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# WHAT IS THE IMPACT OF CURRENCY UNIONS ON FDI FLOWS? EVIDENCE FROM EUROZONE COUNTRIES

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**Abstract**
This paper investigates the effect of EMU on inward FDI flows to the Eurozone using panel data from 22 OECD countries for the period 1973-2006. The empirical findings suggest that the EMU led to a statistically significant overall increase in inward FDI flows to countries that adopted the euro as their national currency. They also show that the EMU effect on inward FDI flows differs substantially across member countries.

**JEL Classification:** F15, F21, F36
**Keywords:** Currency Unions, Euro, EMU, FDI

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## Introduction

The impact of the formation of currency unions on trade volume has been a topic of considerable interest following the seminal work of Rose (2000). This, primarily, empirical literature has grown significantly and has focused to some extent on the effect of the launch of the euro on intra-Eurozone trade. The main conclusion reached by this literature is that currency unions have a positive and quite large effect on trade among the countries that adopted a common currency (Rose, 2000, 2001, Glick and Rose, 2002, Micco *et al*. 2003). In particular, Rose and Glick (2002, p. 1126) find that "bilateral trade approximately doubles/halves as a pair of countries forms/dissolves a currency union, *ceteris paribus*". Despite the growing interest in the effects of currency unions on trade volume, there has been, with some recent exceptions, a lack of attention to the effects of currency unions on FDI flows. This is despite the fact that FDI flows have grown recently at a much faster pace than trade flows. For instance, the growth rate of the FDI flows into the Eurozone from 1990-2006 was 469.6% whereas the growth rate of trade (exports plus imports) in the Eurozone for the same period was only 184.3%.

With that in mind, this paper attempts to contribute to the literature by examining the impact currency unions have on FDI flows in the context of the European Monetary Union (EMU). Specifically, it will investigate the effect of the introduction of the euro on inward FDI flows to the Eurozone, the group of countries that adopted it as their national currency.

Theoretical work on the effect of currency unions on FDI seems to be emerging slowly (Neary, 2007). Empirical work, on the other hand, has recently emerged and has mostly focused on the impact of the euro on FDI flows into the Eurozone[1]. This literature (Aristotelous, 2005; de Sousa and Lochard, 2004, 2006, Petroulas, 2007, Schiavo, 2007, Brouwer *et al*., 2008) points to a positive and significant effect. This seems to be a plausible result since a currency union may boost trade among its members via an increase in FDI flows. Indeed, the increase in inward FDI flows to the Eurozone may be behind the growth in intra-Eurozone trade flows documented in the empirical literature to date. Baldwin *et al*. (2008) provide a useful recent summary of the euro impact on trade and FDI in Europe.

The above-mentioned studies on the currency union-FDI nexus suffer from a number of weaknesses. First, they use a few years of data from the EMU period and hence cannot estimate accurately the effect of the EMU on FDI flows. Second, they investigate the overall effect of the EMU on FDI for the Eurozone and, hence, cannot determine whether this effect is widespread across Eurozone countries. This study

1. Wei and Choi (2002) focus on the effect of dollarization on bilateral FDI flows.

purports to fill these gaps in the literature using a number of econometric methodologies. The rest of the paper is structured as follows. Section 2 offers a review of the empirical literature. Section 3 outlines the estimated model. Section 4 discusses the methodology, the data and the results obtained from the empirical analysis. Finally, section 5 presents our conclusions.

## Literature Review

Increasing monetary integration leading to a common currency may affect FDI positively via a number of channels. First, a monetary union that eliminates exchange rate risk and makes price comparisons more transparent may facilitate goods competition across countries, thus making cross-border mergers and acquisitions more profitable (Neary, 2007). Second, a common currency eliminates uncertainty regarding price variables and makes easier the pricing decisions and cost calculations of firms. Third, a single currency represents a credible commitment to an irrevocable fixing of exchange rates and hence reduces transactions costs associated with international investment flows. The reduction in transactions costs promotes investment flows across borders and hence FDI. A US company, for example, that is already operating in the Eurozone has an incentive to further expand its investment activity as it now anticipates higher trade activity in the Eurozone and hence more sales. Therefore, the positive impact of a common currency on FDI flows goes beyond the elimination of exchange rate uncertainty arising from the common currency.

