The Currency Union Effect on Foreign Direct Investment: A Case Study

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The paper presents a case study regarding the currency union effect on foreign direct investment (FDI). The issue is addressed in terms of Spain's experience with the Economic and Monetary Union (EMU). The model specification disentangles the FDI effect caused by entry to the European Union (EU) from the FDI effect triggered by EMU membership. The study finds that Spain has been benefited substantially as a FDI destination initially by entry to the EU and subsequently by membership to the EMU. The analysis shows that EU effect is more prominent than the EMU effect; the EU effect accounts for 134.96% increase in FDI, whereas, the EMU effect accounts for 67.51% increase in FDI.

INTRODUCTION

The creation of the European Union (EU) and its subsequent transition into a currency union through the formation of the Economic and Monetary Union (EMU) has sparked considerable research interest to determine the manner by which the flow of foreign direct Investment (FDI) is impacted by such a currency union. However, the literature on the subject provides inconclusive results. This is attributed to numerous factors such as different model specifications, varying estimation methods, data aggregation and data heterogeneity as well as datasets with limited observations for the period after the formation of the EMU. The issue of data aggregation and data heterogeneity arises from the fact that the literature has focused on how the formation of the EMU has affected the flow of aggregate FDI from an integrated block of countries such as countries in the EMU (or EU) to another block of countries such as non-EMU (or non-EU) and vice-versa.

The study addresses the currency union effect at the single country level. Thus, the study departs from the country-block aggregate FDI approach and, instead, uses disaggregated data at the single country level as it examines the currency union effect on the inflow of FDI for a single country member of the EMU. In addition, the study departs from the gravity model specification widely used in empirical literature because such specification is inadequate for the single country application. Instead, this study utilizes the eclectic approach to international production where FDI emerges as a result of various factors relating to the host country economic environment. The paper uses the usual binary dummy viable approach to evaluate the impact of EU and EMU on FDI but also uses a break point test to detect whether structural breaks have, indeed, occurred as a result of entry to the EU and membership to the EMU.

The country of Spain presents an interesting case study because of its unique characteristics; being upper-middle income, newly industrialized, member of the EMU and located at the periphery of theEMU. Moreover, the case of Spain offers the benefit of a time series dataset extending over several decades which covers four periods of particular interest; namely, prior to joining the EU from 1960 to 1985, after accession to EU from 1986 to 2011, prior to EMU membership from 1960 to 1998, and after EMU membership from 1999 to 2011 which includes a substantial number of years after the formation of the EMU. As a result, this study examines how the flow of FDI into the Spanish economy has been affected by two events which have marked the political and economic life of Spain over the last four decades; accession to the EU in 1986 and subsequent EMU membership with the adoption of the euro in 1999.

LITERATURE REVIEW

Petroulas (2007) used a gravity type model with annual data for 18 developed countries from 1992 to 2001. The study shows that the formation of EMU increased the aggregate inflow of FDI from 14% to 16% between euro countries, from 11% to 13% from non-euro countries to euro countries and by a weak 8% from euro countries to non-euro countries. The study also finds that EU membership plays no role on FDI flows. Schiavo (2007) utilized a log-linear gravity specification to study the effect of common currency on FDI for 25 developed countries from 1980 to 2001. The study finds that EMU exerts a favorable impact on FDI. However, the model specification does not control for the EU status effect on FDI. Brouwer et al. (2008) conducted a study on the effects of EU and EMU on trade and FDI using a panel of 29 countries for the period from 1990 to 2004 focusing, in particular, on the 2004 EU enlargement. The study finds that both the EU and the EMU have had a positive and significant influence on FDI. Likewise, Coeurdacier et al. (2009) used a panel of sectional data composed of 21 source countries and 31 host countries for the period from 1985 to 2004. They find that both the EU and the EMU have impacted significantly FDI flows. De Sousa and Lochard (2011) used a cross sectional dataset for 21 OECD countries from 1992 to 2005. They find an EMU effect for FDI but no EU effect.

Abbott and De Vita (2011) utilized panel data from 27 OECD and non-OECD high income countries for the period 1980 to 2003. They find that the EMU effect on FDI is ambiguous and that there is no FDI effect for EU membership. Along the same lines is the study by Aristotelous and Fountas (2012) who used a gravity type model with panel data for 22 OECD countries from 1973 to 2006. They find no EU effect and an inconclusive EMU effect. Finally, Pantelidis et al. (2012) and Kirikilis et al. (2013) show no significant EMU effect for FDI flows.

