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Ray Barrell, Abdulkader Nahhas and John Hunter

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Exchange Rates and Bilateral FDI: Gravity models of Bilateral FDI in High Income Economies

Ray Barrell[1], Abdulkader Nahhas [2] and John Hunter [3*]

[1,3] The Department of Economics and Finance, The College of Business, Arts and Social Sciences, Brunel University, Uxbridge, Middlesex UB8 3PH, UK

[2] The Department of Economics, The University of Exeter, Exeter EX4, UK

ABSTRACT

This paper examines the factors affecting bilateral FDI stocks from 14 high income countries to all OECD countries over the period 1995 -2012. We specifically emphasise the effect of bilateral exchange rate volatility along with membership of CU and the EU. Our empirical analysis applies the generalised method of moments (GMM) estimator to a gravity model of BFDI stocks. The findings imply that exchange rate volatility and EU membership are significant determinants of FDI even when we condition on the variables that follow from the application of the gravity model. This study also considers the extent to which the East Asia and the global financial markets crises and systemic banking crises have exerted an impact on BFDI. We note that a high degree of exchange rate volatility discourages BFDI, but that adopting the single currency has not promoted further BFDI flows between the Euro zone countries. Furthermore, our results suggest that European Market Integration has a large effect on FDI stocks, raising intra Single market flows noticeably.

Keywords: Foreign direct investment, exchange rate volatility, generalised method of moments, gravity equation, dynamic panel data model, financial crisis

JEL classification: F21; F14; C23; G01

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1. Introduction

Foreign Direct Investment (FDI) has become a critical driver of the World Economy and in the last two decades there have been critical advances across the globe in the investment environment, triggered in part by the recognition of the important contribution that FDI can have on economic growth and development. However, more volatile environments probably reduce FDI, with unanticipated exchange rate movements being a clear barrier to such capital flows. In addition, it is recognised that financial and economic crises, such as the one that hit Asian financial markets in 1997 and more recently the global financial crisis of 2008 have had a significant impact on this especially in relation to bilateral FDI and other forms of international capital movements.

Global FDI flows have been large in the last decade, though the economic and financial crises ameliorated this effect *(UNCTAD, 2014)*. There is general agreement about the push and pull factors that influence FDI, and they are summarised in the Gravity model (see Head and Mayer 2014). However, recent research by Kambayashi and Kiyota (2015) found that evidence over the fundamental drivers of FDI to be inconclusive, as many different factors may affect the decision to invest abroad, as the products might simply be exported. However, directing investment into overseas markets can be used to avoid direct and indirect barriers to trade such as tariffs, transport costs and exchange rate risk.

This article focuses on bilateral FDI from 14 high income OECD countries to the countries in the OECD over the period 1995-2012 using annual stock data. Our sample choice covers most market driven outward FDI decisions which will have common causes, and we exclude flows from emerging markets such as China as these are driven by other more strategic goals. We use a Gravity model to determine the key factors that drive FDI and we take into account other economic and institutional factors, such as exchange rate volatility and membership of trade arrangements that may affect the distribution of FDI stocks across the host countries[1]. We estimation a dynamic panel using systems-GMM as it not only exploits the time series variation in the data, but accounts for unobserved country specific effects while controlling for possible correlation between the regressors and the error term.

We focus on European Institutions, and show that the Single Market Programme has raised intra-EU FDI by 50%, reflecting the greater integration in the last 25 years. We also look at the role of exchange rate volatility and also ask whether a European common currency (CU) has had any effect on FDI. Adopting a single currency potentially reduces both direct transaction costs associated with foreign exchange and eliminates hedging costs within the union. We find a clear role for exchange rate volatility, which reduces FDI, but no additional effect from CU is uncovered. It is also to be expected that financial crises will reduce investment flows. This article aims to inform this debate by examining the behaviour of bilateral FDI in the context of the 1997–1998 East Asian crisis, the global financial crisis of 2008, and in response to systemic banking crises. The article first looks at the literature on Gravity model of FDI and then discusses the impact of crises, the Euro zone, exchange rate volatility and further factors such as the role of the Single Market in Europe in promoting cross border investment flows. Then the data and methodology are discussed followed by estimation and tests. Finally, conclusions are offered.

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[1] Like the majority of work in the area we use the real stock of FDI (nominal deflated by the host GDP deflator), whilst others use flows in various ways.

2. Gravity Models and FDI

The Gravity model was first adopted to analyse international trade flows and then subsequently applied to bilateral FDI. Its advantages are the simplicity of structure and its compatibility with a wide range of theoretical frameworks (Head and Mayer, 2014). Moreover, the model's flexibility allows for both "push" factors originating in home countries and "pull" factors arising from host economies to affect bilateral trade or asset flows. The Gravity model is derived from the Newtonian principle of gravitational pull applied in an economic context, and developed to explain the movement between countries of information, commodities and investment as a result of the distance between them (Erlander, 1980). The model depends on the interactions of the different factors that determine the extent of this force across borders.

Tinbergen (1962) and Pöyhönen (1963) pioneered the application of the Gravity model to analyse international trade flows. The model has been widely employed to study FDI as can be seen from the applications in Bevan and Estrin (2004), and Eaton and Tamura (1994), among others. It is suggested from the nature of the gravity equation that BFDI between any two economies is positively related to size and negatively to distance. Size can either be measured by GDP and/or population while distance between capitals has widely been used to explain global trade flows. Distance between countries may be also be captured by more ethereal characteristics such as history, culture and language. Markusen (2002) suggests that there might be a positive effect for distance on FDI, because FDI and trade are viewed as substitutes. However, the primary association between FDI and distance is considered to be negative (Bergstrand and Egger, 2013) and this is supported by much of the empirical research on FDI. It is clear that FDI is also affected by trade arrangements such as the European Union and the Single Market, as well as by borders and by barriers such as tariffs, and we investigate these. Measures of exchange rate volatility are also used here to explain bilateral FDI, as has been common, but not universal in the literature. We also look in this section at the role of the European Currency Union as this may be more than a device for reducing exchange rate volatility. In addition we also include traditional gravity variables such as common language and common border that reflect distance are still considered (Blonigen and Piger, 2014).

2.1 FDI and Crises

It is to be expected that financial crises will reduce all international investment flows and this suggests that it is important to trace the impact of financial crises on FDI. The effect of the Asian Financial Crisis on FDI flows has been much discussed, in part because FDI flows subsequently dipped in late 1998 and 1999, especially in Eastern and South-Eastern Asia, the Middle East and North Africa. After "the Great Recession" of 2009 FDI flows from overseas parent companies fell along with lower reinvested earnings and less intercompany debt (Contessi and Li, 2012). Dullien et al., (2010) explains this because the Global Financial crisis involved financial institutions across the OECD economies this automatically impacted FDI flows. In addition, banking crises (either individually or in a wave such as in 2007-8) may be followed by or interact with financial or economic crises and so be accompanied by a downturn in of world GDP, which is highly correlated with FDI.