Most of the empirical work focuses on the effects of currency unions on trade. However, currency union formation may affect trade via its effect on FDI. Empirical evidence on the effect of monetary integration on FDI has recently emerged. Wei and Choi (2002) examine the effect of a currency board or complete dollarization on US FDI. They find the positive effect on US FDI can be as high as 185%. De Sousa and Lochard (2006) estimate a gravity model to test for the impact of EMU on FDI flows and stocks. The estimated equation controls for market size, transactions and production costs, exchange rate volatility, exchange rates, skilled-labor endowments and merger and acquisition determinants. The authors use data on 22 OECD countries for the period 1982-2002. The major findings are the following. First, EMU leads to an increase in euro-members (and non-members) FDI inside the euro area. In particular, EMU is estimated to have increased FDI stocks in the EMU countries by about 29%. Second, there is no evidence that the EMU has led to a decrease in FDI originating from Eurozone countries into non-Eurozone EU-member countries (Denmark, Sweden, and UK).

Aristotelous (2005) tests for the effect of EMU on US FDI flows into the Eurozone using a panel of 15 EU countries and data for 1966-2003. Using a model that includes supply and demand-related locational determinants of FDI, the paper finds that EMU had a positive and statistically significant effect on US FDI flows into the Eurozone. In

addition, there was no FDI diversion - meaning that there is no evidence for a decline in US FDI into the three countries that opted out of the single currency (UK, Denmark, and Sweden). Petroulas (2007) also examines the effect of EMU on inward FDI flows to the Eurozone. The study focuses on both inward FDI flows originating from other Eurozone countries and from non-Eurozone countries. The estimated increase in the former case is 16% and in the latter 8%. In the analysis, the author uses annual data from 1992-2001 for 18 developed countries.

Schiavo (2007) uses data from 25 developed countries for the period 1980-2001 to investigate the effect of EMU on FDI flows. Despite using only three years of data from the euro regime, he finds that EMU had a positive and significant effect on FDI flows. More recently, Brouwer *et al*. (2008) examine the likely trade and FDI effects of the 2004 EU enlargement in each of the ten countries that joined the EU in that year. Using a panel of 29 countries for the period 1990-2004, the authors find the EMU effect on FDI to be positive and in the range of 18.5-30% where the minimum effect applies for Poland and the maximum for Hungary.

This paper contributes to the empirical literature that relates EMU and FDI flows in three ways. First, we use a number of econometric methodologies (that include dynamic panel estimation) to estimate the effects of EMU on FDI flows. Second, we include data up to 2006, thus allowing a longer time scale of EMU data that is expected to provide more accurate estimates of the EMU impact on FDI flows. Third, our methodology allows for the determination of country effects on FDI in order to examine whether the impact of the euro on FDI is symmetric across Eurozone countries.

## The model

Numerous theories have been developed over the years to explain the determinants of FDI. These theories draw not only on different areas of economics such as industrial organization and economic geography, but also on corporate investment theory and strategic theory. UNCTAD, 1998, provides a good overview of these theories. In this paper we examine the impact of the euro on inward FDI to the Eurozone using a model of the determinants of FDI flows that is rooted in these theories. The estimated model is shown below:

$$FDI_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 GDPGR_{it} + \beta_3 RER_{it} + \beta_4 VOL_{it} + \beta_5 DIST_i + \beta_6 EU_{it} + \beta_7 EMU_{it} + e_{it} \quad (1)$$

where i refers to 22 host countries, t to the time period 1973-2006 and e is the error term. The regression's dependent variable, $FDI_{it,}$ is real total FDI inflows to host country i measured in US dollars. It is calculated by dividing inward FDI flows by the US GDP deflator.

