that Germany and Belgium-Luxembourg are the central locations of EMU and that if these countries are withdrawn from the model the Euro effects disappear. However, if they are excluded only as receivers and then only as investors, the Euro positive impact upon FDI is significant. The author’s conclusion on this aspect is that Germany and Belgium-Luxembourg represent the hub for FDI flows in the Euro zone (Petroulas, 2004, pp. 19).

Petroulas (2004) also obtains an asymmetric effect, by finding that the Euro has a larger impact for the “big” countries than for “small” economies<sup>1</sup>. Moreover, within the Euro zone FDI originates mostly from the same group. The author concludes on the agglomeration tendencies topic that there is a partial concentration, since the “big” countries attract most of FDI, while the “small” economies receive slightly, but increasing, more exports. Though the topic of the EMU effect on trade is important, it is not the topic of the current paper and will not be discussed in detail here. However, the “Euro effects on the intensive and extensive margins of trade”, Harry Flam and Håkan Nordström (2006) and “The currency union effect on trade and the FDI channel”, José De Sousa and Julie Lochardy (2004), are two reference papers of research done in this domain. Worthy to notify is that both Petroulas (2004) and Sousa and Lochard (2011) have found an asymmetric effect. However, this impact is different in the two papers. In the first mentioned study is found a larger Euro effect for the “big” economies, whilst Sousa and Lochard (2011) obtained a higher increase in FDI in the less advanced Euro countries.

Even though Petroulas (2004) offers important insights into the topic, and represents one of the pioneering papers in the economic literature measuring the EMU impact on FDI, this study may be subject to flaws by analysing a short time period and very close to 1999, the year of launching the Euro. It only covers three years of Euro membership and the effects may be caused by other factors, and not exhaustively by the Euro itself. Such factors may include the announcement of the Euro, as Bevan and Estri (2000) prove that it positively and significantly affected FDI, the economic prosperity of the period, as well as the Single Market Program’s effect.

One of the articles that found no impact of the Euro on FDI is the one conducted by Flam and Nordström, (2007). Consistent with previous studies, the authors find a positive Euro effect on trade, which increased between the EMU countries by 28% and between Euro countries and non-Euro members by 12-14%.

The authors find no EMU impact on FDI, but a significantly large effect of the Single Market Program inside the Euro zone and between EMU members and non-Euro countries. In numbers, SMP has increased FDI by 85% among the SMP countries and by 45% between the zone and the outside countries. Therefore, Flam and Nordström (2007) obtain different results compared to previous studies, and the authors

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<sup>1</sup> The classification is done according to the market size. The “big” countries group includes Germany, France, Italy and Spain, while the rest of the sample studied is grouped as the “small” countries.

explain and empirically prove that the positive impact of Euro on FDI previously documented is caused by the failure to adequately control for the Single Market Program's effect.

An improvement of this paper's methodology compared to preceding studies is that it controls for business and GDP cyclical effects. It is an enhancement since these effects may be comprised by the Euro impact, taking into consideration the short time period previously studied.

Flam and Nordström (2007) discuss the Euro effects upon both trade and FDI, and highlight that the effect of the reduced transaction costs is ambiguous and depends on the type of FDI. In the case of dominant horizontal FDI, common currency affects positively trade and negatively the FDI. But, if horizontal FDI is export-type, then FDI and trade are complements, and the effect is the same for both. However, most of FDI is represented by Mergers and Acquisitions, and in this case the effects of adopting the Euro are ambiguous (Flam and Nordström, 2007, pp. 9-10).

The main conclusion of this article is that the Single Market Program and not the Euro has largely increased the FDI. Nevertheless, joining the EMU has a great impact on trade inside the Euro zone, as well as between the Euro and non-Euro countries. The researchers confirm their results by highlighting that the Euro variable captures also the SMP effects, if the latter is omitted in the gravity model, explaining in this way why previous studies found a positive Euro impact on FDI. The Single Market Program also increased FDI from the area to non-member countries, fact that the authors explain as being caused by the increased competitiveness due to the restructuring and consolidation imposed by this programme.

Using a more complex methodology, Dinga and Dingová, (2011) found that, generally, Euro has no significant impact on FDI. This paper analyses the EMU effect on a wider sample of 35 countries over a longer period of time than previously studied, namely the 1997-2008. Besides the methodology employed, another factor motivating the different result obtained in this paper may be considered not including Luxembourg in the sample. This is consistent with Petroulas (2004) findings, the author obtaining no Euro effect when Luxembourg, along with Germany and Belgium, are withdrawn from the study, being the central locations of FDI.

Dinga and Dingová, (2011) prove that testing the Euro effect on FDI on a larger time span may lead to different results by comparing the results for the period 1997-2003 (the period mostly studied by previous papers) to the period 1997-2008. The outcome sustains that the Euro effect is larger in the first years after the introduction of Euro (23.7% - 54.1%), effect that becomes insignificant in the long term.

The researchers obtained a significant Euro impact on FDI in the EU, EMU increasing the FDI by 14.3 to 42.5 per cent in the case of EU countries. By this finding, the researchers are stating that a common currency brings positive effects in a group of more integrated economies suggesting that through such economic linkages an optimum currency union can be achieved (Dinga and Dingová, 2011, pp. 14).

As most of the papers on the same topic, it is found that being an EU member rises FDI more than adopting the Euro, the EU membership effect varying between 55% and 166%.

Regarding the methodology, Dinga and Dingová (2011) are using a standard gravity model and are comparing results from the OLS estimation with results from the Tobit model. The OLS specification exhibits a positive Euro impact, but since such estimation is biased when considering time series, the authors perform a Tobit model and obtain an insignificant impact.

The flaws of this study are related to the methodology used, since a Tobit model left-censors the dependent variable, meaning that all the negative values of FDI are transformed into zero, and actually the model considers only the positive values. Moreover, the authors are using a semi-logarithmic function, which alters the sample size since it also ignores negative values.

On the other hand, the researchers are studying the Euro impact on FDI on a larger time span, which might be the reason for which they obtained different results than previous studies. Another reason for the different outcome obtained might be the use of a more complex econometric technique implied, namely propensity score matching.

Concluding the literature review, it is worthy to notify the outstanding evolution in the results obtained. While in the beginning of studying this topic only positive effects were obtained, the most recent papers have found insignificant and even no Euro impact on FDI. As such, by improving the methodology and studying on a long term, now data being available for this purpose, a more accurate response can be found.

### **3. Methodology**

#### **3.1. Objectives of the research**

Compared to existing literature, this paper aims at analysing the Euro effect on FDI on a longer period of time available today, namely from 1994 to 2010. As documented by Dinga and Dingová (2011), studying on an extended period can be observed the real effects of the EMU. Moreover, the current paper will take into account more explanatory variables than the discussed papers did in order to include as many as possible influencing factors of FDI. The choice of the independent variables is based on existing literature and is motivated in the Econometric model part.

The articles previously discussed approached a logarithmic form when testing the Euro effect on FDI. Because such an approach shortens the sample size – the logarithm form does not consider negative values and hence the results obtained are affected by the loss in data – this paper will abandon the literature methodology and will take into account the negative values as well.

