Regional Integration and Bilateral FDI Stocks in the OECD*

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ABSTRACT

We examine factors affecting OECD bilateral Foreign Direct Investment (FDI) stocks over 1995-2016. We emphasise the effect of regional trade agreements, the European Union (EU) and the North American Free Trade Area (NAFTA). We find that EU membership is a significant determinant of FDI even when we condition on other gravity variables. The importance of robust economic institutions and freedoms is discussed, with implications for countries that are reducing such freedoms. European Integration has raised intra Single Market FDI by over 40 %. The UK has no labour market or competitive environment advantage above the rest of the EU in attracting FDI, and it will lose stocks after departure. We show that distance matters, but the effect is declining slowly.

Keywords: Regional trade agreements; foreign direct investment; gravity equation; dynamic panel data.

JEL classification: F14; F15; F21; C23

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1. Introduction

Global Foreign Direct Investment (FDI) flows have been large in the last two decades, and there is general agreement about the main economic and political push and pull factors that influence them. Economic integration may raise the connectedness of production and increase FDI in a market such as the European Union (EU) where the Single Market Programme has had a major impact on production patterns over the last 30 years. In addition, directing investment into overseas markets can be used to avoid direct and indirect barriers to trade. These include regulatory standards, tariffs and other barriers associated with the trade and competition policies that are linked to the evolution of the trading blocks that are the main focus of interest in this paper.

Economic integration between countries has many forms, and they can integrate parts of their economies together through an economic union such as the EU or through a free trade agreement such as the North American Free Trade Area (NAFTA). Economic integration is often thought to attract FDI from countries outside of the economic integration area. However, the effect on FDI from countries within the economic integration zone appears ambiguous. The removal of trade barriers may well reduce foreign investment from countries within an economic integration area as it can be substituted by an increase in international trade. On the other hand, foreign investment could be increased within the area due to a lower cost of factor relocation or because barriers to operation have been reduced by the integration process. There are some studies on the impact on bilateral trade of the two economic integration programmes we discuss. However, how this integration affects FDI seems under-researched.

The two areas we cover, NAFTA and the EU have had different approaches to integration, with NAFTA being focussed on trade integration and the facilitation of the movement of goods. The latter seems to have had little impact on FDI within the region, with the standard factors of size, costs, distance and institutions appearing to provide a fully adequate description of the evolution of the stocks of FDI within NAFTA over our period. The EU has approached integration in a different way, with a well-designed programme to reduce the barriers to competition within the market area. Integration has been much more extensive with significant coordination of regulations and standards. This programme has removed barriers to the movement of FDI within the region, and those FDI stocks have risen significantly more than the standard factors of size, costs, distance and institutions would suggest.

This paper contributes to the empirical literature on the determinants of FDI stocks by testing for differences between the two levels of regional integration represented by NAFTA and the EU. We use bilateral FDI stocks from the 14 largest high income OECD countries to all the high income countries in the OECD using annual data over the period 1995-2016. Our time period covers the period of intense Globalisation and European Integration that began after the World Trade Organisation (WTO) was set up and the Single Market Programme in Europe completed. We use a Gravity model (Head & Mayer 2014; Antras & Yeaple, 2014) to determine the key factors that drive FDI and we take into account other economic and institutional factors that may affect the distribution of FDI stocks across the host countries. We find that the size of countries and their trade links affect FDI stocks much as this approach suggests, although host country factors seem more important. In addition we test whether the distance effects will remain at the same level over the time due to technology and the growth of the internet. To our knowledge, the impact of the death of distance on FDI stocks has not been tested in previous studies. Our paper also extends previous research on the determinants of FDI by looking at the impacts of EU integration on investors from non-member countries and in emphasising the effects of European integration on FDI into the new EU countries. In light of Brexit we also ask if the UK has any special advantages that would allow it to maintain its position as a major destination for FDI after exit from the EU.

Our results show that the Single Market Programme has raised intra-EU FDI by over 40%, reflecting greater integration in the last 25 years. In addition to looking at the impact of NAFTA and the Single Market programme, we aim to develop the current literature and test the relationship between membership of the European Monetary Union (which we denote CU) and FDI stocks whilst taking into account other significant factors. Although many researchers expected that membership of a currency union would have a positive effect on FDI, our results do not support that conclusion. We also show that the formation of NAFTA has not had a similar impact to that of the Single Market, although it may have raised FDI from outside the block. Even within the OECD institutions and their quality matters along with common languages, and we show that they affect FDI significantly.

In the second section of the paper, we look at the literature on Integration and FDI in the context of the widely used Gravity models. We then discuss the framework within which our models sit in section three, and in section four we look at the estimation of our relationship using a dynamic panel with systems-GMM and discuss data issues. In section five we present our core results and in section six we look at robustness issues such as the importance of

accession effects in Europe, different approaches to distance, the (lack of) importance of missing observations and the exit of the UK from the EU. Finally, conclusions are offered.

2. Multinational Corporations and a Gravity Model of FDI

2.1. Gravity Models and FDI

In this paper we study stocks of FDI as these reflect the level of involvement of foreign firms in the domestic economy, whilst flows only denote changes in involvement. Other papers also use outward stocks of FDI (Baltagi et al., 2007: Stein & Daude, 2007) for these reasons. The framework for the analysis of multinationals developed in Antras & Yeaple (2014) demonstrates a strong case for taking into account the relative size of countries as well as the frictions associated with moving between them. The Gravity model's flexibility allows for both "push" factors originating in home countries and "pull" factors arising from host economies. It has been employed to study FDI as can be seen from the applications, among others, in Eaton & Kortum (2002) and Bevan & Estrin (2004) as well as more recent studies such as Sondermann & Vansteenkiste (2019).

Relative size is measured by GDP in almost all studies of bilateral FDI even when they are not cast explicitly in a Gravity framework. Within the more formal framework discussed by Antras & Yealple (2014) there are clear production capacity reasons for measuring size in this way, and the effects of size might well be the same in home and host economies. Home country GDP can be taken as a measure of specialist capacity to produce products which can either be exported or produced abroad. Host country GDP is assumed to reflect both the capacity of that economy to produce goods and also the size of the potential market to be served. As such its impact may be greater than that of home country size. In addition to country size, it is common to include variables such as distance, trade links and relative unit labour costs in papers on bilateral FDI.

Following the work at CEPII, transportation and information costs are normally measured by a bilateral variable that computes the metric distance between the economic central point of home and host countries[1]. This measure has become common in gravity studies in the last decade (see Head & Mayer, 2014). This gives a smaller, and more accurate, impact than does the simple geographic distance between capital cities of countries that was in previous use. That measure is acceptable in models of financial transactions, such as in Portes & Rey (2005),

[1] See Mayer & Zignano (2011) for details of the widely used measure of distance developed at CEPII.

as capital cities are normally also dominant financial centres. However, production is often more eccentrically located, and the CEPII measure is to be preferred in studies of FDI and trade in goods.