Furthermore, banking crises could impact both the amount invested and the number of investments across borders. In response to demand or credit shortening, firms may reduce either the extensive or intensive margin of FDI. The former may reduce investment abroad while the latter the financial scale of prospective projects. Buch et al. (2010) found in the case of German firms, FDI reacts to financial constraints, but this reaction is less pronounced in relation to the magnitude of sales of foreign affiliates. However, Gil-Pareja et al., (2013) use a Gravity model to estimate the impact of systemic banking crises on FDI on a sample of 161 countries from 2003 to 2010 show that they impact FDI in two ways. Firstly, this is via the impact on aggregate flows and secondly from individual project counts. The results indicate banking crises since 2007 operated through credit constraints on markets and had a significant negative impact on the investment decision, but not on the quantities invested.

2.2 Exchange rate volatility, European Currency Union and FDI

There can be many barriers and frictions reducing FDI, and exchange rate volatility is clearly one of them. It is not necessarily the case that a Currency Union is just an example of zero exchange rate volatility. Empirical research has focused mostly on the effect of the Euro on FDI flows into the Euro zone. The Gravity model has been used by De Sousa and Lochard (2011), and Brouwer et al. (2008) among others, a positive, significant effect of the Euro on FDI. However, these studies did not investigate whether exchange rate volatility affects bilateral BFDI. In this context, CU has the potential to affect FDI inflows through transformation of the volatility of the exchange rate and reduced transaction costs. However, the findings on the impact of exchange rate risk on FDI are mixed, in part because early studies tended to use unconditional indicators of volatility, and these may just represent fully anticipated movements in exchange rates. For instance, the early study by Cushman (1988) found a positive link between exchange rate volatility and FDI, whereas later studies such as Petroulas (2007) among others found the link to be negative. As we note below, using conditional volatility removes the 'expected' component of measures of exchange rate volatility[2], and this can be done using a GARCH based approach of some centred moving average.

Schiavo (2007) analysed the effect of European CU on FDI flows over the period 1980-2001 and argued that the elimination of volatility stemming from CU "gives a non-negative impulse to cross-border investment". Moreover, it is suggested that adopting the same currency appears to do more than merely eliminate exchange rate volatility. It appears from this study that CU has resulted in larger FDI flows with the rest of the world. In addition it appears that the common currency acts as a spur to FDI stocks inside the Euro zone for Euro and non-Euro zone members. However, only a brief part of the sample covers the European CU period. A common finding of this literature suggests a significant positive effect of the Euro on FDI, but without agreement on the size.

Whether CU creates a better environment for companies making long-term investment decisions is open to debate. However, floating currencies with higher exchange rate variability create uncertainty that discourages FDI, so that fixing the exchange rate eliminates this risk. What is without dispute is that transacting without the necessity to continuously convert prices into another unit creates a level playing field and subject to quality greater transparency for the purchaser of the products.

3. The FDI decision: financial and macroeconomic variables

The determinants of FDI can be considered in terms of primary characteristics like factor-price differences, market size, and trade costs (Eaton and Tamura, 1994). There is a considerable literature on the determinants of FDI that augments the more traditional models

[2] Within period variance can be a very misleading indicator. If two countries have different interest rates, then the one with the higher rate will continually bilaterally depreciate, following the arbitrage path. Within period volatility will exist, but there is no uncertainty in these exchange rate changes.

by further factors: political and economic stability, factor proportions, openness, product-market regulation and labour market arrangements. In terms of the macroeconomy or policy that is implimented at the level of an economy or economic block some factors already feature in the Gravity model such as the size of the market as measured by national income.

Here the focus is on those variables that are driven by policy or relate to the broader economic environment, and it is common to look at the openness of the economy as a core indicator of policy stance. Eaton and Tamura (1994) for both the U.S. and Japan explained bilateral trade and FDI flows in the context of a standard Gravity model to find openness having a strong effect on outward FDI.

Political and economic instability are expected to drive FDI since they create uncertainty. It is expected that FDI will be more likely to flow into host economies that are politically stable with good access to large regional markets. A predictable policy environment that enhances macroeconomic stability, guarantees the rule of law and the enforcement of contracts, supports competitiveness, minimises distortions, and spurs private sector development, can be expected to encourage investment. Pourshahabi et al. (2011) analysed the relation between FDI, economic freedom and growth in OECD economies and it was indicated that market size, inflation, political stability and economic freedom positively affected FDI inflow, though in the latter case the effect was insignificant.

The question of whether labour costs affect the investment decision in relation to the OECD countries is seen as a critical one and the subject of some debate. In a comparative static analysis at the level of the corporation increases in labour cost may stimulate further investment to replace capital by labour. Bevan et al. (2004), as has been common in the literature, found a negative effect for labour cost on FDI, whilst Javorcik and Spatareanu (2005) found a positive and statistically significant impact of labour cost on FDI as when labour cost rose in response to aggregate wage increases, investment may also rise.

Cavallari and D'Addona (2013) in addition to analysing country-specific sources of exchange rate volatility also analysed the impact of interest rate volatility in driving FDI over the period 1985-2007 for the OECD. They found that nominal and real volatility variables have a significant impact on foreign investments along with output. Kilic et al. (2014), in addition to the more usual effects of Gravity variables found a positive impact on FDI inflows of real GDP and exchange rate volatility, but they find that inflation volatility has a negative effect on FDI. It is suggested that CU and the EU contribute to the inflows of FDI by reducing exchange rate and inflation volatility, while encouraging economic growth.

4. Data description and sources

To undertake the analysis, a panel has been collected that considers stock data on BFDI from 14 high income OECD countries to all OECD countries (see Appendix A) with annual data spanning the period 1995 to 2012.[3] The dependent variable is the outward bilateral FDI stock divided by a GDP deflator, which is among the most used measures of FDI in the literature. Many articles use the outward stocks of FDI (Egger and Merlo, 2007, Baltagi et al., 2007 Stein and Daude, 2007, Cardamone and Scoppola, 2015), and one-way FDI stocks are used for each country pair in the empirical specification. These are defined as outward FDI stocks, where an investment from country *i* to country *j* (FDI_{ij}) is seen as an outflow from the

[3] However, some observations are missing on the dependent and explanatory variables leaving a complete sample of 5820 country-year observations.

perspective of country *i*.[4]

The Gravity variables adopted in this study are measures of are market size and distance. In addition to this further variables are adopted to capture membership of the Single Market, entry into the Euro zone, the various crises, exchange rate volatility and measures that relate to the economic environment and institutional conditions. Therefore:

1. Market size of home and host countries is commonly measured by real GDP. A variable representing the market size has been used in nearly all empirical studies of FDI.

2. Following Portes and Rey (2005) and others, transportation and information costs are measured by a bilateral variable that computes the metric distance between the capital cities of home and host countries.

3. Information costs may also arise in response to institutional and cultural distance. Buch et al. (2004) suggest higher information and communication costs and differences in culture and institutions may impact market know-how and so the specification requires a variable to capture this effect on FDI. The first is based on language similarities between the home and host countries in the sample. The other dummy variable examines the common border between both countries.

4. As Bevan and Estrin (2004), and Carstensen and Toubal (2004) have indicated, trade patterns have had a significant effect on the size of FDI. Trade is measured by a bilateral export variable and this is intended to capture whether trade complements FDI activity. If this captures greater openness, then this should enhance FDI.