Considering the impacts of a common currency area, such an initiative has important consequences on FDI in member countries. According to theoretical aspects and to the process of adopting the Euro, it is expected to obtain a negative impact on FDI. Firstly, the joining members of the Euro zone had to converge to the prices of Germany. The main consequence is that many countries faced increased cost of living by adopting the Euro, such as Greece and Spain. Furthermore, joining the Euro increased labour costs and, hence, companies are less willing to invest in these countries and divert to countries with lower labour costs<sup>1</sup>. Other factors explaining the expected negative effect of the Euro are the tighter regulation, convergence criteria and the emerging countries that have recently adhered to EU, providing investment incentives and holding great potential of growth.

#### **3.2. Econometric model**

In order to measure the Euro impact on FDI, a gravity model with Random Effects (RE) and Fixed Effects (FE), and a difference-in-difference estimator are used. The motivation for this model is the aim to

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<sup>1</sup> The increased in FDI flows to less advanced non-EMU countries is documented by Sousa and Lochard, (2011).



measure the effect of introducing the Euro while controlling for the time effects and country specific factors.

Accordingly, the estimated model is:

and country specific factors. Accordingly, the estimated model is:

$$FDI_{ij,t} = \beta(GDP_{i,t}, GDP_{j,t}, EU_{j,t}, PSI_{j,t}, CPI_{j,t}, REER_{j,t}, Dist_{ij,t}, openness_{j,t}, GDPgrowth_{j,t}, GDPcapita_{j,t}, commborder_{ij,t}, emu_{j,t})$$

Where:

- $FDI_{ij,t}$  represents the inward FDI flows from home, i, to host, j, countries.
- $GDP_{i,t}$  – The home country GDP, measured in US dollars at current prices, in millions.
- $GDP_{j,t}$  – The host country GDP, measured in US dollars at current prices, in millions.
- $EU_{j,t}$  – Dummy variable for EU membership, which takes the value 1 if the specific country is an EU member and 0 otherwise.
- $PSI_{j,t}$  – Political Stability Index assessed by the Centre for Systemic Peace. The higher the index value, the higher the political risk of the assessed country.
- $CPI_{j,t}$  – Corruption Perception Index, of a scale from 1 – highly corrupt, to 10 – very clean.
- $REER_{j,t}$  – Real Effective Exchange Rate Index. REER is an index of the trade weighted exchange rate between the host country and its trading partners, compared to the base year, 2005.
- $Dist_{ij,t}$  – Distance (in kilometres) between the capitals of the two countries.
- $openness_{j,t}$  – The openness of the economy measured by the sum of exports and imports divided by the country's GDP.
- $GDPgrowth_{j,t}$  – GDP growth rate, measured as the annual average growth rate.
- $GDPcapita_{j,t}$  – GDP per capita, measured in US dollars at current prices, in millions, divided by population.
- $commborder_{ij,t}$  – Dummy variable taking the value 1 if the two countries, i and j, have common border and 0 otherwise.
- $emu_{j,t}$  is the variable of interest; it is an interaction dummy variable (of time and EMU member status) taking the value 1 if the specific country adopted the Euro and 0 otherwise.

The choice of the model is based on existing literature, gravity equation being the model used by most papers dealing with FDI. It is considered that investments depend on the geographic distance between the parent and host countries, and also on indicators of both countries.

Gravity model is commonly used to analyse trade and its original form sustains that trade depends on the economic size of the two trade partners and on the cost of trade. The latter is determined mainly by the distance between the partner countries, and also on other related factors, such as common border, language and trade policies (Flam and Nordström, 2007).

The gravity model has been more often used in the last years when studying FDI, and recently gravity equations have been derived for both horizontal and vertical FDI, as well as arguments for the use of this model (Kleinert and Toubal, 2005). Another contributing factor for choosing this model is the discussed literature in the previous part. Most of the presented papers have used the gravity equation when assessing the Euro effect on FDI.

Regarding the estimated equation, the independent variables employed in the current paper are influencing factors of FDI as documented by many academic articles. The majority of the studies conducted on the present topic include in modelling the Euro effect on FDI the GDP of both parent and host countries, an exchange rate volatility measure, and factors that determine the attractiveness of the location.

Taking into consideration existing literature and economic theory, the current paper includes measures of market size – GDP of both origin and host countries, measure that illustrates the economic potential of the two country-pairs. The other independent variables are the Real Effective Exchange Rate index as a measure of exchange rate volatility, the distance between the capitals of the two countries, the dummy variable indicating common border, and some other variables determining the attractiveness of the host country since theoretically multinational enterprises are investing in another country if the expected returns overcome the cost incurred. Accordingly, it is employed GDP growth indicating the economic potential, openness of the economy, corruption index and a political stability index, all factors being of high interest when making a foreign investment decision.

Moreover, the EU membership is considered since it is empirically proven, for example by Dinga and Dingová, (2011) that being a member of the European Union increases FDI. GDP per capita is also included as it measures the average standard of living of nationals, and, hence, GDP per capita, compared to

GDP, takes into account the size of a nation. In view of that, “an increase in GDP per capita signifies national economic growth” (Madsen, 2006).

Regarding the methodology employed, a Random Effects model will be used to estimate the above equation. This model is preferable in a panel data since RE provides more efficient estimators as they yield better p-values. However, a Hausman test will be employed for checking the validity of the model, which compares the results of the RE model with those of the Fixed Effects one. The FE model always provides consistent estimators, yet the Random Effects model is only valid if the explanatory variables are not correlated with the individual effect, the unobservable factors that are constant over time. Hence, the results of the Random Effects model are compared with the ones obtained in a Fixed Effects model, under the following hypothesis:

$$H_0: \hat{\beta}_{FE} - \hat{\beta}_{RE} = 0$$

Where  $\hat{\beta}_{FE}$  is the estimated coefficient with Fixed Effects model and  $\hat{\beta}_{RE}$  is the estimated coefficient obtained through the Random Effects model. Therefore, if we accept the null hypothesis it means that statistically there is no significant difference between the estimation obtained, and Random Effects model is valid.

Although most empirical studies have adopted a logarithm form, the current paper will not make use of this form since the logarithm does not take into consideration the negative values. In the database used are many negative values for FDI and these must be considered if we want to observe the real effect of the Euro. By using a logarithm form the validity of the model is altered since it would include fewer values.

Besides the Fixed Effects and Random Effects models, it will be used Quantile Regression, a method that divides the dependent variable sample into percentiles and provides results of the explanatory variables effects on each of the percentages chosen. This model is used in order to observe if Euro has different effects among the FDI sample.

### 3.3. Data

With the aim of testing the EMU effects on Foreign Direct Investment, a sample covering the period 1994-2010 is compiled, which represents a longer period of time than previously studied. The panel data employed includes 15 countries, Euro zone members (Finland, France, Germany, Italy, Spain, the Netherlands, Portugal), and non-EMU countries (Denmark, Sweden, the United Kingdom, Canada, Japan, Norway, Switzerland and the United States of America). The classification of these states according to investing and receiving countries is presented in the **Appendix 2**, Table 3.1.

It is used the inward  $FDI_{ij,t}$  representing investment flows from home country,  $i$ , to host country,  $j$ , in period  $t$ <sup>1</sup>. Data for inward FDI by partner country was gathered from the OECD database. For most of the remaining variables data was gathered from UNCTAD, except Real Effective Exchange Rate index which is provided by the IMF, the Political Stability Index provided by the Centre for Systemic Peace and the Corruption Perception Index. A summary of the data is presented in the **Appendix 2**, Table 3.2.