There are many other variables that can be used to calibrate the effects of proximity. Blonigen & Piger (2014) indicate that common language is still considered as one of the important determinants of FDI. However, distance and language do not capture the costs associated with the need to interact quickly. In particular, distance does not fully capture this effect as telephone, e-mail and teleconference communication are close substitutes for face-to-face interaction. This would suggest lateral distance is more disruptive than within longitude distance and a time zone differential between capital cities has been used in FDI literature by Stein & Daude (2007) amongst others.

The question of whether labour costs affect the investment decision across OECD countries is the subject of some debate. Firms may compare cost at home with other locations in general, or they may look at the relative costs between themselves and specific new locations. Relative unit labour cost is seen by many authors to be the most relevant measure for location decisions. Bevan et al. (2004), as has been common in the literature, found higher labour costs raised outward and reduced inward FDI. However, Devereux & Griffith (1998) found unit labour costs differentials to be a non-significant driver of the location choices of US multinationals in the EU. Their results may indicate that foreign firms do not rely on domestic productivity levels, but rather bring their own techniques and skills to augment those of the host workforce.

2.2. Trade Agreements, Integration and FDI

Our focus in this paper is mainly on the impact of the EU and NAFTA on stocks of FDI in high income markets in the OECD. Early studies, such as that by Barrell & Pain (1997) demonstrated that the Single Market was having an impact on FDI from outside the Union as well as within it, and recent research supports the conclusion that the Single Market has stimulated FDI within the EU. This in part comes from the growth of complex supply chains within the Union, as is discussed by Cresenzi et al. (2014), as firms find that barriers have been removed and they can begin to utilise special skills and advantages in other countries within the Single Market. In addition to such vertical FDI firms can undertake horizontal FDI across countries in the Single Market and utilise central specialist production and technology in multiple remote plants, much as we see in the US Single Market.

The link between trade agreements and FDI is not well understood in general, as barriers to trade may well increase FDI to markets that would not otherwise be available to producers. Such barrier jumping may have existed, but many authors have noted a positive relationship between FDI and trade agreements (for example, Medvedev, 2012; Büthe & Milner, 2008). However, the description of the way trade agreements impact on FDI varies among the studies. This is because trade agreements may affect FDI through diverse channels, such as reducing FDI barriers, protecting intellectual property rights and introducing investor protection mechanisms which could attract foreign investors to markets they would not otherwise approach. In general trade and FDI seem to be positively correlated, as discussed in Xiong & Sun (2019) who look at the simultaneous determination of exports and outward FDI.

The Single Market has changed the patterns of FDI stocks within Europe noticeably over the last two decades, with stocks of FDI in Europe growing more rapidly than in other advanced economies whilst becoming more European in origin. If we compare the start and the end of the decade from 2003 to 2012[2], we can see a clear increase in internal European stocks relative to home and host GDP, and a fall in the share of inward stocks originating from the US. The major external investor remained the US, with about 50 % of the initial outward FDI stocks from the US located in Europe, with around a third of that located in the UK at the start of the period. Over the decade the outward stock of US FDI rose from 24 to 32 % of its GDP. Over the same period the stock of inward FDI in the UK rose from 28 % of GDP to 48 %, with much of the increase coming from the rest of Europe, with the European share of the inward stock rising from 47 to 58 %, which the US share fell from 38 % to 29 %. The increasing Europeanisation of the European stock of inward FDI reflects increasing integration in the region. This is also shown by trends in both the level and location of outward stocks of FDI from Germany where the European share rose from 65 to 69 % over the period, whilst that from France rose from 63 to 67 %. In both cases the outward stock of FDI as a % of GDP rose over the decade by 50 % or more from around 30 % of GDP in 2003, noticeably more than the equivalent increase in the US stock of outward FDI.

The removal of intraregional trade barriers is a simple explanation of why trade agreements could spur FDI. According to (UNCTAD, 2009) removing the barriers affects one

[2] This is the period covered by the OECD BM3 data, and hence it is comparable across years without splicing. It also avoids end point problems associated with the rise of the probability of the UK leaving the Single Market. Stocks of outward FDI relative to GDP from European countries probably reached their peak just before the financial crisis in 2008.

of the main drivers of FDI, as it increases potential market size when it creates a large regional market. Several studies have applied the gravity model to predict the relation between FDI and trade variables for different regions. Most results suggest a positive link between trade agreements and FDI but the channel varies between agreements, as discussed in Medvedev (2012), who suggests the impact is greater for developing countries. We can conclude that regional economic integration can be a medium to attract more FDI to the participating countries, but at least in part through applying more attractive investment packages within the free trade agreements.

Much of the empirical work on the impacts of trade agreements has involved investigations of the impact of Europe Agreements on FDI within the EU and to other European economies. These Agreements were designed to liberalise trade between the EU and the applicant countries in Central and Eastern European. Baltagi et al. (2008) study the effects of these Agreements on bilateral outbound FDI stocks within Europe and find strong evidence for their impact. Their findings point to increased FDI from Western European home countries to Eastern European host countries flowing from the Europe Agreements. The process of European integration was aided by the gradual implementation of common rules under the Single Market Programme from 1985 to 1992. As Driffield & Karaloglou (2019) note, over this period trade integration was influenced by the number of agreements implemented by partners. However, FDI is much more forward looking than trade, and there is little evidence that adoption rates affected stocks of FDI after the completion of the Single Market in the early 1990s.

The 1988 preferential trade agreement between Canada and the US removed tariffs and capital movement restrictions in many areas, and it was extended to include Mexico in 1994, creating NAFTA. This agreement was in turn replaced in 2020, prior to which time the existing free trade agreement remained in place. The impacts on trade have been extensively analysed, but there have been a more limited number of studies looking at the impacts of NAFTA on FDI. For instance, MacDermott (2007) investigated the impact of NAFTA on FDI using a fixed-effects gravity model. Feils & Rahman (2011) examined the impact of NAFTA on FDI into the region and the individual member countries. They find that the NAFTA implementation process had a generally positive effect on inward FDI into the entire region, with the benefits accruing only to Canada and the United States. There was evidence in these studies that trade integration increased FDI over the period 1982–1997.

2.3. Institutional and macroeconomic impacts on multinationals

There is a considerable literature on the determinants of FDI that augments the more traditional models by further factors such as exchange rate regimes, political and economic stability, openness, product-market regulation and labour market arrangements. Policy and institutional factors include openness, product-market regulation and labour market arrangements. Blonigen & Piger (2014) used Bayesian statistical techniques to choose from a large set of candidates those variables likely to be FDI determinants. The variables are traditional gravity variables along with parent-country per capita GDP, cultural distance factors, relative labour cost, and regional trade agreements. Variables with little support for inclusion are openness, costs of the host country business, recipient country infrastructure (including credit markets), and recipient country institutions. However, recipient country institutions are hard to measure, and they have been found to be important, as Buchanan et al. (2012) show for a wider group of countries than in our study.