As evidenced by the literature, there is no general consensus regarding the effect of EMU on FDI. There are studies that show evidence in favor of such relationship while other studies present evidence against. Yet, there are studies that have produced inconclusive results. The conflicting conclusions may be attributed to estimation methods used, heterogeneity caused by the nature of aggregate country-block aggregate FDI data and from the limited time span for which data were available after the formation of the EMU. The latter not only undermines point estimates and inferences but also introduces a bias in that the formation of a currency union can cause multinationals to make short-run portfolio adjustments with the prospect to return to their pre-shock levels in the long-run. This study uses disaggregated FDI data at the single country level and, in addition, the dataset for this study includes a substantial number of years after the formation of the EMU.

MODEL SPECIFICATION

The model specification follows the framework of the eclectic approach to international production as developed by Dunning (1988, 2000) and Dunning and Lundam (2008) where FDI emerges as a result of ownership, internalization and locational advantages. This framework incorporates a plethora of influential factors, among those, a comprehensive understanding of host country macroeconomic factors important for drawing multinationals and FDI into the host country. Along those lines, the model specification distinguishes three types of influences for the inflow of FDI into Spain. First, factors reflecting domestic economic performance, second, variables which control for economic and monetary integration effects, and third, a time trend variable which accounts for time related unobservable influences. It must be noted that a gravity type model is not adequate for model specification as its key variables, namely, the product of host and originating countries GDP and the distance between the host and originating countries have no meaning for the single country application.

Domestic economic performance is measured in terms of market size, trade flows and inflationary pressures. Market size refers to the size of the domestic market which is approximated by the host country GDP. Market size is expected to be directly related to the ability of the host country to attract FDI. Trade flows are measured by the trade balance as well as the volume change of the trade balance. Trade flows and FDI may be complements as in the case of export oriented FDI but also substitutes when FDI is directed towards import substitution and trade diversion policies. Price stability is an important macroeconomic indicator as it provides evidence of balanced markets, sound economic policies and a robust economy. Inflationary pressures, on the other hand, can be a sign of economic turmoil and uncertainty. As a result, the price level along with the inflation rate is included in the model specification to capture the effects of inflationary pressures on FDI.

The model specification disentangles the FDI effect triggered by EMU membership from the FDI effect caused by entry to the EU. The EU effect is captured by a binary dummy variable indicative of EU status. It assumes the value of one for each year Spain is a member of the EU and zero otherwise. Likewise, a binary dummy variable is introduced to capture the EMU effect on FDI. It takes the value of one for each year Spain has adopted the euro and zero otherwise. This dummy variable is the key variable for this study. A time trend variable is introduced in the model specification to guard against any non-quantifiable, unspecified and unobserved factors that may grow or shrink overtime causing a spurious regression situation. Finally, a constant term (β_0) is included to capture influences on the dependent variable that remain constant through the period covered by the data.

In formal terms and according to the aforementioned discussion the model is specified as:

$$\log FDI_t = \beta_0 + \beta_1 \log GDP_{t-1} + \beta_2 TRBLC_{t-2} + \beta_3 \Delta TRBLC_t + \beta_4 P_{t-1} + \beta_5 INF_t + \beta_6 EU_t + \beta_7 EMU_t + \beta_8 TR_t + \varepsilon_t$$

where:

FDI_t = Inflow of foreign direct investment at time t in billions of 2005 deflated (real) euros;

GDP_{t-1} = Gross domestic product at time t-1 in billions of 2005 deflated (real) euros;

$TRBLC_{t-2}$ = Trade balance at time t-2 in billions of 2009 deflated (real) U.S. dollars;

$\Delta TRBLC_t$ = Volume change of the trade balance at time t computed as ($TRBLC_t - TRBLC_{t-1}$) in billions of 2009 deflated (real) U.S. dollars;

P_{t-1} = Price level at time t-1 measured by the GDP deflator, 2005 = 100;

INF_t = Inflation rate at time t measured by the annual percent change of the price level. Thus, $INF_t = (P_t - P_{t-1})/P_{t-1}$;

EU_t = Binary dummy variable indicative of EU status at time t. Thus, $EU_t = 0$ from 1960 to 1985 and $EU_t = 1$ from 1986 to 2011;

EMU_t = Binary dummy variable indicative of EMU membership at time t. Thus, $EMU_t = 0$ from 1960 to 1998 and $EMU_t = 1$ from 1999 to 2011;

TR_t = A linear time trend variable defined as 1 for t = 1960, 2 for t = 1961, etc.;

ε_t = Error term assumed normally distributed with mean zero and constant variance.