5. The investment climate is incorporated in the model by the free economics indices of home and host countries. The 'Free Economy Index'[5] is a measure by which the quality of the economic environment is proxied. It takes values in the range 0 to 100, with 100 being the highest level of economic freedom. This has been one of the FDI determinants identified by Beach and Kane (2008) among others.

6. The Global Financial Crisis and the Asian Crisis are measured by construction of dummy variables that measure the presence of the crisis at time t. Systemic banking crises are measured by a dummy variable that equals 1 when host country suffers from systemic banking crisis in a year t and 0 otherwise. The Appendix specifies the 24 countries in our sample that experienced borderline systemic banking crises.[6]

7. Relative Unit Labour Cost (ULC) is defined here as the costs of the labour input that is needed to produce one unit of output in the home country as compared to the host. Explaining the location choice for foreign investment between different host countries means that ULC should be expressed in a common currency. Unit labour costs are taken from the OECD and derived as the natural logarithmic difference between labour cost in

[4] Egger (2001), Baltagi et al. (2007), Egger and Merlo (2007), and Egger (2008) all specify the model in natural logarithms, the data set used here includes a number of observations where the FDI stock is zero. Here the dependent variable applied to FDI stocks is $\log(1+(FDI/P_{GDP})$ that is assumed to well approximate $\log(FDI/P_{GDP})$ and that these coefficients following transformation should still closely approximate elasticities.

[5] Economic freedom has been defined as 'the absence of government coercion or constraint on the production, distribution, or consumption of goods and services beyond the extent necessary for citizens to protect and maintain liberty itself'. This index is an indicator of the quality of the economic environment. It not only captures the economic policy of the government, but also the legal soundness of the economy and macroeconomic stability.

[6] Laeven and Valencia (2013) define a systemic banking crisis when substantial numbers of borrowers default or experience repayment difficulties, leading to a sharp increase in non-performing loans for lenders and to an exhaustion of capital for the banking system as a whole.

host country and labour cost in home country.

8. The variable that captures EU membership by both parties is an indicator that takes the value one at the point the country receiving FDI from an EU member itself entered the EU. This enables us to assess the effect of ongoing European integration on the FDI decision.

9. Adoption of the single currency is measured by a dummy variable when each of the countries enter the Euro zone. Introducing a measure of exchange rate uncertainty in the gravity equation may allow us to distinguish between the impacts of the common currency.

10. Conditional exchange rate volatility is computed by experimentation with measures of volatility based on estimation of a model of the variance. Nominal volatility in this case is expected to capture the role of country-specific currency risk. There is no consensus as to which measure of volatility is most appropriate. However, volatility derives from the behaviour of prices (Engle, 1982) and this suggests nominal exchange rate volatility may also be appropriate.

All the above factors must be taken into account when investigating the BFDI determinants in the OECD countries. To summarise the discussion of the variables, Table (1) below displays the variables that are considered here and their definitions.

Insert Table (1) here

4.1 Exchange Rate Volatility

We pay particular attention to measures of exchange rate volatility as we wish to test hypotheses on its role in determing patterns of FDI. Once volatility is observed, then it makes little sense to assume that the variance or standard deviation remain fixed over the sample. A range of possible methods arise, updating a simple variance estimate on an annual basis, exponentially weighted moving averages (WMA) and the various models that arise from the ARCH family are used to measure time varying risk (Hull, 2014).The latter two approaches are adopted here, with a strong preference for the ARCH approach.[8]

The existing theoretical literature is mainly focused on the consequences of volatility in the exchange rate on different time horizons in relation to FDI. There are several ways to extract indicators of volatility, and early studies tended to use unconditional estimates, whilst later studies have tended to use techniques such as generalised autoregressive conditional heteroscedasticity (GARCH) to estimate the conditional variance or unexpected component in exchange rate changes. The volatility measure of the nominal exchange rate is constructed by first taking the log difference of daily exchange rates calculated from data taken from the IFS database and then using a GARCH (or WMA) procedure to extract the conditional component.[9]

Here the intention is to find a coherent measure of volatility that is intended to capture uncertainty in a similar manner for the different economies and to control for this key feature of the exchange rate. Carruth et al. (2000) survey different volatility specifications and

[8] All estimations were undertaken in STATA 13.0

[9] Calculation of the exchange rate for Euro area countries: firstly, due to differences in national conventions for rounding up the data all conversions between the national currencies had to be carried out using data that impoeses a binding cross arbitrage condition via the Euro that implies for coherency a simple specification for the underlying exchange rates as following random walks (Smith and Hunter, 1985)..

suggest that these results are not greatly affected by the choice. As is common in the finance literature the volatility (σ_{it}) conditioned on the regression errors (u_{it}) is explained by a GARCH(1,1) process:

$$\sigma_{it}^2 = \omega_i + \alpha_i u_{it-1}^2 + \beta_i \sigma_{it-1}^2. \qquad (1)$$

Daily conditional variances are used to construct an indicator of annual volatility**.** In a few cases, it was not possible to uncover a stable GARCH process. In these cases, a simple weighted moving average model (2) is adopted when it is not possible to identify the ARCH/GARCH specification:

$$\sigma_{it}^2 = \sum_{j=1}^{p} u_{it-j}^2 \qquad (2)$$

These are based on blocks of p=20 past observations on the past errors to create a rolling moving average. The details as to the methods applied to estimate the volatility for each bilateral pair of currencies are given below in Table (2) for all of the bilateral nominal GARCH and the moving average models applied. In 20 out of 420 cases the WMA process is used, and in a relatively small number of cases the GARCH(1,2) specification is applied, but when not otherwise stated the model of variance is GARCH(1,1).

Insert Table (2) here

5. The Gravity model on Bilateral FDI stocks

In this paper, a Gravity model is used as a framework to test hypotheses on the roles of crises, EU membership, the Euro zone and exchange rate volatility on bilateral FDI[10]. As there is a good deal of inertia in investment stock data we estimate a dynamic model (Egger, 2002). With fewer than 30 time series observations, the autoregressive coefficient is likely to be biased downwards (Nickell, 1981), implying that the model is best estimated using what has been termed a systems GMM method (Blundel and Bond, 1998). We start by specifying a gravity equation used to estimate the determinants of BFDI stocks and flows along the lines followed by Stein and Daude (2007), and Abbott and De Vita (2011). A number of factors are used to capture aspects of common culture and stronger ties through language, as well as a number of other possible determinants of bilateral stock patterns. In order to determine the parameters affecting the BFDI stock over the crises we add dummy variables to capture the impact of financial distress:

$$\begin{aligned} y_{i,j,t} = {} & \alpha_0 + \lambda y_{i,j,t-1} + \alpha_1 \log(\mathrm{EXP}_{i,j,t}) + \alpha_2 \log(\mathrm{GDP}_{j,t}) + \alpha_3 \log(\mathrm{GDP}_{i,t}) \\ & + \alpha_4 \log(\mathrm{DIS}_{i,j,t}) + \alpha_5 \mathrm{EXV}_{i,j,t} + \alpha_6 \mathrm{EcoFree}_{i,t} + \alpha_7 \mathrm{EcoFree}_{j,t} + \alpha_8 \ln UCL_{j,i,t} \\ & + \alpha_9 \mathrm{Lang}_{i,j} + \alpha_{10} \mathrm{CU}_{i,j,t} + \alpha_{11} \mathrm{land}_{i,j} + \alpha_{12} \mathrm{FC}_t + \alpha_{13} SYS_{j,t} + \alpha_{14} EU_{j,t} + \varepsilon_{i,j,t}. \quad (3) \end{aligned}$$

[10] When the Gravity model is estimated using a random effects panel data model applied to real bilateral FDI stocks the Wooldridge test for first order serial correlation is found to be significant at the 1% level. This implies that these results cannot be relied on to provide a short-run explanation of BFDI as there is inertia in the stock data; that at least requires a lagged dependent variable to capture this. Once a lagged dependent variable is included, then the requirement to control for endogeneity is best met by applying GMM to a dynamic panel model.