The literature appears to demonstrate that currency unions have a large positive effect on trade within the common currency zone. Hence a firm from outside the union may have an incentive to expand its production in a member country to benefit from this. The introduction of the euro could have led to lower the business cost, reduced transaction costs, and facilitated capital mobility, as a result changing the weight of factors determining FDI decisions. Schiavo (2007) analysed the effects of the European Monetary Union on FDI flows from 1980 to 2001, and argued that the elimination of volatility stemming from the Euro 'gives a non-negative impulse to cross border investment' both with the rest of the world and inside the Euro-zone. However, only a brief part of their sample covers the relevant period. The Gravity model has also been used in this context by De Sousa & Lochard (2011), Petroulas (2007) and Brouwer et al. (2008), who all found a positive, significant effect of the euro on FDI. Their coverage of the existence of the European Monetary Union is also limited. More recently Sondermann & Vansteenkiste (2019) found a positive effect from membership of the European Monetary Union, but the effects vary by types of FDI.

Political and economic instability are expected to reduce FDI since they create uncertainty, and this may have been affecting FDI to the Accession countries before they began the process of accession to the EU. 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. It can be expected that investment is encouraged by 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. The role of these forms of economic freedom has been investigated in the economic and business literature, for instance by Herrera-Echeverri et al. (2014), and most studies indicate the positive link between economic freedom (good institutions) and economic performance. A number of researchers have used the 'Free Economics Index'[3] in studies of FDI and of growth in developed and developing economies economies, and it was one of the FDI determinants identified by Economou (2019) who confirms the high level of economic freedom attract foreign investors in some European countries. Reductions in the level of this index would indicate that countries are moving outside the 'Narrow Corridor' that Acemoglou & Robinson (2019) suggest is available to maintain economic growth, and its level may matter for some Accession economies, such as Poland and Hungary, that have recently been moving towards the exit from the corridor.

3. Theoretical Approaches to Foreign Direct Investment

We assume that bilateral foreign direct investment is a production decision, with different producers having different endowments and efficiencies, as Barrell & Pain (1997) discuss. This will give us the traditional factors such as country size and characteristics, as well as include barriers which will affect monitoring costs. These trade-like features lead naturally to the framework discussed in the Head & Mayer (2014) paper on Gravity Models. The Gravity model was first adopted to analyse international trade flows and then subsequently used in other applications such as global financial markets. Its advantages are the simplicity of structure and its compatibility with a wide range of theoretical frameworks (Head & Mayer, 2014; Antras & Yeaple, 2014). Microeconomic foundations for this Gravity approach were developed by Anderson & van Wincoop (2003) and Melitz & Ottaviano (2008) amongst others. The model's flexibility allows for both "push" factors originating in home countries and "pull" factors arising from host economies. These may involve the size of the economy as an indicator of the ability to produce relevant products, the nature of the market there, the efficiency of producers and any legal or cultural barriers or ties that may be present. We may summarise these in a model of foreign direct investment (Y) from country i to country j written multiplicatively for simplicity of exposition as

[3] 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.

$$Y_{ij} = E_{ij}\, Z_i Z_j\, G_{ij}\, (X_i)^{a1}\, (X_j)^{a2} \qquad (1)$$

We discuss the size variables X_i and X_j and the home and host indicators Z_i and Z_j first, and we then look at the friction variables G_{ij} and the institutional measures E_{ij} as these include many of the indicators that we stress. The size of home (X_i) and host countries (X_j) are commonly measured by real GDP in trade studies, and has been used in nearly all empirical studies of bilateral FDI. A larger home country in terms of GDP will generally have a wider range of firms and products and will generate larger FDI outflows, and more FDI should be received into a larger host country market, as measured by GDP, as it will also have a wider range of production capacities. Therefore, for both variables we expect a positively signed coefficient. We do not impose the same coefficient on home and host GDP, although this is common, as we wish to evaluate whether market oriented factors are more important than home size.

Specific home and host country factors considered in this study include relative costs of production, which are usually measured by relative unit labour costs, $RULC_i$, in the country in question. It is normal to use a measure based on the trade weighted costs of competitors. We would expect home costs to have a positive impact, with high costs driving firms away from the home country, but the impact of relative cost amongst hosts is less clear. The existence of political risks in a country, and the specific nature of market risk in host countries, will affect the ability and willingness of cross border firms to invest in host countries. There are various ways we can measure these factors, which we may call R_i for home country risk and freedoms, and R_j for hosts. We can write an equation for country specific factors, Z_i (or Z_j) as

$$Z_i = b_i\, RULC_i^{\,b1}\, R_i^{\,b2} \qquad (2)$$

Bilateral frictions can be related to monitoring costs for production and there are various indicators of monitoring costs, and the most prominently used include distance between home i and host j, DIS_{ij}. Bilateral trade patterns (EXP_{ij}), included in G_{ij}, are widely seen as having had a significant effect on the scale of FDI, as greater openness of the economy may provide support for foreign investment. Other frictions have been associated in the literature in section 2 above with a common official language, $Lang_{ij}$. These factors can be augmented by measures based on time zone differences, $Timediff_{ij}$, between two locations. We can hence write the friction variable as an equation

$$G_{ij} = c_{ij}\, DIS_{ij}^{c1}\, EXP_{ij}^{c2}\, Lang^{c3}_{ij}\, Timdiff^{c4}_{ij} \qquad (3)$$

There are other institutional factors that may affect home and host at the same time. The EU

Single Market Act, the NAFTA agreement and associated regulations were in part designed to remove barriers to cross-border movements of capital, including FDI. The legislation that established the Single Market changed the nature of the internal market and may have affected FDI stocks. We denote common membership of the European Union at time t as $EU_{ij,t}$. We also look at similar dummies for NAFTA membership ($NAFTA_{ij,t}$). Most of these would be associated with cross border regulation or market access controls. Some institutional factors might be associated with membership of the European Monetary Union by both parties which we might denote CU_{ij}, as there are both different risk factors involved in lending and different regulations to follow once both countries are in the Union. We may write a regulatory and environmental issues relationship as

$$E_{ij} = e_{ij}\, EU_{ij}^{e1}\, NAFTA_{ij}^{e2}\, CU_{ij}^{e3} \qquad (4)$$

We can substitute GDP_{it}, GDP_{jt}, along with (2), (3) and (4) back in to (1) and produce an extended gravity model that builds on the simple canonical model with only size and distance to include country and environment factors that affect the behaviour of firms undertaking foreign direct investment.

4. Data and Methodology

To undertake the analysis, a panel has been collected that considers stock data on bilateral FDI from 14 high income OECD countries to 31 OECD countries (see Appendix) with annual data spanning the period 1995 to 2016. The dependent variable is the outward bilateral FDI stock divided by a GDP deflator[4]. These stocks are defined as outward FDI, where an investment from country *i* to country *j* ($FDI_{i,j}$) is seen as an outflow from the perspective of country *i*. We measure the size of home and host countries by real GDP in a common currency. We estimate a dynamic model 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 a systems GMM method (Blundell & Bond, 1998).

The "system GMM." model is an augmented version of the method outlined by Arellano & Bover (1995) and was fully developed by Blundell & Bond (1998). The fundamental idea behind the systems GMM estimator is to estimate two equations: one in levels and the other

[4] Baltagi et al. (2007), and Egger (2008) and many others specify the model in natural logarithms, as we do here, and the data set used here includes a very limited number of observations where the FDI stock is zero. Here the dependent variable is $\log(1+(FDI/P_{GDP})$ which in our case closely approximates $\log(FDI/P_{GDP})$ where P_{GDP} is the GDP deflator, and this deals with our limited number of zeros.

one in first-differences (Greene, 2012, chapter 13). The strictly exogenous variables serve as standard instruments for the level equation. The equivalent difference equation includes a set of variables that can be used as bases for the instruments for the endogenous variables in the levels equation. It in turn is instrumented by variables from the levels equation.