$GDP_{it}$ is host-country i's real GDP measured in US dollars at constant 2000 prices and exchange rates and it captures the effect of market size on foreign investment.

$GDPGR_{it}$ is the growth rate of real GDP of country i. It accounts for the growth rate of market size in the host country that is expected, according to the acceleration principle, to affect positively FDI inflows. $RER_{it}$ stands for the host country's real effective exchange rate against its trading partners. It is the trade weighted nominal exchange rate between the host country and its trading partners adjusted by the CPI of the host country and its trading partners. An increase in the real exchange rate implies a real depreciation of the host country currency and hence an increase of relative wealth of foreign firms (compared to domestic firms) leading to a rise in foreign FDI inflows into country i. $VOL_{it}$ is the annualized month-to-month volatility of the trade-weighted real exchange rate measured in two different ways. We use the moving standard deviation of the logged real rate and the conditional variance of shocks to the exchange rate. In the second case, a GARCH model of the monthly real exchange rate is estimated and the estimated conditional variance is taken as a proxy of volatility. It is expected that the direction of the effect volatility would have on FDI is ambiguous. More volatility would expose firms involved in international trade to more uncertainty and hence would lead to substitution of FDI for trade flows; hence a positive effect of volatility on FDI (Harvey, 1989). In contrast, more volatility would expose firms to more uncertainty when investing abroad (for example, the size of profits in domestic currency terms would be more uncertain) and reduce FDI flows.

Another variable of interest is the distance in kilometers ($DIST_i$) between the capital of each host country and Frankfurt, considered in the literature as the industrial centre of the EU. The rationale for the incorporation of such a variable stems from the existence of locational externalities that arise from agglomeration economies in the EU. The closer a peripheral market is to the centre of industrial activity, the higher the positive externalities arising from this proximity and hence the more likely a foreign firm will wish to reap the benefits by investing in such a market. Hence, the sign of $\beta_5$ is expected to be negative. Equation (1) includes also two dummy variables. $EU_{it}$ is the EU membership dummy that takes the value of one when the host country i was a member of the EU and zero otherwise. It is included in order to test whether being an EU member implies a positive effect on inward FDI. Finally, the last independent variable included in the regression is $EMU_{it}$, the dummy variable that captures the impact of the creation of the EMU on inward FDI flows. It takes the value of one starting in the year host country i joined the euro. Hence, it is equal to one starting in 1999 for Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain. For Greece, which joined the Eurozone in 2001, it takes the value of one from that year till 2006. Finally, for the rest of the countries that are part of the sample, including the three EU-members that have not joined the euro (Denmark, Sweden, UK), the dummy takes the value of zero throughout our sample.

As the objective of the paper is to test for the impact of the euro on inward FDI in the Eurozone, our primary focus in the above estimated regression is on the coefficient $\beta_7$.

It is anticipated that this coefficient will be positive and statistically significant for the reasons outlined in the previous section. Recent evidence has concluded that currency unions tend to have a beneficial effect on trade volume (Rose, 2000, Glick and Rose, 2002, Micco *et al.*, 2003). Moreover, some evidence suggests that the effect of currency unions on trade may take place via their effect on FDI (de Sousa and Lochard, 2006). In other words, in anticipation of the positive effects on trade volume a currency union may bring to its members, a foreign company has a stronger incentive to expand its production activities (or set up new facilities to initiate a production activity) in the host country in order to reap the benefits of the boost in trade. Hence, the creation of a currency union tends to boost FDI flows into the Eurozone.

**Methodology, Data and empirical results**

(i) Methodology

Regression models that use pooled data have been traditionally estimated in three different ways: Pooled Least Squares (PLS), Fixed Effects (FE), and Random Effects (RE). PLS is the simplest estimation model. It assumes that the intercept and slope coefficients are the same for the different cross-sectional entities. It is commonly estimated to provide 'base-line' or 'benchmark' results. The FE estimation model allows for different intercepts for each cross-sectional entity and should be used when differences between the intercepts for the cross-sectional entities are considered constant over time, not random. The RE estimation model incorporates differences between cross-sectional entities by allowing the intercept to change, as in FE, but the amount of the change is random. It should be used when each entity in the cross-section data is chosen at random to represent a larger population. Because the cross-sectional entities in this paper were not chosen at random (they are all OECD member countries), the FE, and not the RE, is the appropriate technique to estimate equation (1).