Where $y_{i,j,t}$ in logarithms is the stock measure of bilateral outflow from the home country (i) to the host country (j) in year t, with FDI in current dollars deflated using the home country's GDP deflator, its lagged value is indicated by the subscript t-1, and λ is the adjustment coefficient in the dynamic form of the gravity model. $EXV_{i,j,t}$ is the measure of exchange rate volatility derived either from a GARCH or EWMA model as explained in Table (2). $GDP_{i,t}$ is real GDP for the home country and $GDP_{j,t}$ real GDP for the host country, $EXP_{i,j,t}$ is bilateral exports from the home to host country. $EcoFree_{i,t}$ is the free economic index for the home country and $EcoFree_{j,t}$ for the host country and $DIS_{i,j,t}$ is the log of geographic distance. $ULC_{j,i,t}$ is labour costs in the host country relative to the home country. The dummy variables to capture these further factors are: $Lang_{i,j}$ defined as the effect of a common official language, $Land_{i,j}$ a common land border, $CU_{i,j,t}$ the country specific impact of the introduction of the Euro and $SYS_{j,t}$ represents systemic banking crisis as described in the previous section. EU_{ijt} is a dummy that is one when the host and the home countries are both in the EU. We also introduce financial crisis dummies that distinguish between the global crisis, and Asian crisis (FC_t).

It has been common to explain bilateral FDI stocks without our dynamic extension which incorporates a lagged dependent variable. This is likely to have led to errors as FDI stocks are much larger than flows, and hence it takes considerable amounts of time for them to fully respond to changes in driving variables. There are various ways of correcting for this error. With $T=18$ time series and large N, standard estimation with a lagged dependent is not consistent, and we could use a first differenced regression that defines a first order approximation to a range of linear and non-linear specifications. This GMM dynamic panel method with lagged instruments (Arellano and Bond, 1991) has had some exposure in the FDI literature. If the model is well formulated and the estimates consistent the betas from this equation should resemble those of the form in levels. However, the differencing is often seen to remove time invariant effects such as distance, and these are seen to be important for the Gravity explanation of the data.

The Systems GMM (SYS-GMM) estimator of Blundell and Bond (1998) is more useful here, because the irreversible nature of much of investment explains why such time series are likely to be persistent. When the instruments are well defined, GMM should capture the impact of endogeneity that may arise, due to concerns with country-specific characteristics, reverse causation, omitted variables and measurement error. Physical investment is best seen as a real asset with significant persistence, unlike stock prices that aggregate to the market valuation in a form observably less volatile.[11] In particular, Blundell and Bond (1998), Alonso-Borrego and Arellano (1999) and Blundell et al. (2001) indicate that when the series are highly persistent or if the variance of the individual specific impact is largely relevant to the residual variance of the error term, then the lagged levels may make weak instruments for the regression equation in differences.[12]

6. Empirical findings for models estimated by GMM

The preferred results from the two-step system GMM estimator are presented in Table (3). Several model specifications are developed, with and without financial crises dummies, capturing the impact of exchange rate volatility and the timing of the crises. First of all we

[11] For instance, Sarno and Taylor (1999) find that FDI is less volatile than portfolio investment flows.
[12] Weak instruments are uncorrelated with the error term, but only weakly correlated with the endogenous variable. The weak instrument problem in the case of the first differenced GMM estimator usually occurs when time series are persistent so the AR(1) coefficient is close to one, and/or the relative variance of the fixed effects increases with the sample.

add our exchange rate volatility, European Currency Union and Single Market variables to a traditional Gravity model[13] and this is presented in column (1), and then to that model are added the crises dummy variables, in column (2) for systemic banking crisis. In column (3, 4 and 5), the dummies for the Asian and global crisis are added, and lastly both crises (global and Asian) dummies in column (6). As systemic banking crisis and global crisis are often related or overlapping, the global crisis dummy is excluded from the model in column (2) to show the effect of the systemic banking crisis.

The dynamic specification seems to be well defined from the diagnostic test for the definition of the instruments (Hansen, 1982).[14] Across all specifications in Table 3, the results for the tests of serial correlation are as expected. Although, it is not possible to accept the null hypothesis that there is no first order serial correlation, higher order serial correlation does not appear to be a problem as it is not possible to reject the null of no second or third order serial correlation. Therefore, an important criterion related to the moment conditions are met as further serial correlation in the first-differenced disturbances at an order greater than one would render the GMM estimator inconsistent (Arellano and Bond, 1991, and Roodman, 2009). The findings on further serial correlation with the autoregressive coefficient suggest that the serial correlation is not persistent meaning it might relate to moving average behaviour. Otherwise, the finding of serial correlation might imply that the models are not well formulated and there may be some other specification that includes variables not currently included in the model.

Insert Table (3) here

The adjustment coefficient that relates to the lagged FDI variable is positive and statistically significant suggesting significant inertia in the stock adjustment process. Given the sunk costs incurred by investors to set up distribution networks and services in foreign markets it is not surprising that there is persistence in FDI, because when forms from a country invest in another country in a given year this tends to continue over time. The coefficient on lagged FDI, δ in column 1 is about 0.24. This means that the stock adjustment of FDI in one year is 76 percent of the difference between the steady-state level and the current value of FDI. The partial adjustment coefficient ranges in size from .24 to .31 in remaining columns in Table (3). A higher autoregressive coefficient implies a slower speed of adjustment and indicates more persistence in the pattern of FDI for these OECD economies. The significance of the lagged dependent variable confirms that it is essential to adopt a systems estimator.

The long-run coefficients are readily computed[15] and are reported in addition to the Wald test of these coefficients in Table (3a); the results suggest the use of the complete model represented by equation (3) except again for unit labour cost that it seems possible to exclude

[13] We experimented with time zone effects as in Stein and Daude (2007) but they were not preferred to the EU related variables. This may be because the EU countries are all generally in one time zone, with minor variations, and there is a lot of FDI between them. The resulst are reported in the next section.

[14] The J-statistic, which is the minimized value of the two-step GMM criterion function, has an asymptotic $\chi 2$ distribution (Arellano and Bond, 1991) where the number of degrees of freedom equals the number of over-identifying restrictions. If there are as many moment conditions as endogenous variables then the IV/GMM criterion is zero and the coefficients of the model are exactly identified, but the validity of the instruments is not then tested in this context.