Two conditions need to be met to ensure the validity of the System-GMM estimator (Roodman, 2009). First, based on the validity of the levels specification of the model, the first-differenced residuals should exhibit negative and significant first-order autocorrelation as this model will normally be over-differenced, but there should be no second order autocorrelation. Hence it is important to test for evidence of first and second order serial correlation in the error using the statistic developed by Arellano & Bond (1991) as an extension to the usual LM test. Second, the instruments should be uncorrelated with the error term. This condition can be tested using the Hansen (1982) J-test of over-identifying restrictions which evaluates the joint validity of the instruments.

Equation (5) below includes the lagged dependent variable, and three endogenous variables, bilateral exports, trade related relative unit labour costs in the home country and trade related relative unit labour costs in the host country, all of which are correlated with the error. These variables are the minimal endogenous set we need and were chosen by experimentation. If we assume all variables are exogenous, we fail the Hansen (1982) test for instrument validity, and we continue to do so as we expand the set of endogenous variables until we select these three variables.

We start by specifying a gravity equation used to estimate the determinants of bilateral FDI stocks based on the analysis in the previous section:

$$y_{\mathrm{i,j,t}} = a_0 + \lambda y_{\mathrm{i,j,t-1}} + a_1 \log\left(EXP_{\mathrm{i,j,t}}\right) + a_2 \log\left(GDP_{\mathrm{i,t}}\right) + a_3 \log\left(GDP_{\mathrm{j,t}}\right) + a_4 \log\left(DIS_{\mathrm{i,j,t}}\right) + a_5 R_{\mathrm{i,t}} + a_6 R_{\mathrm{j,t}} + a_7 \log\left(RULC_{\mathrm{i,t}}\right) + a_8 \log\left(RULC_{j,t}\right) + a_9 CU_{\mathrm{i,j,t}} + a_{10} EU_{\mathrm{i,j,t}} + a_{11} NAFTA_{\mathrm{i,j,t}} + a_{12} TimDiff_{\mathrm{i,j,t}} + a_{13} Lang_{\mathrm{i,j}} \quad (5)$$

Variable definitions are largely given above, but we collect and expand them here. The dependent variable $y_{i,j,t}$ in logarithms is the stock measure of bilateral outflow (Y_{ijt} above) 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 in dollars, its lagged value is indicated by the subscript t-1, and λ is the adjustment coefficient in the dynamic form of the gravity model. $GDP_{i,t}$ 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. $R_{i,t}$ is the economic freedom index for the home country and $R_{j,t}$ for

the host country. $DIS_{i,j,t}$ is the log of geographic distance. We have two measures of relative unit labour costs, one for the relative costs of the home country $RULC_{i,t}$ which are labour costs in the home country relative to labour costs in the countries with whom the home country trades, and the other for the relative costs of the host country relative to costs in the countries it trades with, $RULC_{j,t}$. We also capture further cultural similarity factors using: $Lang_{i,j}$ which is defined as the use of a common official language, which reflects cultural similarities.

We use a number of variables that are less common in other studies. Adoption of the single currency is measured by a dummy variable that changes from zero to one when both of the countries are members of the Euro zone, denoted $CU_{i,j,t}$. The dummy $EU_{i.j.t}$ is the variable that captures EU membership by both parties is an indicator that takes the value one from the point the country receiving FDI from an EU member itself entered the EU, and is zero before then, and also when only one country, or neither country, are EU members. We also look at similar dummies for NAFTA membership, $NAFTA_{i,j,t}$ which is a dummy that is one when the host and the home countries are both inside the NAFTA trade block. $TimDiff_{i,j,t}$ captures the time zone differential between countries measured in hours. In our empirical work we also separate out extra effects from home and hosts both inside and outside the EU and NAFTA, but for brevity we do not spell out these dummies here.

To summarise the discussion of the variables, Table (1) below displays the variables that are considered here and their definitions.

Insert Table (1) here

There are of course missing observations in the matrix, and this can cause problems for estimation and for interpretation when many observations are missing. There is a significant debate on zeros in trade flows models, and this is summarised in Head & Mayer (2014). In our sample, some 1831 observations, or about a fifth of the possible observations are absent, with only 186 of these being zero. Most of the zeros are the result of recording errors in South Korean data, and leaving that country out does not affect our results[5]. The majority of the missing observations come from non-reporting of data. For instance, there are no disaggregated data for Belgium from 1995 to 2007, and none for Spain from 1995 to 2002, despite the fact that aggregate FDI stocks of considerable size are reported. In addition, the FDI data contain a

[5] There are 186 data points that are recorded as zero, which is around 2% of the data, but 111 of those are for Korea, and 60 of those reflect a data error in 2002 and 2005 when all stocks are recorded as zero whilst the total outward stock of FDI from Korea in these years is similar in scale to that in adjacent years.

considerable number of cells that are 'not available' due to reporting and confidentiality restrictions[6], as publication can reveal market sensitive information[7]. In both cases we have a problem where missing cells should not bias coefficients, as there is no reason to presume they differ from filled cells. These two statistical problems leave us with an unbalanced panel with less than two % of observed data points being zero, and these may be different from other cells, in that absence may have different causes from the scale of FDI once the decision to invest is made. We discuss this issue in our robustness section below.

5. Empirical findings for models estimated by GMM

The preferred results from the two-step system GMM estimator are presented in Table (2). Several model specifications are developed. First of all, we add our European Monetary Union and European Single Market variables to a traditional Gravity model and this is presented in column (1), and then to that model the trade block dummy variables for home non-EU host EU and home EU host non-EU are added in column (2). In column (3) a NAFTA dummy is added to the traditional gravity model, and in (4) non –NAFTA dummies similar to those in column 2 for the EU are added. In columns (5) and (6) first individual EU and NAFTA dummies are added to test whether there is similar within block effect on FDI stocks, and then the set of non-EU and non-NAFTA dummies are also included. In general, the EU dummy remains significant whilst the NAFTA indicator is not significant, and we may regard column (1) as our preferred result, with additional information provided by column (6).

The dynamic specification seems to be well defined, and a Hansen test of the validity of the instruments (and the appropriateness of the specification) is passed by all our equations[8]. Across all specifications in Table (2), 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 is met as further serial correlation in the first-differenced disturbances at an order greater than one would render the GMM estimator inconsistent (Arellano & Bond, 1991; & Roodman, 2009).

[6] The largest set of not availables is for Japan, but our results are not particularly affected by omitting Japan, as we see below.

[7] The bilateral FDI data at a national level are built up from individual industry data, and where there are a small number of firms in an industry then publishing this detailed information can potentially reveal commercially sensitive information. If all other industry level cells are published, then the sensitive information will be revealed if the aggregate is published. Hence 'not available' is common at the aggregate level. Reporting based restrictions on data availability depend on country specific disclosure rules, and these differ significantly.