The log notation refers to the natural logarithm. The logarithmic specification of the dependent variable provides the advantage that regression coefficients are interpreted as percentages. As a result, changes in the independent variables reflect percent changes of the dependent variable. In the event that an independent variable is continuous and also logarithmic, as in $\log GDP_{t-1}$, the estimated regression coefficient becomes an elasticity coefficient. Moreover, a logarithmic specification reduces variability imbedded in the data reducing skewness and kurtosis, thus, producing more robust standard errors. The time lags in GDP_{t-1}, $TRBLC_{t-2}$ and P_{t-1} are introduced to avoid contemporaneous endogeneity with $\Delta TRBLC_t$ and INF_t.

ESTIMATION AND RESULTS

The model is estimated by the method of ordinary least squares (OLS) using annual time series data for the period from 1960 to 2011. Estimation results are presented in Table 1. The data for all variables are taken from International Financial Statistics. All variables originally expressed in nominal terms have been deflated to reflect their real counterparts.

TABLE 1
DEPENDENT VARIABLE: logFDI

Variable	Coefficient	Std. Error	t-Statistic	p-value
β_0	-7.771255	5.435142	-1.429816	0.1603
$logGDP_{t-1}$	2.027061	0.998191	2.030735	0.0488**
$TRBLC_{t-2}$	-0.00685	0.003670	-1.867945	0.0689*
$\Delta TRBLC_t$	-0.01570	0.004170	-3.753668	0.0005***
P_{t-1}	-0.024650	0.010467	-2.355040	0.0234**
INF_t	-1.812358	0.911237	-1.988898	0.0534*
EU_t	0.854279	0.247878	3.446373	0.0013***
EMU_t	0.515909	0.259894	1.985074	0.0539*
TR_t	0.007853	0.033326	0.235628	0.8149

R-squared	0.891648*	Mean dependent var	4.650432
Adjusted R-squared	0.870506	S.D. dependent var	0.890111
S.E. of regression	0.320308	Akaike info criterion	0.722482
Sum squared resid	4.206489	Schwarz criterion	1.066647
Log likelihood	-9.062059	Hannan-Quinn criter.	0.853542
F-statistic	42.17467	Durbin-Watson stat	1.739455
p-value (F-statistic)	0.000000		

Sample: 1960-2011, Included Observations: 50 after adjustments
The notation ***,**,* indicates statistical significance at 0.01, 0.05 and 0.1, respectively.

The constant term (β_0) is not statistically significant. This is a favorable result as it implies absence of factors that remain constant over the period of the dataset affecting the behavior of the dependent variable in a significant manner. The market size hypothesis is tested by the presence of $logGDP_{t-1}$. This hypothesis postulates that FDI flows are directly related to the host country's GDP. The coefficient of $logGDP_{t-1}$ assumes the expected sign and is statistically significant. Its coefficient provides the elasticity of FDI_t with respect to changes in GDP_{t-1}. Thus, it implies that a 1% increase (decrease) in GDP_{t-1} would cause a 2.03% increase (decrease) in FDI_t.

$TRBLC_{t-2}$ assumes a negative sign and is statistically significant, thus, adversely affecting FDI_t in a statistically significant manner. Since $TRBLC_{t-2}$ results in deficit for the entire dataset, essentially $TRBLC_{t-2}$ measures the trade deficit. From [exp(–0.00685) – 1]*100 = –0.68%, the coefficient of $TRBLC_{t-2}$ implies that for every billion [U.S. real 2009 dollars] increase (decrease) of the trade deficit, FDI_t would decrease (increase) by 0.68%. Likewise, $\Delta TRBLC_t$, the volume change of the trade deficit, is statistically significant and inversely related with FDI_t. Moreover, [exp(–0.01570) – 1]*100 = –1.56%. Thus, FDI_t increases (decreases) by 1.56% for every billion [U.S. real 2009 dollars] decrease (increase) in $\Delta TRBLC_t$. The negative signs in $TRBLC_{t-2}$ and $\Delta TRBLC_t$ supports the view of export oriented FDI.