In addition to the frequently used procedures discussed above, a Generalized Method of Moments (GMM) estimator along the lines suggested by Arellano and Bond (1991) and Arellano and Bover (1995) can also be used to estimate a panel equation such as equation (1). Arellano and Bond (1991) suggest an estimation procedure that uses first differenced data, whereas Arellano and Bover (1995) suggest removing individual effects from a panel equation using orthogonal deviations. These types of estimation procedures are commonly used in the literature to estimate dynamic panel data models. For a more detailed survey of the literature of GMM estimation and dynamic panel estimators, see Wooldridge (2002).

(ii) Data

We use panel data for 22 OECD countries[2] that cover the period 1973-2006. The start

2. The 22 OECD countries included in the study are the 15 European countries that were members of the EU when the euro was launched plus Australia, Canada, Japan, Korea, New Zealand, Norway, Switzerland, and USA. Please note that in the past FDI figures for Belgium and Luxemburg were combined into a single total; rather than lose valuable observations, this study treats Belgium and Luxemburg as if they were a single country.

of the sample period is dictated by the collapse of the Bretton Woods system and the beginning of the exchange rate float. The FDI data are taken from the World Investment Report (UNCTAD, 2007). The rest of the data are from the OECD (Main Economic Indicators) and International Financial Statistics CD-ROM. Monthly-frequency data are used in order to construct the proxies for exchange rate volatility.

(iii) Results

We estimate equation (1) for three sample periods: the full sample period 1973-2006 and two sub-sample periods (1979-2006 and 1990-2006). We do so in order to determine whether our findings are sensitive to the time period under consideration. The first sub-sample is motivated by the creation of the European Monetary System (EMS) in 1979. The second sub-sample is chosen on the basis that EMU, the name basically given to the process of harmonizing the economic and monetary policies of the EU members with a view to the introduction of euro on Jan. 1, 1999, began in July 1990.

To establish the robustness of our results, we also estimate equation (1) using a number of panel data estimation techniques. Table 1 reports the results of the baseline panel least squares estimation procedure. The baseline estimates obtain under the assumption that the intercept and slope coefficients are identical for the different cross-sectional entities. Table 2 reports the results of the fixed effects panel estimation. In this case, the estimated intercepts for the various cross-sectional entities are allowed to differ but the differences among them are taken to be constant and not random. Finally, Table 3 provides the estimates of two dynamic panel models.

According to the results reported in Tables 1-3, we derive the following conclusions. First, real GDP and the real GDP growth rate have a positive and very statistically significant impact on inward FDI in almost all cases, a result consistent with our expectations. Second, the effect of the real effective exchange rate on inward FDI is positive and significant in most cases. Hence, as expected, a real depreciation of the domestic currency leads to an increase in inward FDI flows. Third, exchange rate volatility measured by the moving standard deviation seems to have an ambiguous effect on inward FDI flows. The direction of the effect appears to be sensitive to the estimation technique used. When the 5% level of significance is reached, the effect of exchange rate volatility on FDI inflows is estimated to be positive (see Table 3). When volatility is measured using the conditional variance of shocks to the real effective exchange rate, however, its effect on FDI flows is positive in all cases and significant in most cases (see Table 4). Fourth, distance from the centre of activity had a negative and statistically significant effect on inward FDI flows as expected. Fifth, the positive effect of EU membership seems to be rather weak as it obtains only in the baseline estimates.