[8] GMM allows flexibility in the use of lagged instruments, and we use up to the fourth lag in our estimates.

Insert Table (2) here

The adjustment coefficient on lagged FDI is positive and statistically significant suggesting significant inertia in the stock adjustment process. The significance of the lagged dependent variable confirms that it is essential to use an instrumental variables estimator. 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 stocks. The coefficient on lagged FDI in column (1) is about 0.10, and hence the long run impacts of variables are amplified by around a one-tenth as compared to the impact coefficient. The long-run coefficients for the regressions in column (1) are reported next to this column (along with the Wald test of their significance) in Table (2).

There are a number of regional factors that we have included in our analysis. Perhaps our most important finding is that the Single Market Programme has significantly increased stocks of FDI within the Market, given the other factors driving FDI. The EU coefficient estimate is economically and statistically significant suggesting that the bilateral FDI stocks between member states are higher than other factors, such as size and proximity, would suggest. In the long run the initial impact of membership of the Single Market feeds through the lagged dependent variable and raises FDI from other members by over 40 %, with supply chains spreading across the market area. This is clearly reversible, albeit slowly, when a country leaves the Single Market. As we can see from the results in column 2, we find no evidence that the EU has attracted additional FDI from outside its borders given the other factors driving flows. The coefficient on home EU to host non-EU is significant at the 5% level which may be reflecting in part flows to pre-accession countries in Europe, and we look at this in our robustness section. Turning to the estimation of the European Monetary Union dummy effects, it appears that there is no additional effect for the creation of a common currency, as this dummy variable, when both countries (host and donor) are in the Monetary Union, is not significant in any of the specifications in Table (2). The correlation between EU and European Monetary Union membership is only around 0.6, and hence the European Monetary Union effect can be easily separated from the EU effect. As the appendix shows, two home countries (the UK and Sweden) are in the EU, but not in European Monetary Union, as are 3 hosts (Poland, Hungary and the Czech Republic). A further 7 home countries and 10 of our hosts are in both for only 80 % of our time period, whilst another four hosts are in both for as little as 50 % of the time.

We have tested for equivalent effects in NAFTA in column 3 of Table (2) and it is not

significant on its own. The nature of integration within the NAFTA region is different from that within the EU, and the trade agreement is not particularly aimed at increasing economic integration between the countries involved. However, when we add in column 4 dummies for (home not in NAFTA, host in NAFTA) and (home in NAFTA, host not in NAFTA), we find that Multinational firms from outside NAFTA appear to have increased their investment there more than might be expected given the standard driving variables, and some FDI has been undertaken to 'jump' barriers set up by NAFTA to produce in the USA, Mexico and Canada.

We can of course add our NAFTA and EU results together, and we do so in columns 5 and 6. It is clear that the EU has had a significant and positive impact on FDI within its region, whilst NAFTA has not had a significant effect within its region. This would suggest that US FDI to Mexico, for instance, has been no more than would have been anticipated given proximity and size. Hence reducing the role of NAFTA, as is currently proposed, may not lead to a significant return of jobs to the US from Mexico. There is no evidence that the NAFTA countries have increased their FDI to countries outside the area, as we can see from column 6, These results bring out the strong differences in the impacts of the two sets of integration forces in North America and Europe, with Europe displaying a pattern designed to increase competition within the region, and not just trade between partners.

As for institutional variables, the economic freedom index R_i for the home country and R_j for the host country are positive and significant, presenting evidence that the OECD countries with good institutions managed to attract more FDI. Institutional quality is important, as Economou (2019) shows for a narrower group of countries than in our study. Even within the OECD stronger institutions and a system of law enforcement signals that investors' rights will more likely be protected, and that home economies will undertake proper policing of outward foreign investors behaviour.

Additionally, it is found that indicators such as distance and language dummies have significant negative and positive impacts respectively. More particularly, the distance between home and host countries has a negative and significant impact on bilateral FDI. If distance increases by 1 %, the bilateral stock of FDI falls by about 0.47 % in the long run. This suggests that companies prefer investing in countries that are close to them as increases in distance raise control costs. Our findings suggest cultural similarity, as indicated by a common official language has a significant positive impact, raising bilateral FDI. This factor is partly an Anglo Saxon one, with three home countries (US, UK and Canada) sharing a common official

language with six host nations. It is enough to explain the strong presence of US investment in the UK. There is clear evidence to support the notion that transaction costs are reduced as a result of common cultural ties or values and that this encourages bilateral FDI.

Home costs appear not to be significant in most of our experiments, at least as compared to those in countries with whom the home trades, whilst the effects of host costs are not negative. Only in our most general model in column 6 of Table 2 we see positive and significant effects from home costs, whilst host costs are not significant in this experiment. These findings are not inconsistent with Devereux & Griffith (1998) who found bilateral unit labour costs differentials to be a non-significant driver of the location choices of US multinationals in the EU, but they do offer some support for the importance of relative costs.

The results related to the core variables in Table (2) are also of interest with real GDP of the host and home countries both having a positive sign and being statistically significant in all specifications. The coefficient on bilateral exports is positive and statistically significant, suggesting they are complementary to bilateral FDI. The real GDP elasticity of the host country is around 0.6 and hence is 30 % larger than the distance elasticity. We should note that the impact from the host country's GDP is almost a fifth larger than that of the home country, suggesting that market specific effects augment the gravity part of the relationship.

6. 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, NAFTA and membership of European Monetary Union. This specific European focus allows us to look again at time zone effects and produce new, and negative, results on them. We also investigate whether the UK has special advantages that might aid it after leaving the EU, and also whether the distance effect is declining over time. The results are reported in Table (3). In addition, in Table (4) we test whether joining the EU boosted FDI stocks in the Accession countries, and if the accession effect explains the EU effects we observe. In Table (4) we also report on the impacts of removing Japan from our regressions as it has the largest number of not available observations.

Time zone effects have been found to be important by Stein & Daude (2007) amongst others, and they have a plausibility related to the need for managerial control in real time. 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. We have included several European

focussed variables in our sample, and these appear to be significant, whilst time zone effects are not, as we can see from column (1) and (2) of Table (3). The EU countries are in three adjacent time zones, and the inclusion of a common membership dummy indicates within EU FDI stocks are much higher than other gravity variables would indicate. The Single Market dummy perhaps takes up some of the explanation provided by a time zone differential when that differential is included on its own.

In Table (3), we also include tests of the special nature of the UK as an FDI platform for countries outside the EU. In column 3 we include a dummy for non-EU inward stocks of FDI in the UK. This variable is positive but not significant, suggesting strongly that the UK has no labour market or competitive environment advantage above the rest of the EU. The scale of FDI into the UK, which has been noticeable, is picked up by other factors in the regression, especially by a common official language with the US and Canada, an advantage shared with Ireland. We see no more FDI in the UK than would be expected given other factors, and this conclusion is reinforced by the result in column 4 where we include a dummy that covers FDI stocks in the UK from all EU home countries as well as those outside it. There is no significant UK effect in this regression, strengthening our result that the UK has no special attraction factors except those included in our model.