The sample compiled aimed at covering most of the Euro zone according to data availability. Concerning this issue, there are EMU members that have not been included in the sample. For example, Greece is not part of the sample studied, though it is a member of the EMU, since not enough data exist for it in order to make a reliable analysis. The same reasoning applies to the latest Euro area members, such as Slovenia, Slovakia, Malta, and Cyprus.

Furthermore, unlike most of the previous papers, Luxembourg and Belgium are not included due to data availability. Hence, until 2001, Belgium and Luxembourg are taken together and since 2002 data is available separately. In order to avoid conflicting results, these two countries are not analysed. Also, these nations are not included since they are considered an FDI hub due to factors not related to the Euro, but to the tax haven status; Belgium and Luxembourg have among the lowest taxes in the EU.

This fact is documented not only by Petroulas who obtains a positive Euro effect on FDI only when Luxembourg, Belgium and Germany are considered too, but also in this current research. The second methodology employed, the Quantile Regression, shows that for the countries receiving the highest number of FDI, the Euro positively affected the foreign investment. However, this effect is relevant in only one

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<sup>1</sup> FDI flows are regarded by UNCTAD as “For associates and subsidiaries, FDI flows consist of the net sales of shares and loans (including non-cash acquisitions made against equipment, manufacturing rights, etc.) to the parent company plus the parent firm’s share of the affiliate’s reinvested earnings plus total net intra-company loans (short- and long-term) provided by the parent company.

model and for 5% of the studied sample. Hence, including Luxemburg and Belgium would lead to biased results. The choice of investing countries is made according to economic performances, since the selected countries are among the best performing economies worldwide. For example, USA (USD 406 billion) and Japan (USD 114 billion) were the first two investors last year. At the same time the countries chosen are among the major partners of European countries. Also, there are chosen as investing countries Euro members too since if the EMU was to function properly, according to theory, FDI would have to increase inside the currency union as well.

In conclusion, the sample covers 17 years (1994 - 2010) and 15 countries observed in pairs. The availability of observing data on a larger time span offers the advantage of obtaining more significant results as compared to preceding articles.

## 4. Results and interpretation

### 4.1. Fixed Effects and Random Effects estimations

In order to make inference on the database firstly are run tests for unit roots. A series with unit roots is called integrated of order one – I (1) – meaning that the process is non-stationary and, accordingly, the mean and variance are not constant over time. The terminology arises from the coefficient of such variable which is unity. Unit roots may lead to spurious regression in the case of time series.

It is required to firstly test for unit roots since on such series classical OLS inference cannot be applied. If a process is integrated of order one, there has to be made alterations in the form of the first difference, as the first difference of an I (1) process is I (0) – integrated of order 0, case in which classical OLS inference can be made (Elder and Kennedy, 2001, pp. 138).

In **Appendix 3**, Table 3.1, are presented the results of the Fisher test, the procedure used to test for unit roots. These results sustain that only the GDP of the host country has unit roots. Consequently, first difference is applied to this variable and inference can now be made on the regressions tested.

This paper uses as econometric methodology the Random effects and Fixed Effects models. Based on economic theory, the estimated model is:

$$\begin{aligned} FDI_{ij,t} = & \beta_0 + \beta_1 GDP_{i,t} + \beta_2 GDP_{j,t} + \beta_3 eu_j + \beta_4 PSI_{j,t} + \beta_5 CPI_{j,t} + \beta_6 REER_{j,t} \\ & + \beta_7 Distance_{ij,t} + \beta_8 openness_{j,t} + \beta_9 GDP\ growth_{j,t} + \beta_{10} GDP\ capita_{j,t} \\ & + \beta_{11} common\ border_{i,t} + \beta_{12} emu_{j,t} + \alpha_t + e_{it} \end{aligned}$$

Where  $\beta_0 - \beta_{12}$  are the population parameters.

We are interested in  $\beta_{12}$  which is the coefficient that measures the Euro impact on FDI.  $\alpha_t$  denotes the time effect which is captured by dummies by year.  $e_{it}$  represents the error term, varying with time.

Regarding the methodology implied, there are some clarifications needed to be made before presenting the results. Firstly, is tested if the model has a trend and as Table 3.2 in **Appendix 3** shows, time has no effect on FDI and hence, it is not included in the tested models.

Another point needed to be clarified regards the robustness of the model, since as exposed in the Econometric Model part of this paper, the Random Effects model's results need to be tested against the Fixed Effects ones. As such, **Appendix 3** presents for comparison the results of each specification in

Random Effects and Fixed Effects (Table 3.3), as well as the Hausman test results (Table 3.4), which tests the significance of the RE model.

There are estimated two specifications of the above model, both being tested with Fixed and Random effects. After comparing these two models' results (presented in **Appendix 3**), we observe that the difference between the coefficients is too large, and as Hausman test sustains, the Random effects model is not significant. Consequently, this estimation' results will not be discussed here. The results of the two models tested with Fixed Effects are presented in the following table:

**Table 4.1. Results of models estimated**

Dependent variable: $FDI_{j,t}$		
Variables	Model 1 Fixed Effects	Model 2 Fixed Effects
$Emu_{jt}$	-3501.311 (0.000)	-3389.523 (0.000)
$GDP_{j,t} D1^1$	-.0004772 (0.496)	-.0003936 (0.574)
$GDP_{i,t}$	.0004175 (0.000)	.0004212 (0.000)
$GDP\ growth_{j,t}$	50.9545 (0.752)	-
$REER_{j,t}$	122.1039 (0.001)	114.0596 (0.001)
$EU_{j,t}$	2322.852 (0.002)	2998.727 (0.000)
$PSI_{j,t}$	-1126.026 (0.077)	-875.5437 (0.123)
$Openess_{j,t}$	713.1767	566.7895

<sup>1</sup> First difference applied. The procedure is presented in **Appendix 4**.

<b>Dependent variable: <math>FDI_{ij,t}</math></b>		
<b>Variables</b>	<b>Model 1 Fixed Effects</b>	<b>Model 2 Fixed Effects</b>
	(0.180)	(0.230)
GDP capita <sub>j,t</sub>	-.0541016 (0.106)	-
CPI <sub>j,t</sub>	295.7415 (0.095)	-
Distance <sub>ij,t</sub>	-.3761059 (0.000)	-.3808136 (0.000)
Common border <sub>ij,t</sub>	1013.44 (0.048)	957.7558 (0.061)
Adjusted R <sup>2</sup> (%)	2.26	1.93
No. of obs.	2656	2656

Source: Author's calculations.

Note: p-value in parentheses. Level of confidence 95%.

Even though the Random Effects estimation is not statistically significant it can be observed that the sign and significance of variables are the same as in FE model, only the magnitude of the effect being different.

Accordingly, here are presented only the results obtained under the Fixed Effects specification. From the two estimations presented in the above table, it is chosen for inference only Model 2 since there are many insignificant variables in the first model. The specification of this second model is as follows:

$$FDI_{ij,t} = (EMU_{jt}, GDP_{i,t}, GDP_{j,t}(D1), REER_{j,t}, EU_{j,t}, PSI_{j,t}, openness_{j,t}, Dist_{ij,t}, commborder_{ij,t})$$

In order for the model to make economic sense, the variables with the highest insignificance were subtracted. In this view, the GDP of the host country was kept even though is not significant according to its p-value, due to its economic relevance. For the same reasoning, the Political Stability Index and Openness of



the economy - factors determining the attractiveness of the host country were retained. It was also maintained the variable common border that, along with the geographical distance between the two countries, are key variables of the gravity model as factors that determine the cost of investing.