**Table 1.** Panel Least Squares Estimates of EMU impact on FDI inflows into the Eurozone

| | Dependent Variable: FDI Inflows | | |
|---|---|---|---|
| | Sample period: 1973-2006 | Sample period: 1979-2006 | Sample period: 1990-2006 |
| | | | |
| Real GDP | 10.24*<br>(1.51) | 10.70*<br>(1.57) | 11.67*<br>(1.94) |
| Real GDP growth rate | 440<br>(296) | 736***<br>(427) | 1293**<br>(674) |
| Real Effective Exchange Rate | 18450*<br>(3220) | 19888*<br>(4386) | 27700*<br>(10774) |
| Exchange Rate Volatility | -123108***<br>(65723) | -137384***<br>(79906) | -174526<br>(133839) |
| Distance | -0.27*<br>(0.088) | -0.30*<br>(0.12) | -0.55*<br>(0.20) |
| EU Membership | 4685*<br>(850) | 5153*<br>(931) | 6325*<br>(1535) |
| **EMU** | **11442***<br>**(3701)** | **13201***<br>**(3682)** | **8748****<br>**(3981)** |
| | | | |
| Adjusted R-squared | 0.40 | 0.40 | 0.38 |
| F-statistic | 69.2 (0.00) | 59.2 (0.00) | 34.0 (0.00) |
| Number of observations | 738 | 612 | 374 |

*Source:* Authors' calculations.

*Notes:* White-type robust standard errors are given in parenthesis. * denotes statistical significance at the one percent level, ** at the five percent level, and *** at the ten percent level.

**Table 2.** Fixed Effects Estimates of EMU impact on FDI inflows into the Eurozone

| | Dependent Variable: FDI Inflows | | |
|---|---|---|---|
| | Sample period: 1973-2006 | Sample period: 1979-2006 | Sample period: 1990-2006 |
| | | | |
| Real GDP | 21.89*<br>(4.32) | 23.10*<br>(5.34) | 29.51*<br>(9.02) |
| Real GDP growth rate | 574**<br>(273) | 929**<br>(405) | 1402**<br>(641) |
| Real Effective Exchange Rate | 17467*<br>(4433) | 14473**<br>(5525) | 1102<br>(10006) |
| Exchange Rate Volatility | 3198<br>(43981) | 71205<br>(76511) | 186541<br>(164229) |
| EU Membership | 1840<br>(1985) | 2014<br>(2010) | 2405<br>(3162) |
| **EMU** | **17053***<br>**(3267)** | **16673***<br>**(3202)** | **14632***<br>**(3199)** |
| | | | |
| Adjusted R-squared | 0.56 | 0.56 | 0.55 |
| F-statistic | 35.1 (0.00) | 30.2 (0.00) | 18.2 (0.00) |
| Number of observations | 738 | 612 | 374 |

*Source:* Authors' calculations.

*Notes:* White-type robust standard errors are given in parenthesis. * denotes statistical significance at the one percent level, ** at the five percent level, and *** at the ten percent level.

**Table 3.** Dynamic Estimates of EMU impact on FDI inflows into the Eurozone

| | Dependent Variable: FDI Inflows | | | |
|---|---|---|---|---|
| | Sample period: 1973-2006 | | Sample period: 1979-2006 | |
| | GMM/Dynamic Estimates Transformation: First Differences | GMM/Dynamic Estimates Transformation: Orthogonal | GMM/Dynamic Estimates Transformation: First Differences[3] | GMM/Dynamic Estimates Transformation: Orthogonal[4] |
| | | | | |
| FDI Inflows (-1) | 0.54* (0.09) | 0.54* (0.09) | 0.54* (0.09) | 0.54* (0.09) |
| Real GDP | 11.99* (2.59) | 11.98* (2.58) | 11.77* (2.60) | 11.77* (2.60) |
| Real GDP growth rate | 1100* (432) | 1106* (431) | 1227** (525) | 1227** (525) |
| Real Effective Exchange Rate | 2,182 (3,833) | 2045 (3908) | 2389 (4678) | 2389 (4678) |
| Exchange Rate Volatility | 120669** (57135) | 120,214** (57079) | 136349** (66609) | 136349** (66609) |
| EU Membership | 788 (2778) | 800 (2785) | 876 (2859) | 876 (2859) |
| **EMU** | **8702** (3690)** | **8698** (3691)** | **8779** (3751)** | **8779** (3752)** |
| | | | | |
| Number of observations | 734 | 734 | 610 | 610 |

*Source:* Authors' calculations.