[15] If the AR(1) parameter is termed γ and the i^{th} coefficient relates to the i^{th} non deterministic regressor, the long-run coefficient is $\pi_i=\beta_i /(1-\gamma_i)$. The more general case of this type of dynamic model appears in Gregoriou et al. (2009) and the article includes some discussion of the application of the same type of Wald test constructed from the unrestricted parameters.

from the model. The test is not linear as the long-run is based on a ratio of the linear regression coefficients.

Perhaps the more important finding in our result is that the Single Market has significantly increased FDI flows within the Market, but we find no evidence that it has attracted additional FDI from outside given the other factors driving flows. It is found that joint EU membership has a strong impact on FDI. The EU coefficient estimate is economically and statistically significant so the bilateral FDI stock between member states increases. In the long run membership of the Single Market raises FDI from other members by around 50 percent, with supply chains spreading across the market area. This integration is clearly reversible, albeit slowly when a country leaves the Single Market.

The results for the financial crises variables imply that the shock related to the crises has spread as a result of the negative coefficient, which means the risk that follows from a crisis reduces BFDI, albeit temporarily. The effect of financial crises for all the models is coherent as these coefficients are as expected negative and statistically significant. Specifically, the coefficients of the global crisis dummy variables were found highly significant, indicating the presence of an impact of the global financial crises on the bilateral FDI stocks in the selected panel. The results for the estimates of the crises dummy coefficients reveal a significant decrease in FDI during the Asian crisis of 1997, with a slightly more negative coefficient during systemic banking crises. While, it can be seen from Table (3), columns (3) and (6) that the impact of the Asian crisis dummy related to 1998 although still negative is not significant.

The results for the global financial crisis are in line with the UNCTAD (2009) report that states global FDI inflows fell by 39% between 2008 and 2009, which is rather more than would be expected given the scale in the decline in GDP in home and host countries. To the extent past FDI patterns can provide relevant insights to the current FDI slump, the global financial crisis has a higher and more significance coefficient when compared with the Asian crisis as can be seen in column (6). This crisis caused FDI stock from a home to a host country to drop by 12% in 2008. Similar negative and significant coefficients were observed by Mahmoud (2011) for the global financial crisis, but though negative for the Asian it is not significant.

Turning to the estimation exchange rate volatility effects, we can look at two components, volatility itself and membership of CU. The findings confirm the importance of exchange rate volatility, which is significant at the 5% level with a negative coefficient suggesting the risk hypothesis to be correct so outward BFDI in all the specifications in the Table (3) is reduced. In addittion it appears that these is no additional affectof the creation of a common currency, as the Euro dummy variable, when both countries (host and donor) are in the Euro zone, is not significant in all the specifications in Table (3).

As for institutional variables, the economic freedom index for the home country and host country is positive and highly significant presenting evidence that the OECD countries with good institutions managed to attract more FDI. This indicates that there is no implicit restriction on trade for these countries. A system of law enforcement signals that investors' rights will more likely be protected.

Additionally, it is found that distance and language dummies have significant negative and positive impacts respectively. Tekin-Koru and Waldkirch (2010) also show distance has a significant negative effect on FDI, while common language exerts a positive impact. In particular, these finding suggest cultural proximity to be proxied by a common language as the effect is statistically significant and positive. This is consistent with the notion that transaction costs as a result of a what may be common cultural ties or values are reduced and this encourages BFDI. This confirms similar findings for the same language in Buch et al. (2003), Bergstrand and Egger (2007) and Görg and Wakelin (2002).

More particularly, the distance between home and host countries has a negative and significant impact on BFDI. The coefficient suggests that when the distance increases by 1%, the bilateral stock of FDI falls by about 0.32%-0.50%. This is also consistent with previous studies as evidenced by Buch et al. (2004, 2005). This suggests that companies are found to prefer investing in closer countries rather than those farther away, while the impact of a common border is negative but not significant in all specifications in Table (3). This fits with the trade literature where the coefficient is positive, because proximity reduces the need for FDI in horizontally integrated industries. These results suggest that sharing the same land border has little impact on the FDI stocks.

It appears that unit labour costs are not important as they are not significant for any specification of the model. This finding is consistent with Devereux and Griffith (1998) who also found unit labour costs differentials to be a non-significant driver of the location choices of US multinationals in the EU. They explain this result by their data not being disaggregated enough a measure of productivity so not reflecting the firm's heterogeneity within each industry, but these results would suggest that this finding is more general.

The results related to the control variables in Table (3) are also of interest with real GDP of the host country and home country having a positive sign and being statistically significant in all specifications. Real GDP is likely to exert a stronger effect on FDI when FDI outflow is market seeking in relation to a domestic (service) market. The result suggests that the income in investment partners and host countries strongly influence FDI stocks. We should note that the impact from the host country GDP is almost twice as large as for the home country, suggesting that market specific effects may dominate the gravity part of the relationship. In the same way, a positive link with export intensity may indicate that trade and FDI are complements. The coefficient on bilateral exports is positive and statistically significant at the 1% level. So, trade appears to be complementary to bilateral FDI.

Insert Table (4) here

7. Robustness Results

The focus of this paper has been on a number of new variables in the Gravity approach to FDI, and we have looked at the role of the Single Market in Europe, exchange rate volatility and membership of the Currency Union in Europe. This specific European focus allows us to look again at time zone effects and also throws up results that are new, and we test for their robustness by estimating reduced scale panels for the EU. We first focus on time zones, and then we look at the determinants of stocks with the EU, with 9 out of our initial 14 home countries and 20 out of our initial 31 host countries. We finally look at the determinants of bilateral FDI from our 9 European home countries to all 31 potential hosts (see Appendix for the countries). The results are reported in Table 5.

Time zone effects have been found by Stein and Daude (2007) amongst others, and they have a plausibility related to the need for managerial control in real time. However, this is not necessarily the only explanation of the coefficient. We look only at OECD countries, and we focus on the 14 largest home countries, and hence our results cover the vast majority of within OECD stocks of FDI, whereas other studies may include other countries with smaller outward stocks, or whose investments are driven by factors not captured in a market based model. We have included a number of European Union variables in our sample, and these appear to be significant, whilst time zone effects are not, as we can see from column 1 of Table5. The EU countries are in three adjacent time zones, rather fewer than within the USA, and the inclusion of a common membership dummy which indicates within EU FDI stocks are much higher than other gravity variables would indicate appears to override any effects from time zones.

Our panel of 9 EU home countries and 20 EU hosts is reported in column 2 of Table 5, and the pattern of results is similar to the full panel which has twice as many observations. The EU dummy is absent, as all members of the panel were members of the EU from 2004 (when 5 of the 20 hosts joined – see Appendix) and FDI flows were already strong at that start of our sample and were encouraged by the pre-Accession Agreements. The impacts of exchange rate volatility remain significant and negative, and hence the stabilisation of exchange rates required by the build up to membership of the Currency Union in Europe has encouraged FDI. However, there remains no role for membership of the Currency Union itself. The common land border indicator is marginally (and negatively) significant in the EU sample. Host economic freedom is more significant than home economic freedom in the EU countries as one might expect given the homogenous nature of the home countries in this sub-sample. Host size and distance also remain significant in this sample, although the significance of home size drops as compared to Table 3.