Among the variables not included in the second model, it is observed that the GDP growth and the Corruption Perception Index have a large and positive effect, increasing the inward FDI by \$50.9545 million and, respectively, \$295.7415 million. Though not statistically significant, the effect of these two variables is important since it shows that the economic potential and the perceived corruption are factors that determine a higher flow of foreign investment.

Testing Model 2, it is obtained, as expected, a negative and large impact of Euro upon FDI, joining the Euro zone decreasing, on average, the inward foreign investments by \$3,389.523 million. Under this specification GDP of both host and origin country does not affect largely the foreign investment. Nevertheless, the Real Effective Exchange Rate of the host country has a significant and large impact upon FDI, increasing the flow of foreign investments by \$114.0596 million. This effect shows that the real effective currency appreciation sends positive signals to investors indicating a healthy economy.

Consistent with existing literature, EU membership increases the flow of foreign investments; in this paper is obtained an increase in FDI of \$2,998.727 million, for EU countries. Also, the openness of the economy and having common border positively influences FDI, on average by \$566.7895 million and by \$957.7558 million, respectively.

On the other hand, the Political Stability Index and the distance between the origin and the home country have a negative effect. As such, a higher political risk in a country negatively influences FDI, decreasing on average the foreign investments by \$875.5437 million. Likewise, the geographical distance impacts FDI negatively; if the distance between the country-pairs increases by one kilometre, FDI decreases on average by \$0.38 million, since a shorter geographical distance represents a strong FDI incentive, reducing costs.

The coefficient of determination of this model is 1.93%, this being the percentage by which the explanatory variables, taken together, explain the FDI dynamics. Under this specification the Adjusted  $R^2$  is lower than in Model 1, which is a normal outcome taking into account that this factor is also determined by the number of variables included. In view of this aspect, a flaw of the adjusted R square is that even though compared to normal R square it is corrected by the number of variables tested, it is still affected by the size

of the model. However, the coefficient of determination is not very high under any specification, meaning that the explanatory variables taken together explain only 1.93% or 2.26%, respectively, of FDI variation.

The second model tested shows that several control variables are insignificant when determining the Euro impact upon FDI inflows. As such, the host country GDP, PSI, the openness of the economy and having a common border are not statistically relevant.

In summary, what is of interest in the models tested is that in every specification, including in RE models, the Euro has negatively affected the inward FDI, meaning that countries joining EMU received less foreign investment compared to non-Euro countries. Likewise, though the significance of the other control variables differs, their sign is the same in all models. The volatility measure, the openness of the economy, EU membership and common border are attractiveness factors that positively determine the flow of inward foreign investment. On the other hand, political instability and a higher geographical distance decrease FDI.

#### ***4.2. Quantile regression***

In measuring the Euro effect on inward FDI it was used the classic Linear regression which is a statistic tool that models the linear relation between a dependent variable and a set of explanatory variables. The methodology presented in this subchapter, Quantile Regression, aims at providing a more detailed image of the effects of independent variables on their regressands, since it presents the results of regression on different percentiles of the response variable, on both its lower and upper tail.

With the purpose of explaining the methodology behind the Quantile regression, firstly it must be shortly presented the main condition of the Ordinary Least Squares method. OLS estimates the conditional mean,  $E(y|x)$ , meaning the expected value of  $y$ , response variable, conditioned on  $x$ , explanatory variable, by the following procedure:

$$\min_{\beta} \sum_{i=1}^n (y_i - \beta x_i)^2$$

Where  $\beta$  is the parameter that measures the  $x$  impact on  $y$ . Such a regression yields an on average result. However, the mean is sensitive to outliers, and Quantile regression provides an optimization to this disadvantage.

Quantile regression models the relation between the control variables and specific percentiles, called quantiles, of the explained variable (Despa 2007). This model divides the population into subgroups determined by the selected percentiles. Consequently, Quantile regression estimates the Conditional quantile,  $Q_y(\tau|x)$ , meaning the expected value of a certain percentage of  $y$  conditioned by  $x$ :

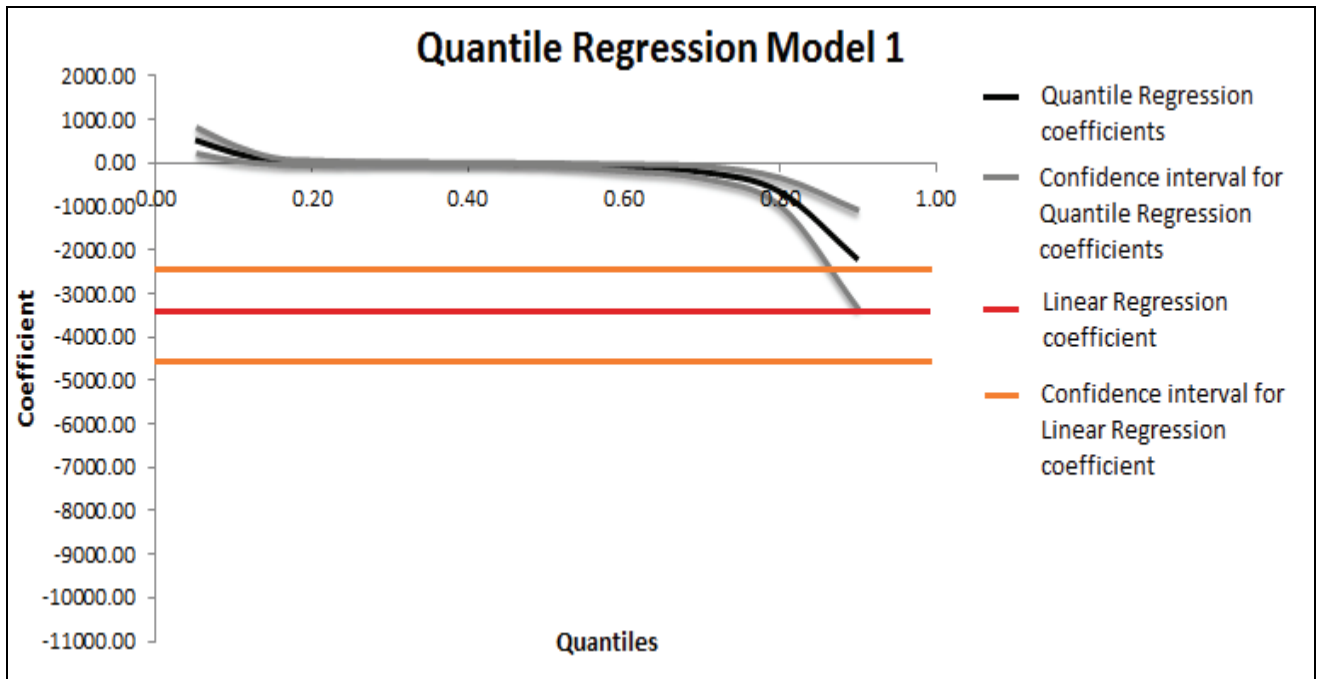
$$\min_{\beta} \sum_{i=1}^n \rho_{\tau}(y - \beta x)$$

Here  $\beta$  measures the impact upon a specified quantile of the dependent variable,  $y$ , at one unit change in the explanatory variable. This regression is highly useful when the sample has large differences between the minimum and maximum values, case in which the average value obtained through Linear Regression is affected by outliers.