*Notes:* (1) White-type robust standard errors are given in parenthesis. * denotes statistical significance at the one percent level, ** at the five percent level, and *** at the ten percent level.
(2) Dynamic estimation could not be performed using EViews for the sample period 1990-2006 because the number of instruments is greater than the number of observations.
(3) The estimation procedure uses differenced data as in Arellano and Bond (1991).
(4) The estimation procedure uses orthogonal deviations as in Arellano and Bond (1995).

The results reported in Tables 1-3 also show that the estimated coefficient for the EMU dummy is positive and statistically significant in all cases. In other words, the results demonstrate that, no matter what estimation technique is used or what sample period is used to estimate equation (1), the impact of the euro on inward FDI flows to the Eurozone is positive and statistically significant. This result is consistent with the finding of the earlier literature on the topic (see Schiavo, 2007, among others) that the euro boosted FDI flows into the Eurozone after its introduction on January 1, 1999. Also notice that the EMU dummy is always significant but the same is not true for the exchange rate volatility variable (Table 2). This finding squares with the fact that the EMU dummy captures not just the elimination of exchange rate uncertainty but also the additional benefits of a single currency outlined earlier.

As our dependent variable is measured in millions of US dollars, the coefficient estimates for the EMU dummy reported in Tables 1-3 capture the average annual change in FDI flows into the Eurozone in millions of US dollars. For instance, the coefficient 11442 in Table 1 suggests that the formation of the EMU led to an average annual increase in FDI flows into the Eurozone of approximately $11.5 billion.

These coefficient estimates range from a low of $8.7 billion to a high of $17.0 billion, representing an average annual increase in inward FDI flows to the Eurozone that is between 11.7 and 22.9 percent of the average annual FDI flows into the Eurozone from the 1990-98 period.

In order to establish whether the results are sensitive to how exchange rate volatility is measured, we also proxied volatility by the conditional variance of shocks to the real effective exchange rate. Table 4 reports the sign and level of significance (when the respective coefficient is statistically significant) of the volatility and EMU dummy coefficients. The EMU coefficient is positive and statistically significant (at 5% or better) in all cases, a result which, in turn, suggests that the EMU effect on FDI flows into the Eurozone is not sensitive to how exchange rate volatility is measured.

**Table 4.** Empirical Estimates of EMU impact on FDI inflows into the Eurozone using an ARCH measure of exchange rate volatility

| | Dependent Variable: FDI Inflows | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Period: 1973-2006 | | | | Sample Period: 1979-2006 | | | | Sample Period: 1990-2006 | |
| | PLS Estimates | Fixed Effects | Dynamic Estimates(2) | Dynamic Estimates(3) | PLS Estimates | Fixed Effects | Dynamic Estimates(2) | Dynamic Estimates(3) | PLS Estimates | Fixed Effects |
| Exchange Rate Volatility (ARCH) | + NS | + NS | + S(1/%) | + S(1/%) | + NS | + NS | + S(5/%) | + S(5/%) | + NS | + S(5/%) |
| EMU dummy | + S(1%) | + S(1%) | + S(5%) | + S(5%) | + S(1%) | + S(1%) | + S(5%) | + S(5%) | + S(5%) | + S(1%) |
| | | | | | | | | | | |

*Source:* Authors' calculations.

*Notes:* (1) NS = not significant; S = Significant

(2) The estimation procedure uses differenced data as in Arellano and Bond (1991).

(3) The estimation procedure uses orthogonal deviations as in Arellano and Bond (1995).