Insert Table (3) here

Gradual improvements in communications technology and the growth of the internet may lead to the 'Death of Distance', but its demise is clearly an empirical matter. In column 5 of Table (3) we add a new variable to column 1 of Table (2) to test for this effect, and we find that the product of time and distance (Tdistance) has a positive effect, indicating that distance is becoming a less important factor over time, but that effect is not significant. However, given the coefficient on distance is –0.4180 whilst the decay coefficient is +0.0010, it will take 400 years of linear decay from our start date in 1995 for the effect of distance to disappear completely. Given we are early in this 400 year process there is no way to find out if decay will continue to zero or whether it will asymptote at a lower coefficient. As the coefficient of Death of Distance is so small and insignificant, we do not introduce it in our other regressions as its absence will not induce biases in coefficients.

In our discussion of the results of the complete set of EU and NAFTA dummies in Table (2) we suggest that some of the effects of the EU to non EU members may be an accession

effect. We test this in two ways. First, in column 1 of Table (4), we include a dummy that is one for the three years before the new EU members joined in 2004 and zero otherwise (see appendix), to test if there was any pre-accession surge in FDI flows to these countries. Our results indicate that the EU accession process had a positive impact on FDI inflows to potential new EU members. It is clear from these results that the flows to the potential new members largely explain the significance of (the home EU host non-EU) coefficient in Table (2). It is also possible that our positive EU membership effect is just a continuing effect of higher FDI to the new members once they have joined. In order to test this in column 2 in Table (4) we have added a dummy variable that is one in the year after new members join and zero otherwise, and our results indicate that there is no additional FDI increase after accession. These results suggest that the advantages of EU membership were taken on board before actual accession, as we might expect in a forward looking investment environment.

Our remaining tests involve repeating our preferred results from Table (2) after excluding the most important country with data that is not available. Belgium, Spain and Japan have similar numbers of missing observations, but as we discuss above the first two results from a failure to publish disaggregated data in the first half of our sample. There are almost 400 observations for Japan that are not available, which is almost a quarter of the missing observations, and hence we omit that country from the data set in column 3 and column 4 of Table (4). We are missing reported Japanese stocks for a number of relatively small economies, noticeably Finland, Hungary and Estonia, Slovenia, Poland, Slovakia, the Czech Republic, Greece and Turkey where they may be confidentiality issues. We have tested the equality of the coefficients in the with and without Japan panels based on our maintained hypothesis that the missing observations are a statistical problem, not a structural one. A Wald test of the restriction is easily passed, with a Chi-squared (12) of 1.97 (prob. 0.9994) for column 3, and Chi-squared (14) of 2.50 (prob. 0.9997) for column 4. We would conclude that our core results in columns 1 and 2 of Table (2) are statistically the same as the core results in columns 3 and 4 of Table (4).

Insert Table (4) here

7. Concluding Remarks

Our objective has been to investigate the role of market integration in determining the pattern of bilateral FDI in the OECD. We have focussed on the major home countries amongst the advanced market economies. We can, as a consequence of our results, draw conclusions both

for policymakers and for potential future work on patterns of bilateral FDI in market economies. Our work stresses the importance of home and host size in determining the scale of FDI, but the relatively greater importance of host size suggests that market size matters in addition to the productive capacity factors stressed in the theoretical Gravity Model approaches. It is also clear that the creation of a Common, or Single Market between countries changes patterns of FDI, raising stocks of FDI amongst member countries. In addition, increases in the distance between partners is a major factor affecting stocks of FDI, with a 10 % increase in distance apart reducing FDI stocks by over 4 %. Time zone effects do not seem to be particularly important. There is a little evidence that the effects of distance are being reduced, perhaps by new technologies. Distance may be dying, but our evidence suggests that it is doing so very slowly.

We have tested extensively for the effects of two levels of regional integration, NAFTA and the EU, and for other institutional factors. We found that common membership of the European Union had a significant and positive effect on bilateral FDI. If both countries are members of the Single Market then bilateral FDI stocks are likely to be 40 % 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 our sample we have a number of host countries joining the EU and a group of EU countries forming a currency union. Some of these changes have also stimulated FDI, with stocks from EU countries located in potential members rising for the three years before accession. Investors reacted to potential benefits, and going forward policy makers could utilise this and offer specific permanent incentives in regions they wished to improve.

There are a number of policy implications from our results on institutions and international arrangements that are of immediate relevance. Firstly, a number of countries in Europe are not members of the Monetary Union, and the case for joining in countries such as Sweden and the Czech Republic is not strengthened by our results. Membership of the European Monetary Union does not appear to change patterns of FDI, and they would not gain extra FDI by becoming members. Secondly, other institutions do matter, with our home and host Economic Freedom indicators suggesting FDI stocks will be higher wherever better quality institutions exist. There are some countries in our sample whose policies could be reducing perceived economic freedoms, and some, such as Poland and Hungary may be undertaking steps that may push them outside the Narrow Corridor into populist autocracies. Our evidence suggests that this will reduce inward FDI and limit their prospects for economic growth. It

appears from our results that positive steps to reduce labour costs to make a country more attractive will have little influence on inward FDI in countries such as Hungary, as lower costs amongst hosts are not found to be important.

It is not only amongst potential hosts that movement toward the edge of the Narrow Corridor is taking place. Economic policy in the US, and especially in the international sphere, for instance in the NAFTA renegotiations, seems to be moving it toward a more authoritarian approach. Our results suggest that this will in turn reduce the willingness of US corporations to invest abroad, and also discourage potential recipients of FDI. Both parties will suffer, and global growth may be lower. There is no evidence, however, that NAFTA had an impact on FDI stocks in the same way as the Single Market Programme in the EU, although inflows from outside the block may have been increased after the erection of common barriers to trade with outsiders. Policy makers who believe NAFTA has been unfair to the US, costing it jobs, may therefore be surprised when recent changes to the structure of NAFTA do not lead to a re-shoring of jobs from Mexico, and that European firms may reduce their investments in the US given the new environment. Further research could look in more detail at the effects on FDI of the formation of trade blocks and their changing nature over time.

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, when it leaves the EU and is outside the Single Market and the Customs Union. Of course, if it can maintain tariff free access whilst reducing the stringency of labour market regulations and increasing the scale of state aid then it may be able to offset this loss with increased FDI from inside and outside the EU. Our results on the lack of a significant role for lower host labour costs does not offer support for such policies. However, at present the possibility of obtaining such an agreement looks low, and such a strategy is unlikely to be available. The Single Market was and should be seen as, an attempt to emulate the efficiencies of the US Single Market whilst maintaining social and environmental standards and reducing the role of the state in production decisions. Although there is still some distance to go in terms of efficiency, progress has been made, but that progress will probably be reversed in the UK once it leaves, with the stock of FDI from (other) EU countries falling by perhaps a third as supply chains adjust. There is no evidence that the UK benefits from currently having a liberalised labour market in attracting FDI, as the inclusion of size, distance, and perhaps importantly a common official language are sufficient to explain FDI in the UK from outside the Single Market and the Customs Union.