Both P_{t-1} and INF_t are statistically significant and assume the expected sign, thus, being inversely related to FDI_t. From [exp(–0.024650) – 1]*100 = –2.43%, the coefficient of P_{t-1} implies that a 1% increase (decrease) in the price level would cause a decrease (increase) in FDI_t by 2.43%. Likewise, from [exp(–1.812358) – 1]*100 = –83.67%, for every 1% increase (decrease) in the annual inflation rate, FDI_t decreases (increases) by 83.67%. It is evident that INF_t exerts a greater impact on FDI_t than P_{t-1}.

The economic integration effect is captured by the EU binary dummy. The coefficient of EU equals 0.854279 assumes the expected sign and is statistically significant. This result implies that the accession of Spain to the EU had a positive and statistically significant impact on FDI. The exact impact in terms of percent difference in the predicted FDI when EU=1 versus when EU=0 can be computed as [exp(0.854279) – 1]*100 = 134.96%. According to this result, Spain has attracted 134.96% more FDI due to its accession into the EU in comparison to the period prior to accession.

The EMU binary dummy accounts for the currency union effect. Its coefficient equals 0.515909, assumes the expected sign and is statistically significant. This result demonstrates that membership to the EMU not only had a positive influence on FDI but also that this influence was statistically significant. The exact effect in terms of the predicted FDI when EMU=1 versus when EMU=0 is computed as [exp(0.515909) – 1]*100 = 67.51%. Thus, membership in the EMU has contributed to the ability of Spain to attract 67.51% more FDI in comparison to the years prior to EMU membership.

It is important to emphasize that the EU effect is more prominent than the EMU effect. The EU effect stands at 134.96%, whereas, the EMU effect reaches 67.51%. In addition, the EU effect is strongly statistically significant with a p-value of 0.0013, whereas, the EMU effect has a weaker statistical significance with a p-value of 0.0539. This analysis shows that EU status has promoted FDI substantially more than EMU membership. Nevertheless, the attractiveness of Spain as a FDI destination from the rest of the world has been enhanced in a substantial manner, initially, by accession to the EU and, subsequently, by membership to the EMU.

The coefficient of the linear time trend assumes a p-value of 0.8149, thus, being strongly insignificant. This result implies absence of time varying unobserved factors which affect systematically the behavior of the dependent and explanatory variables. This is a desired result alleviating fears of spurious regression. The coefficient of the linear trend implies that FDI has increased by [exp(0.007853) – 1]*100 = 0.78% per year on the average over the time period of the sample.

The overall explanatory power of the regression model as measured by R-squared stands at 89% with an Adjusted R-squared of 87%. The model specification is statistically significant with an F-statistic equal to 42.17467 and a p-value of 0.0000. The Akaike, Schwarz, and Hannan-Quinn information criteria provide information regarding the balance between the goodness of fit and model specification. Their respective values are provided as they can be useful in selecting among different model specifications; the model specification with the lower value of the information criterion is preferred to alternative models.

TABLE 2
AUGMENTED DICKEY-FULLER (ADF) UNIT ROOT TEST

Variable	t-statistic	p-value[1]
$logFDI_t$	-4.749913	0.0018***
$logGDP_{t-1}$	-3.925553	0.0181**
$TRBLC_{t-2}$	-5.019155	0.0009***
$\Delta TRBLC_t$	-5.694865	0.0001***
P_{t-1}	-3.293074	0.0792*
INF_t	-7.044893	0.0000***

The notation ***, **, *, indicates statistical significance at 0.01, 0.05 and 0.1, respectively.
[1] MacKinnon (1996) one-sided p-values. Lag Length: 0 (Automatic - based on SIC, maxlag=10).

The stationary state of the variables involved is tested with the Augmented Dickey-Fuller (ADF) unit root test with the inclusion of the intercept and linear trend in the auxiliary regression as discussed in Wooldridge (2013). Results are shown in Table 2. The binary dummy variables (EU and EMU) along with the linear trend (TR_t) are excluded from the ADF unit root test. The respective p-values produce evidence that the null hypothesis of a unit root is rejected for each variable tested.

The Chow (1960) break point test is used to reaffirm that, indeed, a structural break has occurred in 1986 when Spain entered the EU and, again, in 1999 when Spain became member of the EMU. The respective p-values of the F-statistic, Log likelihood ratio and Wald Statistic show that in each case the null hypothesis of no structural breaks is rejected. Therefore, two structural breaks are present; the first in 1986 and the second in1999. This result reinforces the binary dummy variable approach where evidence was presented that Spain's accession to the EU and its subsequent membership to the EMU have each directed significant FDI flows into Spain.