Another issue of great importance is whether the positive and statistically significant effect of EMU on inward FDI flows to the Eurozone are symmetrical across the countries that adopted the euro. In order to be able to do so, equation (1) was re-estimated by incorporating in it EMU country specific dummies. The corresponding results are reported in Table 5. These results suggest that the EMU effect on FDI inflows differs across Eurozone countries. EMU has had a positive and statistically significant effect (in all or most cases) on FDI inflows to Belgium/Luxembourg, France, Germany, Italy, Netherlands, and Spain. In the case of Ireland the EMU effect is positive but not statistically significant. In the case of Austria and Finland, the EMU effect is negative and statistically significant in some cases. In the case of Greece and Portugal, the EMU effect on inward FDI flows is mixed. An interesting observation that can be drawn from these results is that the EMU had a positive and significant effect mostly on inward FDI flows to Eurozone countries that are in the centre of the monetary union and negative or mixed effect on countries that are in the periphery of it.

**Table 5.** Empirical Estimates of EMU effect on FDI inflows for individual Eurozone countries

| | Dependent Variable: FDI Inflows | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Period: 1973-2006 | | | | Sample Period: 1979-2006 | | | | Sample Period: 1990-2006 | |
| | PLS Estimates | Fixed Effects | Dynamic Estimates[2] | Dynamic Estimates[3] | PLS Estimates | Fixed Effects | Dynamic Estimates[2] | Dynamic Estimates[3] | PLS Estimates | Fixed Effects |
| Austria | -1179 | -1322 | -1019 | -1019 | -1949 | -1479 | -972 | -972 | -5169** | -904 |
| | (1,679) | (1,810) | (1,028) | (1,026) | (1,839) | (2,059) | (1,096) | (1,097) | (2,487) | (2,937) |
| Belgium/ Luxembourg | 57,805* | 55,456* | 30,817* | 30,798* | 56,652* | 54,471* | 30,712* | 30,712* | 52,421* | 48,953* |
| | (11436) | (11334) | (5254) | (5237) | (11144) | (11172) | (5565) | (5565) | (10725) | (11155) |
| France | 32236* | 30761* | 17925* | 17925* | 30932* | 30121* | 17801* | 17801* | 26404* | 24185* |
| | (4958) | (5428) | (3576) | (3566) | (5011) | (5569) | (3512) | (3512) | (5298) | (6055) |
| Finland | -485 | -3989** | -3169*** | -3145*** | -1542 | -3528*** | -3016 | -3016 | -5281** | -1534 |
| | (1409) | (1651) | (1835) | (1839) | (1599) | (2056) | (1898) | (1898) | (2405) | (3192) |
| Germany | 30802 | 35910*** | 19210* | 19174* | 29551 | 37874** | 20168* | 20168* | 25095 | 41996** |
| | (19740) | (19493) | (3546) | (3583) | (19756) | (19686) | (3790) | (3790) | (19798) | (21446) |
| Greece | -4121* | -729 | 3751 | 3728 | -5428* | -626 | 3621 | 3621 | -9865* | -2912 |
| | (1420) | (1648) | (5958) | (5960) | (1683) | (1777) | (6006) | (6006) | (2571) | (2174) |
| Ireland | 1666 | 6924 | 2706 | 2703 | -657 | 6038 | 2827 | 2827 | 7480 | 6,290 |
| | (6936) | (6178) | (1745) | (1746) | (7053) | (6142) | (1784) | (1784) | (7845) | (6775) |
| Italy | 1681 | 7755** | 8146* | 8151* | 745 | 8431* | 8348* | 8348* | 3075 | 10029* |
| | (3073) | (3099) | (2380) | (2374) | (3127) | (3115) | (1946) | (1945) | (3557) | (3357) |
| Netherlands | 21892* | 20594* | 5778** | 5721** | 20896* | 19703* | 5712*** | 5712*** | 16685* | 15870** |
| | (7534) | (7007) | (2951) | (2953) | (7543) | (7057) | (3092) | (3092) | (7815) | (8077) |
| Portugal | -554 | 2708 | 1963*** | 1957*** | -1231 | 3432 | 2223** | 2223** | -4287 | 2703 |
| | (1651) | (1942) | (1125) | (1127) | (1984) | (2235) | (1069) | (1069) | (2904) | (2582) |
| Spain | 15379* | 12683* | 4450** | 4445** | 13931* | 11540* | 4589** | 4589** | 9130** | 9175* |
| | (3623) | (3423) | (2014) | (2016) | (3851) | (3495) | (1982) | (1982) | (4743) | (3357) |

*Source:* Authors' calculations.