Our panel of 9 EU home countries and all 31 host countries is reported in column 3 of Table 5. Exchange rate volatility is marginally significant, whilst the EU dummy, which is obviously similar to the intercept, is not significant in this sub-sample. The significant of the common land border drops markedly. As in the main sample, systemic banking crises have a negative effect of FDI positions, albeit only a temporary one. Host GDP remains more significant than home GDP, and this may reflect specific characteristics of the sample, with two of the smaller members, Sweden and the Netherlands, being major sources of FDI both within Europe and outside it.

These results suggest a strong degree of commonality between our EU and full sample results, and they strengthen our conclusion that lower exchange rate volatility has increased FDI and that the Currency Union has no real separate effects on these stocks. In addition, our focus on EU institutional variables has allowed us to conclude that time zone effects may actually be absent as determinants of bilateral FDI.

Insert Table 5 here

8. Concluding Remarks

Our objective has been to investigate the role of market integration and risk in determining the pattern of bilateral FDI in the OECD. We have focusssed on the major home countries amongst the advanced market economies in order to clarify our results. We can, as a consequence of our results, draw both conclusions for policy makers and for potential future work on patterns of bilateral FDI in market economies. It is clear that the creation of a Common, or Single Market between countries changes patterns of FDI. It is also clear that if we do not take in to account the creation of the Single Market we may not properly explain FDI patterns.

It is inevitable that the country selection in this study is weighted toward European countries because they form the majority of countries in an OECD sample. This is important because not all countries are of the same size geographically as well as in terms of GDP. The US, Australia and Canada are all large, multi-time zone countries, and multiplant firms in these countries may face many of the same problems as multiplanat multi-country firms in Europe. Hence a strong European presence should be taken in to account in our framework, and it is likely to affect the results. The nature of the European sample has also change over time, with a number of host countries joining the EU and a group of EU countries forming a currency union. These changes have also stimualted FDI, and they will continue to have effects..

We have tested extensively for European institutional factors, and we found that a dummy that represents common membership of the European Union had a a signficant and positive effect on bilateral FDI. If both countries are members of the EU the bilateral FDI stocks are likely to be 50 oer cent higher than they would otherwise have been This reflects a number of factors, but it is suggested that it comes mainly from the Single Market programme, the major institutional attempt to reduce barriers to trade and capital flows within Europe. In addition we show that the decline in exchange rate volatility in the 1990s that followed from the desire to create a monetary union in Europe increased FDI significantly. This effect will have continued well in to the next decade as membership expanded. However, the use of a common currency, rather than just a fixed exchange rate, appears to have added little to FDI[16].

Going forward, our results suggest that the UK will see a significant reduction of FDI stocks from other European economies, such as Germany, France and the Netherlands, if it leaves the EU and is outsideteh Single Market. The Single Market was, and should be seen as, an attempt to emulate the efficiencies of the US Single Market. Although there is still some distance to go in terms of efficeiency, progress has been made, but that progress will probably be reversed in the UK once it leaves.

We have tested for time zone effects, and we have shown that when we include them along with a set of European dummies and other gravity indicators they are not significant. This, we presume, reflects the lack of significant time zones within Europe and the weight of European countries in our sample. We would conclude that the time zone effect is to an extent a Europe effect. The inclusion of financil crises may also mitigate against finding a time zone effect as the furtherest time zones from the US and Europe are Japan and Australia, and they did not have crises.

To summarise, we emphasise the negative effects of volatility that we uncover, and discuss financial crises and their temporary effects. Exchange rate volatility has clear and negative effects when properly measured, and the impacts of CU on FDI are all explained by reductions in volatility without an extra Single Market effect. However, membership of the Single Market raises bilateral FDI flows within the market by around 50 per cent. Based on a panel data analysis it was found here that bilateral FDI stocks are significantly influenced by both gravity factors (distance, GDP and non-gravity factors (risk as measured by exchange rate volatility and the economic freedom index).

[16] One country, Denmark, has a fixed exchange parity but is not a member of the currency union. Other countries will have had to had fixed parities for the two years before joining, so the fixed parity non-member set is definitely not empty. Policy options remained.

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Appendix ***Countries included in the sample.***[17]

Home countries (14)	Host Countries (31)	EU Countries + joining date	Currency Union (dates)	Systemic Crisis (dates)
Austria	Australia	_	_	_
Belgium	Austria	EU	1999	2008
Canada	Belgium	EU	1999	2008
France	Canada	_	_	_
Germany	Czech	EU 2004	_	1996
Italy	Denmark	EU	_	2008
Japan	Estonia	EU 2004	2011	-
Korea, Rep.	Finland	EU	1999	1995
Netherlands	France	EU	1999	2008
Spain	Germany	EU	1999	2008
Sweden	Greece	EU	2001	2008
Switzerland	Hungary	EU 2004	_	2008
United Kingdom	Ireland	EU	1999	2008
United States	Israel	_	_	_
	Italy	EU	1999	2008
	Japan	_	_	1997
	Korea, Rep.	_	_	1997
	Mexico	_	_	1995
	Netherlands	EU	1999	2008
	New Zealand	_	_	_
	Norway	_	_	_
	Poland	EU 2004	_	_
	Portugal	EU	1999	2008
	Slovak	EU 2004	2009	1998
	Slovenia	EU 2004	2007	2008
	Spain	EU	1999	2008
	Sweden	EU	_	2008
	Switzerland	_	_	2008
	Turkey	_	_	2000
	UK	EU	_	2007
	United States	_	_	2007

Sources, OECD FDI statistics, Laeven and Valencia (2013)

[17] As classified by the World Bank

Table (1) Variables definitions and data sources.

Variables	Unit	Source
$y_{i,j,t}$ =Log ($FDI_{i,j,t}$/ GDP $Deflator_{i,t}$)	is the stock measure of bilateral outflow from the home country (i) to the host country (j) in year t, with FDI in current in US$ deflated using the home country's GDP deflator.	(OECD)
$EXV_{i,j,t}$	A measure of exchange rate volatility predicted using equations (1) and (1a) below, and derived from daily percentage changes in the nominal bilateral exchange rate.	IMF, International Financial Statistics
$EXP_{i,j,t}$	Bilateral exports of goods are just used (As exports of service data are not available for most of the countries in the sample).	(OECD)
Real $GDP_{i,t}$, Real $GDP_{j,t}$	At constant 2005 prices and converted to US$s.	(OECD)
$DIS_{i,j,t}$	Measure in geographical distance in kilometres to proxy transportation costs	www.cepii.fr
$Free_{i,t}$. $Free_{j,t}$	An index of economic freedom that refers as to whether there is any restriction on trade in a country (Busse and Hefeker, 2007).	Heritage Foundation 2015 www.heritage.org
FC_t	Dummy variable for Global Financial Crisis (2008)[21] and Asian crisis (1997-1998) that equals 1 during crisis years and 0 otherwise.	
$SYS_{j,t}$	Dummy variable that equals 1 when host country suffers from systemic banking crisis in year T, otherwise 0	(see Appendix B)
$CU_{i,j,t}$	Dummy variable that equals 1 if countries i and j use the same currency (euro) at time t and 0 otherwise.	(see Appendix C)
$EU_{i,j,t}$	Dummy variable that equals 1 if countries i and j are EU members at time t and 0 otherwise.	(see Appendix D)
$ULC_{j,i,t}$	labour costs in the host country relative to the home country, Exchange Rate Adjusted ULC, Index OECD base year (2010=100)	(OECD)
$Lang_{i,j}$	Dummy variable that equals 1 when both countries share a common official language	www.cepii.fr
$Land_{i,j}$	Dummy variable that equals 1 when both countries share a common land border	World Factbook
The dependent variable, real BFDI stock, is real FDI outflows from 14 High income OECD to all the OECD countries. The nominal FDI outflows to the OECD are converted to real value by dividing GDP deflator.		