Quantile regression results can be of high importance when assessing the Euro impact on inward FDI, since EMU membership may have different effects throughout the FDI population. Moreover, as illustrated in **Appendix 2**, Table 2.2, FDI data have a large difference between its extreme values, and a mean value may be affected by this gap.

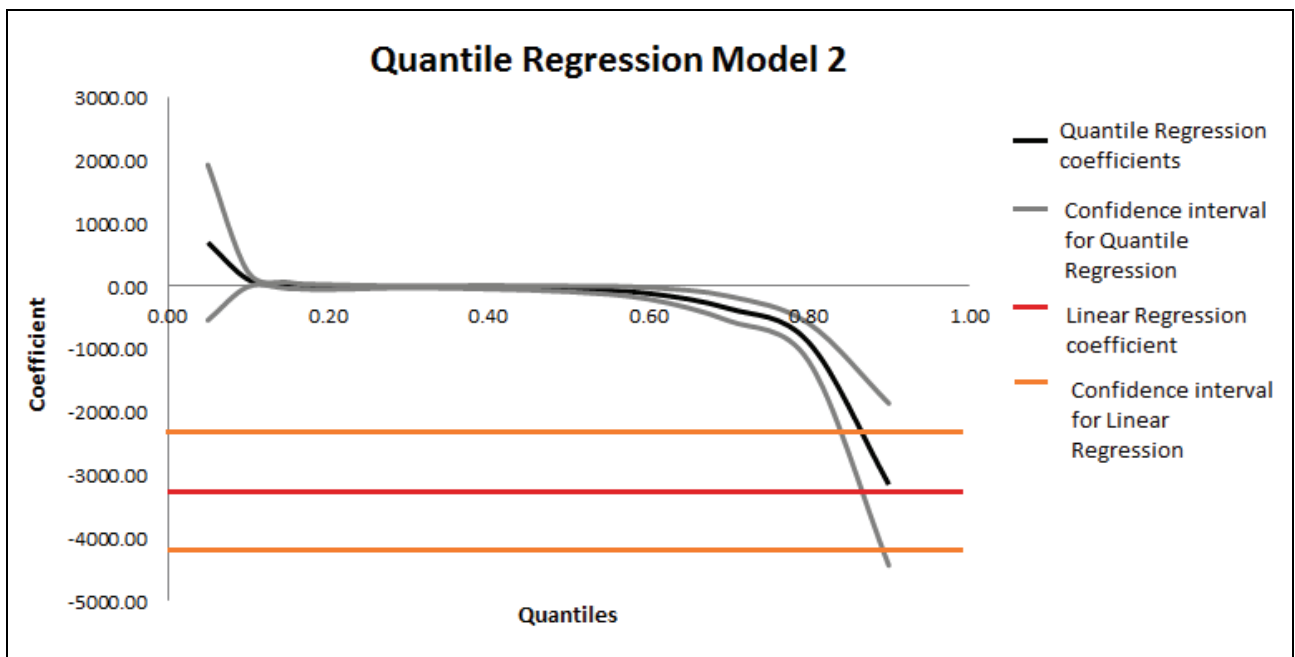
The following graphs present by comparison the estimated EMU coefficients through Quantile regression and the EMU estimators obtained in the two models run with Fixed Effects, previously presented.

Figure 4.1. *Quantile Regression results compared to OLS outcome – Model 1*



Source: Author's calculations.

Figure 4.2. *Quantile Regression results compared to OLS outcome – Model 2*



Source: Author's calculations.

The above graphs highlight that linear regression provides only the mean effect of the Euro on FDI with a large confidence interval. However, there may be heterogeneity in the responses of FDI to Euro, fact illustrated by the Quantile regression results, which have a higher level of confidence. It is, as such, observed how the Euro effect is different among the FDI data. For the first percentages studied, Euro has a positive effect on FDI, while for the median quantiles the impact is almost insignificant, being very close to 0. However, the negative effects predominate, since the majority of the FDI data is negatively influenced.

Consequently, when testing the EMU effects on inward FDI through Quantile regression there are obtained different outcomes among the FDI sample. The results of the most representative quantiles under the two specifications for the variable of interest EMU, are presented in the Table 5.2. The coefficients obtained through Fixed Effects model are also included, for comparison<sup>1</sup>. The results for the other independent variables under the same specifications are presented in **Appendix 3**, Table 3.5 and Table 3.6.

**Table 4.2 EMU results obtained through Quantile regression compared to Linear regression**

Dependent variable: $FDI_{i,t}$				
Coefficients obtained for $EMU_{i,t}$				
	Model 1		Model 2	
Quantiles	Quantile Regression	Linear regression (Fixed Effects)	Quantile Regression	Linear regression (Fixed Effects)
q=5%	526.5632 (0.001)	-3466.23 (0.000)	698.632 (0.268)	-3335.199 (0.000)
q=10%	229.6131 (0.012)		113.1521 (0.060)	
q=50%	-24.91477 (0.165)		-37.70536 (0.107)	
q=80%	-666.0284 (0.000)		-887.7353 (0.000)	
q=90%	-2224.86 (0.000)		-3147.113 (0.000)	

Source: Author's calculations.

<sup>1</sup> In all tested models for this part, including FE, it was subtracted the GDP of the host country since Quantile regression does not admit the use of the first difference.

As it can be observed, in both models for the first 5% and 10% of the FDI sample tested EMU has a positive effect, joining the Euro zone increasing inward FDI by \$526.5632 million and \$698.632 million, respectively. However, the Euro coefficient is statistically significant only for the 5<sup>th</sup> percentile and just in Model 1.

The following percentiles have negative effects, meaning that joining the Euro area has decreased the foreign investments flows over these quantiles of the FDI. As the Table 4.2 illustrates the size of the EMU impact starts by decreasing and after reaching negatives values it increases as the percentage of population rises. As such, for the first 50% adopting the Euro decreased FDI by \$24.91477million and, respectively by \$37.70536 million, while for the subgroup of 90% FDI decreased by \$2,224.86 million and by \$3,147.113 million under the second specification. As mentioned before, Quantile Regression divides the FDI sample into percentiles. Hence, the quantiles presented in the above results are percentages of the FDI data.

Consequently, Quantile Regression provides an optimized panorama of the Euro effect on FDI compared to linear regression. This model's main contribution is the positive effect obtained for the first 5% of the FDI data, suggesting that for a small percentage of the EMU members adopting the Euro has indeed increased the FDI.

## 5. Analysis and Discussion

This paper aimed at estimating the EMU effect on inward FDI, using a gravity model tested with Fixed and Random effects. However, it is obtained that the latter model is not significant under this paper's specification and only the Fixed Effects estimation is considered for inference. Based on existing literature and economic considerations, there are chosen determining variables of FDI, but, as empirically proven there are few such factors that are found statistically insignificant under this specification. These variables are the GDP growth, GDP per capita and the Corruption Perception Index, and have not been considered in the model chosen for inference. Though this second model includes insignificant covariates too, these variables (GDP of the home country, PSI, openness and common border) were kept as for the model to make economic sense.