TABLE 3
CHOW BREAK POINT TEST, BREAK POINTS: 1986, 1999

F-statistic	2.317440	p-value F(14,27)	0.0296**
Log likelihood ratio	48.83380	p-value χ^2(12)	0.0003***
Wald Statistic	49.56325	p-value χ^2(12)	0.0035***

The notation ***,**, indicates statistical significance at 0.01 and 0.05, respectively.

For the integrity of the estimated parameters and subsequent inferential analysis, error term diagnostics is conducted in terms of serial correlation, heteroscedasticity and normality. For serial correlation, the Breusch-Godfrey test statistic in Breusch (1979) and Godfrey (1978) is used because it is capable of detecting first and higher order serial correlation in the presence of lagged dependent and/or lagged independent variables. The relevant statistic is computed as the number of observations times the value of the R-squared (Obs*R-squared). As shown in Table 4, the respective p-values indicate that the null hypothesis of no serial correlation of order p, where p=1,2,3,4, is not rejected.

TABLE 4
BREUSCH-GODFREY SERIAL CORRELATION

1st Order, p=1	Obs*R-squared	0.453002	p-value χ^2(1)	0.5009
2nd Order, p=2	Obs*R-squared	0.453358	p-value χ^2(2)	0.7972
3rd Order, p=3	Obs*R-squared	0.920662	p-value χ^2(3)	0.8204
4th Order, p=4	Obs*R-squared	6.990757	p-value χ^2(4)	0.1364

The assumption of homoscedasticity is tested using White's (1980) test for heteroskedasticity. Results are presented in Table 5. The F-statistic, the Obs*R-squared and the Scaled Explained sum of squares (SS) are computed from the auxiliary regression. The p-values for all three statistics provide evidence that the null hypothesis of homoscedasticity is not rejected.

TABLE 5
WHITE'S HETEROSKEDASTICITY TEST

F-statistic	1.645722	p-value F(7,41)	0.2340
Obs*R-squared	44.70020	p-value χ^2 (7)	0.3191
Scaled explained SS	21.23852	p-value χ^2 (7)	0.9954

The assumption of normality for the error term is tested using the Jarque-Bera (1980) test statistic which is based on the difference of the skewness and kurtosis of the series with those from the normal distribution. Table 6 shows that the Jarque-Bera test statistic equals 0.87 and has a p-value of 0.6457. Thus, the null hypothesis of normally distributed errors is not rejected.

TABLE 6
JARQUE-BERA NORMALITY TEST

Jarque-Bera	0.874759	p-value χ^2 (2)	0.645726

CONCLUSIONS

The paper presented a case study in an effort to shed more light on how a currency union affects FDI. The country of Spain was the subject of the study, first, because of its unique characteristics being upper middle income, newly industrialized and located at the periphery of the EMU and, second, because of the long time span of available time series data.

The study departed from the commonly used approach which is based on aggregate FDI data from a country-block to another country-block. Such aggregation may be the culprit for conflicting conclusions due to unobserved heterogeneity imbedded on aggregate data. Instead, this study used disaggregated data at the single country level as it has focused on the FDI flow into a single country member of the EMU. Moreover, unlike existing studies, the dataset includes a substantial number of observations after the formation of the EMU. In addition, the model specification is based on the eclectic approach to international production as the gravity model is not applicable for the single country application.

The study provided clear evidence that FDI is impacted in a statistically significant manner not only from EMU membership but also from EU status. In particular, it was shown that EMU membership, with the adoption of the euro, increased the ability of Spain to attract 67.51% more FDI in comparison to the period prior to EMU membership. It was also demonstrated that accession into the EU increased the inflow of FDI into Spain by 134.96% in comparison to the period prior to joining the EU. It is evident that the EU effect is more prominent than the EMU effect. Nevertheless, the study demonstrated that Spain has benefitted as FDI destination in a statistically significant manner initially by accession to the EU and subsequently by membership to the EMU.

The Chow's breaking point test provided additional evidence in support of the binary dummy variable approach by establishing that a structural break occurred the year that Spain joined the EU and, yet, another structural break followed the year that Spain adopted the euro. The variables of the model specification successfully passed unit root testing, ensuring their stationary state. Likewise, the error term tested successfully for serial correlation, heteroskedasticity and normality safeguarding the validity of parameter estimates and subsequent inferential analysis.

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