**Annual data over the period 1995-2012

[21] Complex financial crises such as arose in 2008 may not be easy to capture through a single variable, but the financial crisis that started with the failure or Lehman Brothers in the US was amplified across the World so it had a powerful negative effect on the OECD countries.

Table (2) Measure of Bilateral Exchange rate volatility

	Austria	Belgium	Canada	France	Germany	Italy	Japan	Korea, Rep.	Netherlands	Spain	Sweden	Switzerland	United Kingdom	United States
Australia	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Austria	-	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	**WMA**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Belgium	G (1.1)	-	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Canada	G (1.1)	G (1.1)	-	**G(1.2)**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	**G(1.2)**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Czech Republic	G (1.1)	**WMA**	G (1.1)	**G(1.2)**	**G(1.2)**	G (1.1)	G (1.1)	G (1.1)	**G(1.2)**	**G(1.2)**	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Denmark	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Estonia	G (1.1)	**G(1.2)**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	**WMA**	G (1.1)	**WMA**	G (1.1)
Finland	G (1.1)	G (1.1)	**G(1.2)**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
France	G (1.1)	G (1.1)	G (1.1)	-	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Germany	G (1.1)	G (1.1)	G (1.1)	G (1.1)	-	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Greece	G (1.1)	**WMA**	**WMA**	**WMA**	G (1.1)	G (1.1)	**WMA**	G (1.1)	**WMA**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Hungary	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Ireland	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Israel	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	**G(1.2)**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Italy	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	-	**WMA**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Japan	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	-	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Korea, Rep.	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	-	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Mexico	**WMA**	**WMA**	**G(1.2)**	**WMA**	G (1.1)	**G(1.2)**	**G(1.2)**	G (1.1)	**G(1.2)**	**WMA**	**WMA**	**WMA**	**WMA**	G (1.1)
Netherlands	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	-	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
New Zealand	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	**G(1.2)**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Norway	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Poland	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Portugal	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Slovak Republic	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Slovenia	G (1.1)	G (1.1)	**WMA**	G (1.1)	G (1.1)	G (1.1)	**WMA**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Spain	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	-	G (1.1)	G (1.1)	G (1.1)	G (1.1)
Sweden	G (1.1)	**WMA**	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	-	G (1.1)	G (1.1)	G (1.1)
Switzerland	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	**G(1.2)**	G (1.1)	G (1.1)	-	G (1.1)	G (1.1)
Turkey	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)
United Kingdom	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	-	G (1.1)
United States	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	G (1.1)	-

NOTE : G(1.1): GARCH(1.1), G(1.2): GARCH (1.2), WMA: Weighted Moving Average

Table (3) Results for dynamic panel-data estimation using two-step SYS-GMM, for BFDI outflow.

Variables	Column (1)	Column (2)	Column (3)	Column (4)	Column (5)	Column (6)
$LnBFDI_{i,j,t-1}$	0.2455***	0.2451***	0.2680***	0.2541***	0.2534***	0.3151***
	(0.0370)	(0.0367)	(0.0377)	(0.0376)	(0.0382)	(0.0393)
$LnGDP_{i,t}$	0.4133***	0.3290**	0.3941***	0.4170***	0.3218**	0.1637**
	(0.1347)	(0.1360)	(0.1307)	(0.1329)	(0.1289)	(0.1201)
$LnGDP_{j,t}$	0.7883***	0.6929***	0.6305***	0.6866***	0.7632***	0.5503***
	(0.1156)	(0.1115)	(0.1184)	(0.1208)	(0.1220)	(0.1160)
$LnEXP_{i.j.t}$	0.1797**	0.2700***	0.2586***	0.2339***	0.2170***	0.3413***
	(0.0731)	(0.0724)	(0.0785)	(0.0790)	(0.0792)	(0.0788)
$EXV_{i.j.t}$	-1.9046**	-1.4307**	-1.5766**	-1.6971**	-1.6316**	-1.0382**
	(0.7487)	(0.6483)	(0.6806)	(0.7055)	(0.7017)	(0.5892)
$Free_{i.t}$	0.0441***	0.0447***	0.0419***	0.0423***	0.0445***	0.0403***
	(0.0071)	(0.0069)	(0.0066)	(0.0068)	(0.0072)	(0.0065)
$Free_{j,t}$	0.0397***	0.0390***	0.0377***	0.0387***	0.0385***	0.0331***
	(0.0065)	(0.0063)	(0.0064)	(0.0065)	(0.0064)	(0.0060)
$LnDIS_{i.j}$	-0.5048***	-0.4580***	-0.4454***	-0.4766***	-0.4664***	-0.3240***
	(0.1000)	(0.0956)	(0.0989)	(0.0998)	(0.0981)	(0.0930)
$Land_{i.j}$	-0.2390	-0.2824	-0.2599	-0.2574	-0.2589	-0.2900
	(0.2086)	(0.2016)	(0.1919)	(0.1984)	(0.2108)	(0.1890)
$Lang_{i,j}$	0.6032***	0.6152***	0.5565***	0.5698***	0.5984***	0.5256***
	(0.1877)	(0.1871)	(0.1819)	(0.1803)	(0.1926)	(0.1799)
$CU_{i.j.t}$	-0.0082	-0.0135	-0.0143	-0.0189	-0.0152	-0.0451
	(0.1125)	(0.1084)	(0.1083)	(0.1112)	(0.1116)	(0.1010)
$LnUCL_{j.i.t}$	-0.0870	-0.1345	-0.1792	-0.1708	-0.0091	-0.0159
	(0.1184)	(0.1184)	(0.1348)	(0.1369)	(0.1682)	(0.1484)
$EU_{i,j,t}$	0.4248**	0.3932**	0.3609**	0.3579**	0.4245**	0.3512**
	(0.1891)	(0.1768)	(0.1711)	(0.1809)	(0.1881)	(0.1617)
$SYS_{j.t}$		-0.2588***				
		(0.0504)				
FC_{1997}			-0.1157**			-0.1494***
			(0.0463)			(0.0438)
FC_{1998}			-0.0273			-0.0446
			(0.0402)			(0.0396)
$FC_{1997/1998}$				-0.0778*		
				(0.0406)		
FC_{2008}					-0.1083***	-0.1511***
					(0.0213)	(0.0261)
Constant	-25.7435***	-23.1202***	-23.2150***	-24.4240***	-23.7195***	-17.7606***
	(3.4743)	(3.3286)	(3.3898)	(3.4622)	(3.4991)	(3.1638)
Observation Number	5282	5282	5282	5282	5282	5282
AR(1) test	-5.84***	-5.78***	-5.92***	-5.87***	-5.58***	-5.75***
AR(2) test	-0.55	-0.53	-0.23	-0.32	-0.60	-0.08
J-test~$\chi2(425)$	376.47	372.97	378.44	377.76	372.93	374.27
J-test: p-value	0.956	0.967	0.949	0.952	0.967	0.963

Notes: All regressions are estimated over the period 1995–2012 using a dynamic two-step system GMM estimator proposed by Blundell and Bond (1998) with Windmeijer (2005) finite sample correction. Huber–White robust standard errors are reported in the parenthesis. ***, **, and * coefficients are statistically significant at 1%, 5%, and 10%, respectively. The Hansen (1982), J-test statistic with p-values for over-identifying restrictions. AR(1) and AR(2) are tests for 1st and 2nd order serial correlation.