Contrasting most of the existing literature, it is found that Euro negatively affected FDI in all specifications. This can be motivated mainly because most of academic studies have used a logarithmic function and this reduces the number of observations since it takes into account only the non-zero positive values. Moreover, previous studies analysed a shorter period of time, whilst this paper had the opportunity to measure the Euro effects on the long term. As Dinga and Dingová (2011) empirically proved, if this effect is studied soon after the Euro launching, it is found a positive Euro effect, which becomes insignificant when enlarging the time span studied on.

Another issue concerning the positive impact obtained in previous studies is related to the database used. Part of the discussed papers, such as Sousa and Lochard (2011) and Aristotelous and Fountas (2009), included Luxembourg in the sample. Since this country has a lower taxation system, being considered a tax haven, it attracts FDI mainly due to this factor, and, hence, the results obtained may be biased.

Consistent with literature, when testing the model in a Quantile Regression it is obtained a positive Euro effect for the first 5% of FDI data, and for the first 10% as well though not statistically significant. These results imply that for the countries with the highest FDI received, the Euro had a positive impact. The Quantile Regression outcome is consistent with the findings of Petroulas (2004), who sustains that the Euro area has a "hub" for FDI flows, formed by Germany and Belgium-Luxembourg, for which the Euro effects are much higher. The researcher obtains that if these countries are eliminated, the Euro impact becomes insignificant. Hence, there is a group of countries, holding significant attractiveness factors of FDI, for which

Euro facilitated the inflow of foreign investments. It is commonly accepted that FDI has a preference for larger markets due to the size of the market served and, usually, the good economic conditions. Through this model it is proven that EMU has different effects among the FDI data, showing that this outcome depends on the economic conditions of the host country.

However, for the rest of the percentages studied the Euro effect is negative. Furthermore, as soon as the effect becomes negative, the magnitude of the effect rises as the percentile tested increases. In conclusion, Quantile Regression shows that for the vast majority of EMU countries the Euro has decreased the FDI, whilst there are a small percentage of the members that attracted more foreign direct investments. Based on the CFA franc example, the positive Euro effect obtained for the small number of member countries may be explained by the existence of stronger economic linkages.

In line with existing literature, this paper has found the same effects of the covariates. Some of these explanatory variables are the EU membership, which increases FDI, the geographical difference having a negative effect, and generally, the attractiveness factors, such as the openness of the economy, which attracts FDI, or the political instability, which, as expected, has a negative impact on foreign investment.

The main conclusion of this paper is the negative and large Euro impact found, a result that confirms the theory. The dissimilarities among EMU members, mainly divided in two groups, the core one: Germany, France and the Netherlands (similar in economic terms), and the bordering countries, having structural differences from the first cluster, is one of the main causes of EMU not complying with the *optimum currency area* theory and, hence, not providing the promised benefits. These differences along with the high costs of joining the Euro area made the monetary union liable to deter investors. A meaningful aspect here is represented by the rigid German monetary policy which became the centre of decision making in the Euro area and the fiscal regulations EMU members had to adopt (Charles Wyplosz, 2006, pp. 213).

Regarding these dissimilarities, the sceptics of the Euro zone advocated that it would be difficult for a single currency to satisfy the various needs of the very different joining economies. This reasoning was supported by the slow growth of the EMU countries in its beginning (Dinga and Dingová, 2011). Wyplosz (2006) confirms this growth trend of the Euro economies holding responsible the convergence years (1992-1998), the weak performance of the joining members being even more obvious when compared to the growth of OECD countries.



Though the key realisation of the currency union is the reduction in transaction costs, which, theoretically, should cause a rise in FDI, it is empirically proven (Flam and Nordström, 2007) that these effects appear only on trade, Euro increasing exports inside the EMU area and also between the union and outside countries. The fall in transaction costs in the case of a common currency refers to eliminating uncertainty in what regards the pricing process, and, hence, pricing and costs decisions become easier (Aristotelous and Fountas, 2009, pp. 2).

Turning back to the underlying theory, namely the *optimum currency area*, Blanchard and Katz (1992) sustain that the main condition of this theory which the Euro area does not comply with is the labour market mobility. Moreover, the authors claim that this market is not able to respond to asymmetric shocks, an essential condition of an optimum currency union.

Most papers have motivated the results obtained when testing the relation between Euro and FDI based on the elimination of the currency risk. It is true that by adopting a common currency such risk would disappear and MNEs would choose a member country for a direct investment taking advantage of the exchange rate volatility elimination. However, there must be considered also the FDI incentives and the general economic conditions. As such, since EU membership had a large and significant impact on FDI, obtained even by the papers that got a positive Euro effect, the author of this paper would suggest that a corporation looking to invest in Europe would choose a non-Euro but EU member from Eastern Europe for the next FDI location.

A multinational would prefer Poland or Hungary to EMU countries, these states providing both the benefits of EU members and of emerging countries. These advantages are related to the EU regulation and the ascertainment that certain economic and development conditions are met, and mainly to the incentives promoted by such governments. Tax reductions, skilled but cheaper labour force, good infrastructure, reduced barriers to entry and the opening to new markets, and at the same time being held responsible to international organizations, are factors that attract more FDI in the Eastern European countries.

The author of this paper's reasoning is based on the fact that by introducing the Euro, countries faced an increase in the cost of living and most importantly for an investor, higher labour costs. In addition, most of academics consider that it is very difficult for only one institution to make appropriate decisions for all EMU members, countries with different economic background and culture. For example, the working habits and business customs are very different in Germany compared to Greece.

This deduction is sustained by two facts: the continuous increase in FDI to the less developed EU countries, non-Euro members, as documented by Flam and Nordström (2007) and by Petroulas (2004), and the significant rise in exports in the Euro zone, proved by all studies conducted on the topic. Consequently, MNEs have manifested an orientation towards the newly EU members, emerging countries, holding a great potential, while increasing the exports to the Euro zone.

To sum up on the factors motivating this paper's result, Christopher Taylor (2007) sustains that the increase in FDI in the Euro zone which lasted only a few years after the 1999 event, was mainly due to the mergers and acquisitions boom, which was the fortunate consequence of many other factors than the launching of the common currency.

In conclusion, several aspects support the result of this research paper, such as the convergence criteria, the increase in labour costs and the lack of mobility of this market. These considerations along with the EU enlargement to the Eastern European countries, emerging economies with good economic prospective, are factors that determine most MNEs to favour these latter countries for FDI over the EMU members. Meanwhile, the Euro increased the flow of exports into the area.

## 6. Conclusion

This paper analyses the Euro impact on inward FDI. Using a panel data of 15 countries covering the period of 1994-2010 it is modelled a gravity equation tested with Fixed Effects. Through this empirical tool is obtained that on average Euro decreased inward FDI by \$3,389.523 million.

Furthermore, this paper analyses the EMU – FDI relation in a Quantile Regression which illustrates that the monetary union has different effects throughout the FDI sample. Accordingly, it is obtained a positive influence for the first 5 per cent, joining the Euro zone increasing FDI in this subsample by \$526.5632 million. Nonetheless, the majority of percentages tested present negative effect.