Bibliography

1. Acemoglu, D., & Robinson, J.A., (2019). *The Narrow Corridor* Penguin Press, New York.
2. Anderson, J.E., & van Wincoop, E. (2003). Gravity with Gravitas: a solution to the border puzzle. *American Economic Review*, 93 (1), 170-192.
3. Antras, P. & Yeaple, S. (2014). Multinational firms and the Structure of International Trade, Chapter 2, 55- 130, in Gopinath, G., Helpman, E., & Rogoff, K., eds. *Handbook of International Economics* Vol. 4, Oxford, Elsevier B.V.
4. Arellano, M. & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), pp. 277-297.
5. Arellano, M. & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29-51.
6. Baltagi, B.H., Egger, P. & Pfaffermayr, M. (2007). Estimating models of complex FDI: Are there third-country effects?. *Journal of Econometrics*, 140(1), 260-281.
7. Baltagi, B.H., Egger, P. & Pfaffermayr, M. (2008). Estimating regional trade agreement effects on FDI in an interdependent world. *Journal of Econometrics*, 145 (1-2),194-281.
8. Barrell, R. & Pain, N. (1997). Foreign direct investment, technological change, and economic growth within Europe. *Economic Journal*, 107 (445), 1770 - 1786.
9. Bevan, A., Estrin, S. & Meyer, K. (2004). Foreign investment location and institutional development in transition economies. *International Business Review*, 13(1), 43-64.
10. Bevan, A.A. & Estrin, S. (2004). The determinants of foreign direct investment into European transition economies. *Journal of Comparative Economics*, 32(4), 775-787.
11. Blonigen, B.A. & Piger, J. (2014). Determinants of Foreign Direct Investment. *Canadian Journal of Economics/Revue Canadienne d'Economique*, 47(3), 775- 812.
12. Blundell, R. & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115-143.
13. Brouwer, J., Paap, R. & Viaene, J. (2008). The trade and FDI effects of CU enlargement. *Journal of International Money and Finance*, 27(2), 188-208.
14. Buchanan, B., Le, Q., & Rishi, M., (2012). Foreign direct investment and institutional quality. *International Review of Financial Analysis*, 21, 81-89.
15. Büthe, T., & Milner, H. V. (2008). The politics of foreign direct investment into developing countries: increasing FDI through international trade agreements?. *American Journal of Political Science*, *52*(4), 741-762.
16. Cresenzi, R., Pietrobelli, C., & Rabellotti, R., (2014). Innovation drivers, value chains and the geography of multinational corporations in Europe. *Journal of Economic Geography*, 14 (6), 1053-1086.
17. De Sousa, J. & Lochard, J. (2011). Does the Single Currency Affect Foreign Direct Investment?. *The Scandinavian Journal of Economics*, 113(3), 553-578.
18. Devereux, M.P. & Griffith, R. (1998). Taxes and the Location of Production: Evidence from a Panel of US Multinationals. *Journal of Public Economics*, 68(3), 335-367.
19. Driffield, N., & Karoglou, M. (2019). Brexit and Foreign Investment in the UK. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *182*(2), 559-582.
20. Eaton, J., & Kortum, S., (2002). Technology, Geography and Trade. *Econometrica*, 70 (5), 1741-1779.
21. Economou, F., (2019). Economic freedom and asymmetric crisis effects on FDI inflows: The case of four South European economies. *Research in International Business and Finance*, 49(C), 114-126.
22. Egger, P. (2008). On the role of distance for outward FDI. *The Annals of Regional Science*, 42(2), 375-389.
23. Feils, D. J., & Rahman, M. (2011). The impact of regional integration on insider and outsider FDI. *Management International Review, 51(1), 41-63.*

24. Greene, W.H. (2012). Econometric analysis. Chapter 13 (7th ed). *Pearson Education Limited, Harlow*, England.
25. Hansen, L.P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica*, 50(4), 1029-1054.
26. Head, K., & Mayer, T. (2014). Gravity equations: Workhorse, toolkit, and cookbook. Chapter 3, 131-195 in Gopinath, G., Helpman, E., & Rogoff, K. (Eds.). *Handbook of International Economics* Vol. 4, Oxford, Elsevier B.V.
27. Heritage Foundation, (2015). Index of Economic Freedom. The Heritage Foundation, http://www.heritage.org/index/
28. Herrera-Echeverri, H., Haar, J. & Estévez-Bretón, J.B. (2014). Foreign direct investment, institutional quality, economic freedom and entrepreneurship in emerging markets. *Journal of Business Research*, 67(9), 1921-1932.
29. MacDermott, R. (2007). Regional trade agreement and foreign direct investment. *The North American Journal of Economics and Finance*, 18(1), 107-116.
30. Mayer, T. & Zignago, S. (2011). Notes on CEPII's Distances Measures: The GeoDist Database. (CEPII Working Paper No. 2011-25).
31. Melitz, M., & Ottaviano, G., (2008). Market size, trade and productivity. *Review of Economic Studies*, 75 (1), 295-316.
32. Medvedev, D. (2012). Beyond trade: the impact of preferential trade agreements on FDI inflows. *World Development*, 40(1), 49-61.
33. Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica*, 49(6), 1417-1426.
34. Petroulas, P. (2007). The Effect of the Euro on Foreign Direct Investment. *European Economic Review*, 51(6), 1468-1491.
35. Portes, R., & Rey, H. (2005). The determinants of cross-border equity flows. *Journal of international Economics*, *65*(2), 269-296.
36. Roodman D. (2009). How to do xtabond2: an introduction to difference and system GMM in Stata. *The Stata Journal*, 9(1), 86-136.
37. Schiavo, S. (2007). Common currencies and FDI flows. *Oxford Economic Papers*, 59(3), 536-560.
38. Sondermann, D., & Vansteenkiste, I. (2019). Did the euro change the nature of FDI flows among member states?. (ECB Working Paper No. 2275).
39. Stein, E. & Daude, C. (2007). Longitude matters: Time zones and the location of foreign direct investment. *Journal of International Economics*, 71(1), 96-112.
40. UNCTAD. (2009). The Role of International Investment Agreements in Attracting Foreign Direct Investments to Developing Countries. 2009. UNCTAD Series on International Investment Policies for Development.
41. Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*, 126(1), 25-51.
42. Xiong, T., & Sun, H. (2019). Structure and dynamics of global capital and international trade: Analysis of the relationship between exports and foreign direct investment (FDI) from 2001 to 2006. *International Journal of Finance & Economics*. In press, available at: https://doi.org/10.1002/ijfe.1803
43. CEPII Distance Database <www.cepii.fr >
44. Heritage Foundation 2015 <www.heritage.org>
45. OECD Statistics <https://stats.oecd.org/>

Appendix- *Countries included in the sample.*

Home countries (14)	EU Countries (accession dates)	Currency Union (dates)	Host Countries (31)	EU Countries (accession dates)	Currency Union (dates)
Austria	EU	1999	Australia	--	--
Belgium	EU	1999	Austria	EU	1999
Canada (**N**)	--	--	Belgium	EU	1999
France	EU	1999	Canada (**N**)	--	--
Germany	EU	1999	Czech Republic	EU 2004	--
Italy	EU	1999	Denmark	EU	--
Japan	--	--	Estonia	EU 2004	2011
Korea, Rep.	--	--	Finland	EU	1999
Netherlands	EU	1999	France	EU	1999
Spain	EU	1999	Germany	EU	1999
Sweden	EU	--	Greece	EU	2001
Switzerland	--	--	Hungary	EU 2004	--
United Kingdom	EU	--	Ireland	EU	1999
United States (**N**)	--	--	Israel	--	--
			Italy	EU	1999
			Japan	--	--
			Korea, Rep.	--	--
			Mexico (**N**)	--	--
			Netherlands	EU	1999
			New Zealand	--	--
			Norway	--	--
			Poland	EU 2004	--
			Portugal	EU	1999
			Slovak Republic	EU 2004	2009
			Slovenia	EU 2004	2007
			Spain	EU	1999
			Sweden	EU	--
			Switzerland	--	--
			Turkey	--	--
			United Kingdom	EU	--
			United States (**N**)	--	--

Sources, OECD FDI statistics. NOTE: N: NAFTA block member.