Table (4) SYS-GMM long-run estimates with Wald Tests of restriction

Independent Variables	Column (1)	Column (2)	Column (3)	Column (4)	Column (5)	Column (6)
$LnGDP_{i.t}$	0.5477	0.4358	0.5383	0.5591	0.4310	0.2390
Wald test $\sim\chi^2(1)$	9.54^{***}	5.87^{**}	9.20^{***}	9.98^{***}	6.33^{**}	3.34^{**}
$LnGDP_{j.t}$	1.0448	0.9178	0.8613	0.9205	1.0222	0.8035
Wald test $\sim\chi^2(1)$	52.9^{***}	42.76^{***}	32.52^{***}	37.52^{***}	42.43^{***}	25.26^{***}
$LnEXP_{i.j.t}$	0.2381	0.3576	0.3532	0.3136	0.2907	0.4983
Wald test $\sim\chi^2(1)$	6.23^{***}	14.73^{***}	11.10^{***}	8.88^{***}	7.87^{***}	19.42^{***}
$EXV_{i.j.t}$	-2.5243	-1.8952	-2.1538	-2.2752	-2.1854	-1.5158
Wald test $\sim\chi^2(1)$	6.40^{**}	4.82^{**}	5.36^{**}	5.78^{**}	5.37^{**}	3.15^{**}
$Free_{i.t}$	0.0584	0.0592	0.0572	0.0567	0.0596	0.0588
Wald test $\sim\chi^2(1)$	40.59^{***}	43.66^{***}	42.53^{***}	41.75^{***}	40.04^{***}	40.59^{***}
$Free_{j.t}$	0.0526	0.0516	0.0515	0.0519	0.0516	0.0483
Wald test $\sim\chi^2(1)$	40.22^{***}	40.25^{***}	37.83^{***}	38.28^{***}	38.79^{***}	32.88^{***}
$LnDIS_{i.j}$	-0.6690	-0.6067	-0.6084	-0.6390	-0.6247	-0.4731
Wald test $\sim\chi^2(1)$	27.61^{***}	24.56^{***}	22.24^{***}	25.02^{***}	23.72^{***}	12.94^{***}
$Land_{i.j}$	-0.3167	-0.3740	-0.3550	-0.3451	-0.3468	-0.4234
Wald test $\sim\chi^2(1)$	1.33	1.99	1.87	1.71	1.53	2.04
$Lang_{i.j}$	0.7994	0.8149	0.7602	0.7639	0.8015	0.7674
Wald test $\sim\chi^2(1)$	10.81^{***}	11.43^{***}	9.89^{***}	10.56^{***}	10.05^{***}	9.04^{***}
$CU_{i.j}$	0.0108	-0.0178	-0.0195	-0.0253	-0.0204	-0.0658
Wald test $\sim\chi^2(1)$	0.01	0.02	0.02	0.03	0.02	0.20
$LnUCL_{j.i.t}$	-1.1530	-0.1781	-0.2448	-0.2290	-0.0122	-0.0232
Wald test $\sim\chi^2(1)$	0.54	1.28	1.73	1.52	0.00	0.01
$EU_{i,j,t}$	0.5630	0.5208	0.4930	0.4798	0.5686	0.5128
Wald test $\sim\chi^2(1)$	5.06^{**}	4.95^{**}	4.48^{**}	3.95^{**}	5.12^{**}	4.78^{**}

Note: the table shows the long-run estimates derived from an underlying short-run dynamic model using the two step systems GMM. A Wald test is reported in the second row for each coefficient. Denoted ***, **, and * then the coefficients are statistically significant at 1%, 5%, and 10%, respectively.

Table (5) Robustness results for dynamic panel-data estimation on Bilateral FDI outflow

Independent Variables	**Column (1) Time Zone Test**	**Column (2) Home and Host EU**	**Column (3) Home EU to all Hosts**
$LnBFDI_{i,j,t-1}$	0.2432***	0.4159***	0.2675***
	(0.0370)	(0.0391)	(0.0438)
$LnGDP_{i,t}$	0.4036***	0.2383*	0.3015*
	(0.1366)	(0.1433)	(0.1708)
$LnGDP_{j,t}$	0.7796***	0.2394***	0.3862***
	(0.1171)	(0.0810)	(0.0968)
$LnEXP_{i.j.t}$	0.1882**	0.4050***	0.4811***
	(0.0749)	(0.0768)	(0.0720)
$EXV_{i.j.t}$	-1.8640**	-0.8612***	-1.3413*
	(0.7412)	(0.2967)	(0.7262)
$Free_{i.t}$	0.0437***	0.0138**	0.0301***
	(0.0071)	(0.0057)	(0.0065)
$Free_{j,t}$	0.0381***	0.0232***	0.0401***
	(0.0067)	(0.0063)	(0.0065)
$LnDIS_{i.j}$	-0.5924***	-0.4251***	-0.2981***
	(0.1163)	(0.0944)	(0.1007)
$Land_{i.j}$	-0.2742	-0.2457*	-0.0979
	(0.2029)	(0.1389)	(0.1700)
$Lang_{i,j}$	0.5806***	0.1511	0.3058
	(0.1900)	(0.2320)	(0.2057)
$CU_{i.j.t}$	0.0059	-0.0019	-0.0320
	(0.1102)	(0.0708)	(0.0944)
$LnUCL_{j.i.t}$	-0.0950	-0.3476	0.0021
	(0.1190)	(0.2392)	(0.2036)
$EU_{i,j,t}$	0.4160**		0.1411
	(0.1894)		(0.1894)
$SYS_{j.t}$		-0.0651	-0.1791***
		(0.0444)	(0.0497)
Timezone	0.0294		
	(0.0254)		
Constant	-24.6479***	-11.2301***	-19.2939***
	(3.6460)	(3.0964)	(3.8226)
Observation Number	5282	2264	3487
AR(1) test		-5.38***	-4.90***
AR(2) test		-0.22	0.01
J-test~χ2(392)		162.54	256.92
J-test: p-value		0.980	0.985

- Notes: All regressions are estimated over the period 1995–2012 using a dynamic two-step system GMM estimator proposed by Blundell and Bond (1998) with Windmeijer (2005) finite sample correction. Huber–White robust standard errors are reported in the parenthesis. ***, **, and * coefficients are statistically significant at 1%, 5%, and 10%, respectively. The Hansen (1982), J-test statistic with p-values for over-identifying restrictions. AR(1) and AR(2) are tests for 1st and 2nd order serial correlation.