The Quantile Regression outcome can be improved by analysing the factors leading to a positive impact for the respective quantile. Even though it represents a progress in the economic literature on this subject, discussing the various specific country factors is not the topic of the current paper; it was aimed to analyse the general impact and not a particular effect.

Further on, the analysis of this topic can be improved by controlling for the Single Market Program's effect. As proven empirically, SMP might have influenced more the FDI than the Euro and since now can be studied the effects on the long run, improved results can be obtained in this area too.

Additionally, other advancements in the analysis of this topic may be obtained by observing how the determining factors of FDI have been influenced by the Euro. This perspective can be analysed in relation with the increase of FDI allocated to the emerging countries in the last centuries, countries that have provided important investing incentives.

This topic has practical policy implications for existing EMU members that may consider improving the Euro policy as to achieve an optimum currency area according to theory, and hence realising the promised benefits. Likewise, it is a topic of interest for currently adhering countries to the EU and for actual EU members that at some point may get to satisfy the Maastricht criteria and would have to adopt the Euro.

Although the elimination of exchange rate risk leads to reduced costs, which should increase FDI, there are many other consequences of the Euro launching that actually discouraged investments. The main factors are the rise in living and labour costs owing to the price convergence. Such aspects are largely considered by investors when choosing the foreign location, since multinational enterprises are looking for cost advantages. Also, the loss of national sovereignty on monetary policy may be considered as a negative

signal for investors, especially in the case of countries with stable and strong monetary systems. These countries may now be affected by shocks encountered in other union members and they also have to adopt the necessary measures that otherwise would not be required.

Moreover, another significant factor to consider is represented by the newly EU members, emerging countries, which provide important incentives for MNEs. From 1999 onwards, FDI flows have been orientated towards these less developed EU members – non-Euro countries, while the exports to Euro area have increased exponentially. Looking at these trends, it can be summarized that the Euro negatively influenced FDI, leading to more disinvestments, but facilitated an increase in trade.

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## Annexes

### Appendix 1. FDI data

**Table 1.** Inward FDI of the first four countries, 2004-2010

<b>ECONOMY / YEAR</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
<b>United States</b>	135849.8	104809.3	237136	215952	306366	152892	228249
<b>China</b>	60630	72406	72715	83521	108312	95000	105735
<b>United Kingdom</b>	55963.24	176006.1	156185.9	196389.6	91489.17	71139.82	45908.47
<b>France</b>	32560.39	84948.76	71848.02	96221.38	64184.28	34026.86	33905.26

Source: UNCTAD 2012: <http://unctadstat.unctad.org/TableViewer/tableView.aspx>



## Appendix 2. Data presentation

**Table 2.1.** Sample countries divided by categories

Host countries	Home countries
Denmark	Canada
Finland	Denmark
France	Finland
Germany	France
Italy	Germany
Norway	Italy
Portugal	Japan
Spain	Norway
Sweden	Portugal
Switzerland	Spain
The Netherlands	Sweden
United Kingdom	Switzerland
	The Netherlands
	United Kingdom
	USA

Source: Author's calculations.

**Table 2.2.** Sample variables summarized

<b>Variable</b>	<b>No. of observations</b>	<b>Mean</b>	<b>Standard deviation</b>	<b>Minimum value</b>	<b>Maximum value</b>
<b>Year</b>	2856	2002	4.899837	1994	2010
<b>FDI</b>	2673	1834.88	9371.134	-61251	317519
<b>EMU</b>	2856	.4117647	.4922391	0	1
<b>GDP-host country</b>	2856	879504.1	874319.5	37185.67	3623688
<b>GDP-home country</b>	2856	1863501	2875868	37185.67	1.45e+07
<b>GDP growth</b>	2856	2.124113	2.206913	-8.354313	6.207329
<b>REER</b>	2856	98.54399	5.966	76.2573	119.2245
<b>EU</b>	2856	.8235294	.3812868	0	1
<b>PSI</b>	2856	.9519576	.3724714	-.3156396	1.662776
<b>Openness</b>	2856	.8634453	.5501089	.4096923	2.70763
<b>GDP per capita</b>	2856	33206.33	14160.28	9827.139	93366.8
<b>CPI</b>	2856	7.931771	1.480772	2.99	10
<b>Distance</b>	2856	2601.167	2610.484	343	11168
<b>Common border</b>	2856	.1544118	.3614063	0	1

Source: Author's calculations.

*Note:* there are missing observations for FDI, which in the OECD database are presented either as missing or confidential. Also, there are missing observations for the Political Stability Index data and for the Corruption Perception Index. Since these two variables are of less importance, there are estimated the missing values in STATA.

### Appendix 3. Results

**Table 3.1.** Results of the Fisher test

<b>Ho: unit root</b>	
<b>Variable tested</b>	<b>P-value</b>
<b>GDP home</b>	0.0000
<b>GDP host</b>	0.0390
<b>GDP host D1 (first difference)</b>	0.0000
<b>FDI</b>	0.0000
<b>GDP growth</b>	0.0000
<b>REER</b>	0.0002
<b>Openness</b>	0.0000
<b>GDP capita</b>	0.0000

Source: Author's calculations.

**Table 3.2.** Trend test results

<b>Dependent variable: <math>FDI_{t-1}</math></b>	
<b>Variable</b>	<b>Coefficient</b>
<b>Time</b>	-32.31266 (0.637)
<b>Adjusted R<sup>2</sup></b>	0.0003

Source: Author's calculations.

**Table 3.3.** Fixed Effects and Random Effects results

Dependent variable: $FDI_{ijt}$				
Variables	Model 1	Model 1	Model 2	Model 2
	Fixed Effects	Random Effects	Fixed Effects	Random Effects
$Emu_{jt}$	-3501.311 (0.000)	-1586.76 (0.000)	-3389.523 (0.000)	-2594.938 (0.000)
$GDP_{j,t}D1$	-.0004772 (0.496)	-.0003969 (0.574)	-.0003936 (0.574)	-.0003018 (0.668)
$GDP_{i,t}$	.0004175 (0.000)	.0004252 (0.000)	.0004212 (0.000)	.0004237 (0.000)
$GDP$ $growth_{j,t}$	50.9545 (0.752)	200.4691 (0.051)	-	-
$REER_{j,t}$	122.1039 (0.001)	57.43958 (0.091)	114.0596 (0.001)	79.17874 (0.014)
$EU_{j,t}$	2322.852 (0.002)	1970.255 (0.006)	2998.727 (0.000)	2740.015 (0.000)
$PSI_{j,t}$	-1126.026 (0.077)	-900.0645 (0.133)	-875.5437 (0.123)	-405.6034 (0.463)
$Openess_{j,t}$	713.1767 (0.180)	348.9223 (0.506)	566.7895 (0.230)	540.4156 (0.246)
$GDP\ capita_{j,t}$	-.0541016 (0.106)	-.0223976 (0.298)	-	-
$CPI_{j,t}$	295.7415 (0.095)	462.9916 (0.005)	-	-
$Distance_{ij,t}$	-.3761059 (0.000)	-.3839045 (0.000)	-.3808136 (0.000)	-.3871258 (0.000)

Dependent variable: $FDI_{ij,t}$				
Variables	Model 1	Model 1	Model 2	Model 2
	Fixed Effects	Random Effects	Fixed Effects	Random Effects
Common $border_{ij,t}$	1013.44 (0.048)	1025.583 (0.047)	957.7558 (0.061)	973.3308 (0.058)
Adjusted R <sup>2</sup> (%)	2.26	3.09	1.93	2.17
No. of obs.	2656	2656	2656	2656

Source: Author's calculations.