*Notes:* (1) White-type robust standard errors are given in parenthesis. * denotes statistical significance at the one percent level, ** at the five percent level, and *** at the ten percent level.
(2) The estimation procedure uses differenced data as in Arellano and Bond (1991).
(3) The estimation procedure uses orthogonal deviations as in Arellano and Bond (1995).

Finally, we proceed to investigate whether EMU led to diversion of FDI activity from the three countries that opted out from adopting the euro as their national currency. In Table 6 we include results on country specific dummies for Denmark, Sweden, and the UK. These results show that there is no evidence for diversion. On the contrary, we find a positive and significant effect of EMU on inward FDI flows to Denmark and the UK and no significant effect for Sweden. The lack of evidence for diversion for Denmark and the UK squares well with the findings of Schiavo (2007).

**Table 6.** Empirical Estimates of EMU effect on FDI inflows for non-Eurozone EU

| | Dependent Variable: FDI Inflows | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Period: 1973-2006 | | | | Sample Period: 1979-2006 | | | | Sample Period: 1990-2006 | |
| | PLS Estimates | Fixed Effects | Dynamic Estimates[2] | Dynamic Estimates[3] | PLS Estimates | Fixed Effects | Dynamic Estimates[2] | Dynamic Estimates[3] | PLS Estimates | Fixed Effects |
| Denmark | 1818 | 8257** | 4337** | 4331** | 944 | 7908** | 4294** | 4294** | -2035 | 6154 |
| | (3928) | (4025) | (2104) | (2103) | (3909) | (4034) | (1982) | (1982) | (3868) | (4145) |
| Sweden | 13649** | 6816 | 2386 | 2402 | 13080*** | 7880 | 2558 | 2558 | 11606 | 8216 |
| | (6532) | (6863) | (2364) | (2377) | (6721) | (7404) | (1996) | (1996) | (7630) | (8509) |
| UK | 61064* | 51221* | 23991* | 23952* | 59768 | 48821* | 23534* | 23534* | 56640* | 41964** |
| | (17565) | (18053) | (3476) | (3490) | (17590) | (18259) | (3530) | (3530) | (17658) | (19352) |

*Source:* Authors' calculations.

*Notes:* (1) White-type robust standard errors are given in parenthesis. * denotes statistical significance at the one percent level, ** at the five percent level, and *** at the ten percent level.
(2) The estimation procedure uses differenced data as in Arellano and Bond (1991).
(3) The estimation procedure uses orthogonal deviations as in Arellano and Bond (1995).

## Conclusions

This paper examines the EMU effect on inward FDI flows to the twelve countries that adopted the euro as their national currency. In the analysis, we use panel data for 22 OECD countries that cover the period 1973-2006. Our basic model of the determinants of inward FDI flows was estimated using a number of different estimation techniques including dynamic panel estimation.

The empirical results suggest the following: First, the overall EMU effect on FDI flows into the Eurozone is positive and statistically significant. This result is robust to different estimation techniques and sample periods. According to our estimates, the adoption of the euro resulted in an average annual increase in inward FDI flows to the Eurozone that is between 11.7 and 22.9 percent of the average annual inward FDI flows to the Eurozone from the 1990-98 period. Second, our results indicate that there is no diversion of FDI activity from the three countries that opted out from adopting the euro as their national currency. Finally, our results suggest that the EMU effect on FDI inflows differs across Eurozone countries. Specifically, they show that the EMU had (a) a positive and significant effect mostly on inward FDI flows to Eurozone countries that are in the centre of the monetary union and (b) a negative or mixed effect on countries that are in the periphery of it.

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