**Table 3.4.** Hausman tests results

Ho: difference in coefficients not systematic		
Variables	Model 1	Model 2
	FE – RE coefficients	FE – RE coefficients
$Emu_{jt}$	-1914.552	-794.5846
$GDP_{j,t}D1$	-.0000802	-.0000918
$GDP_{i,t}$	-7.68e-06	-2.55e-06
$GDP\ growth_{j,t}$	-149.5146	-
$REER_{j,t}$	64.66435	34.88084
$EU_{j,t}$	352.5966	258.7112
$PSI_{j,t}$	-225.9613	-469.9403
$Openess_{j,t}$	364.2544	26.37383
$GDP\ capita_{j,t}$	-.031704	-
$CPI_{j,t}$	-167.2501	-
$Distance_{ij,t}$	.0077986	.0063121

<b>Ho: difference in coefficients not systematic</b>		
<b>Variables</b>	<b>Model 1</b>	<b>Model 2</b>
	FE – RE coefficients	FE – RE coefficients
Common border <sub>ij,t</sub>	-12.14364	-15.575
p-value	0.000	0.000

Source: Author's calculations.

**Table 3.5.** Quantile regression results – Model 1

<b>Model 1</b>						
<b>Dependent variable: <i>FDI<sub>ij,t</sub></i></b>						
<b>Variable</b>	<b>Quantiles</b>					<b>Linear regression (Fixed Effects)</b>
	q=5%	q=10%	q=50%	q=80%	q=90%	
EMU <sub>j,t</sub>	526.5632 (0.001)	229.6131 (0.012)	-24.91477 (0.165)	-666.0284 (0.000)	-2224.86 (0.000)	-3466.237 (0.000)
GDP <sub>i,t</sub>	-.0003469 (0.089)	-.0000769 (0.401)	.0001817 (0.000)	.000758 (0.000)	.0010952 (0.000)	.0004231 (0.000)
GDP growth <sub>j,t</sub>	152.2665 (0.000)	76.53595 (0.020)	12.4374 (0.148)	-19.86184 (0.711)	59.48442 (0.493)	57.47223 (0.719)
REER <sub>j,t</sub>	74.21054 (0.004)	27.66811 (0.025)	-4.720661 (0.217)	-33.84654 (0.093)	-79.92405 (0.080)	122.1647 (0.001)
EU <sub>j,t</sub>	-167.0362 (0.678)	-40.83669 (0.619)	166.898 (0.006)	1440.097 (0.000)	2910.913 (0.001)	2300.087 (0.002)
PSI <sub>j,t</sub>	-212.2894 (0.403)	-28.78852 (0.865)	-173.4734 (0.001)	-610.223 (0.029)	-1062.326 (0.215)	-1093.654 (0.084)

<b>Model 1</b>						
<b>Dependent variable: <math>FDI_{ij,t}</math></b>						
	<b>Quantiles</b>					<b>Linear</b>
<b>Variable</b>	q=5%	q=10%	q=50%	q=80%	q=90%	<b>regression</b> <b>(Fixed</b> <b>Effects)</b>
Openness <sub>j,t</sub>	-1086.028 (0.194)	-665.4841 (0.022)	137.0759 (0.078)	549.8123 (0.134)	1147.018 (0.162)	749.115 (0.155)
GDP capita <sub>j,t</sub>	-.1162048 (0.000)	-.0494602 (0.000)	-.000389 (0.829)	.0235926 (0.001)	.0583563 (0.076)	-.0544757 (0.102)
CPI <sub>j,t</sub>	201.4799 (0.016)	81.93154 (0.023)	31.84272 (0.001)	309.3758 (0.000)	597.5549 (0.000)	284.8523 (0.105)
Distance <sub>ij,t</sub>	.0654211 (0.188)	.0259429 (0.344)	-.0911818 (0.000)	-.3832061 (0.000)	-.6143439 (0.000)	-.3840194 (0.000)
Common border <sub>ij,t</sub>	-16.83378 (0.961)	100.4739 (0.569)	700.4533 (0.000)	1785.504 (0.000)	2505.844 (0.001)	1013.028 (0.047)

Source: Author's calculations.

**Table 3.6.** Quantile regression results – Model 2

<b>Model 2</b>						
<b>Dependent variable: <math>FDI_{i,t}</math></b>						
	<b>Quantiles</b>					<b>Linear regression (Fixed Effects)</b>
<b>Variable</b>	q=5%	q=10%	q=50%	q=80%	q=90%	
EMU <sub>j,t</sub>	698.632 (0.268)	113.1521 (0.060)	-37.7053 (0.107)	-887.7353 (0.000)	-3147.113 (0.000)	-3335.199 (0.000)
GDP <sub>i,t</sub>	-0.0005005 (0.180)	-0.0001623 (0.146)	.0001756 (0.000)	.0007923 (0.000)	.0012048 (0.000)	.0004269 (0.000)
REER <sub>j,t</sub>	-17.04374 (0.321)	-8.657296 (0.054)	-3.89114 (0.145)	9.067982 (0.374)	-8.72736 (0.870)	113.204 (0.001)
EU <sub>j,t</sub>	-860.3579 (0.176)	-3.52806 (0.983)	174.0503 (0.001)	1368.141 (0.001)	2660.444 (0.000)	2966.122 (0.000)
PSI <sub>j,t</sub>	879.7027 (0.076)	385.9382 (0.008)	-132.387 (0.000)	-353.6442 (0.105)	-488.3726 (0.268)	-866.979 (0.125)
Openess <sub>j,t</sub>	-3961.141 (0.010)	-1435.467 (0.000)	192.348 (0.020)	1371.312 (0.003)	2582.901 (0.089)	588.0554 (0.209)
Distance <sub>ij,t</sub>	.1551833 (0.037)	.0617639 (0.014)	-.088817 (0.000)	-.3968898 (0.000)	-.7025889 (0.000)	-.3890825 (0.000)
Common border <sub>ij,t</sub>	154.6507 (0.791)	44.51507 (0.745)	680.2511 (0.000)	2116.909 (0.000)	3082.801 (0.000)	956.2852 (0.061)

Source: Author's calculations.



#### Appendix 4. First difference<sup>1</sup>

Generally, the First Difference estimator is used in Panel data in order to eliminate the unobserved fixed effect – time constant. As such, in a Panel data model we have:

$$y_{i,t} = \beta_0 + \beta_1 x_{i,t} + c_i + u_{i,t}$$

Where  $c_i$  is the time – constant part of the error term.

And:

$$y_{i,t-1} = \beta_0 + \beta_1 x_{i,t-1} + c_i + u_{i,t-1}$$

Then we apply First difference and the time – constant effect disappears:

$$\Delta y_{i,t} = \Delta \beta_1 x_{i,t} + \Delta u_{i,t}$$

Where:

$$\Delta y_{i,t} = y_{i,t} - y_{i,t-1}$$

In the case of unit roots First difference is applied only to the variable of interest.

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<sup>1</sup> Source: Wooldridge, 2005.