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 in US$.	(OECD)
$EXP_{i,j,t}$	Bilateral exports of goods (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	CEPII Distance Database (www.cepii.fr)
$R_{i,t}$. $R_{j,t}$	An index of economic freedom that refers to whether there is any restriction on trade in a country.	Heritage Foundation 2015 (www.heritage.org)
$EU_{i,j,t}$	Dummy variable that equals 1 if countries i and j are EU members at time t and 0 otherwise.	(see Appendix)
$NAFTA_{i,j,t}$	Dummy variable that equals 1 if countries i and j are inside NAFTA trade block members at time t and 0 otherwise.	(see Appendix)
$Lang_{i,j}$	Dummy variable that equals 1 when both countries share a common official language and 0 otherwise.	www.cepii.fr
$CU_{i,j,t}$	Dummy variable that equals 1 if countries i and j use the same currency (euro) at time t and 0 otherwise.	(see Appendix)
$RULC_{i,t}$ $RULC_{j,t}$	labour costs in the host or home country relative to the countries it trades with country, Exchange Rate Adjusted RULC, Index OECD base year (2010=100)	(OECD)
$TimDiff_{i,j,t}$	Variable accounting for the time differential in between the capital cities of the lender and borrower countries.	Britannica atlas, Encyclopaedia Britannica Inc. 1994
home- Non EU, host- EU	Dummy variable that equals 1 if home country is a non-EU member and host country is EU member at time t and 0 otherwise.	(see Appendix)
home-EU, host- Non EU	Dummy variable that equals 1 if home country is EU member and host country is a non-EU member at time t and 0 otherwise.	(see Appendix)
home- Non NAFTA, host- NAFTA	Dummy variable that equals 1 if home country is non-NAFTA member and host country is NAFTA member at time t and 0 otherwise.	(see Appendix)
home- NAFTA, host- Non NAFTA	Dummy variable that equals 1 if home country is NAFTA member and host country is non- NAFTA member at time t and 0 otherwise.	(see Appendix)
home- Non EU, UK (host)	Dummy variable that equals 1 if home country is a non-EU member and the UK is host country at time t and 0 otherwise.	(see Appendix)
UK (host)	Dummy variable that equals 1 when the UK is host country and 0 otherwise.	(see Appendix)
Before joining EU	Dummy variable that equals 1 in the three years before joining EU and 0 otherwise.	(see Appendix)
After joining EU	Dummy variable that equals 1 in the year after new members joining year and 0 otherwise.	(see Appendix)

**Annual data over the period 1995-2016.

TABLE (2)

Results for dynamic panel-data estimation using two-step SYS-GMM, for FDI stocks.

Table (2) presents the results for the determinants of FDI stocks from high income countries to OECD countries

Independent Variables	Column (1)	long-run estimates	Column (2)	Column (3)	Column (4)	Column (5)	Column (6)
$y_{i,j,t-1}$	0.1048**		0.1120**	0.1060**	0.1039**	0.1059**	0.1386***
	(0.0482)		(0.0482)	(0.0482)	(0.0482)	(0.0482)	(0.0491)
$\log(GDP_{i,t})$	0.4724***	0.5277	0.5014***	0.4513***	0.5030***	0.4838***	0.4830***
	(0.0858)	39.25***	(0.0880)	(0.0826)	(0.0959)	(0.0854)	(0.0931)
$\log(GDP_{i,t})$	0.5598***	0.6253	0.5610***	0.5285***	0.5288***	0.5683***	0.5385***
	(0.0836)	65.22***	(0.0833)	(0.0810)	(0.0804)	(0.0831)	(0.0803)
$\log(EXP_{i,i,t})$	0.3611***	0.4034	0.3365***	0.4078***	0.3628***	0.3633***	0.3076***
	(0.0659)	26.08***	(0.0652)	(0.0645)	(0.0673)	(0.0659)	(0.0735)
$R_{i,t}$	0.0406***	0.0454	0.0492***	0.0380***	0.0455***	0.0409***	0.0517***
	(0.0071)	32.79***	(0.0084)	(0.0073)	(0.0077)	(0.0071)	(0.0080)
$R_{j,t}$	0.0355***	0.0397	0.0295***	0.0341***	0.0347***	0.0344***	0.0367***
	(0.0077)	25.32***	(0.0081)	(0.0081)	(0.0086)	(0.0078)	(0.0088)
$\log(DIS_{i,i,t})$	-0.4235***	-0.4731	-0.3792***	-0.4868***	-0.4775***	-0.4379***	-0.5081***
	(0.0960)	23.32***	(0.1001)	(0.0908)	(0.1062)	(0.0957)	(0.1046)
$Lang_{i,j}$	1.9837***	2.2159	2.4271***	2.0303***	1.9625**	2.0940***	1.5876**
	(0.6187)	10.44***	(0.7102)	(0.6189)	(0.7841)	(0.6262)	(0.7905)
$CU_{i,j,t}$	-0.0590	-0.0659	-0.0727	0.1133	-0.0422	-0.0714	0.0032
	(0.1249)	0.22	(0.1327)	(0.1297)	(0.1299)	(0.1259)	(0.1289)
$\log(RULC_{i,t})$	-0.0482	-0.0538	-0.0750	-0.0394	-0.0641	-0.0478	0.5964**
	(0.1172)	0.17	(0.1195)	(0.1151)	(0.1208)	(0.1170)	(0.2538)
$\log(RULC_{j,t})$	0.3348**	0.3740	0.3842***	0.3580**	0.3179**	0.3413**	0.5387*
	(0.1455)	5.54**	(0.1458)	(0.1460)	(0.1443)	(0.1452)	(0.2755)
$EU_{i,j,t}$	0.4245**	0.4742	0.8231***		0.4310**	0.3989**	0.5265**
	(0.1747)	6.04**	(0.2927)		(0.1777)	(0.1755)	(0.2449)
$NAFTA_{i,j,t}$				-1.3366	-0.9594	-1.1330	-0.6013
				(0.8616)	(0.7496)	(0.7809)	(0.7090)
home- Non EU, host- EU			0.1156				0.0516
			(0.2108)				(0.1881)
home-EU, host- Non EU			0.4927**				0.2900
			(0.2362)				(0.1979)
home- Non NAFTA, host- NAFTA					0.6191***		0.5600***
					(0.2346)		(0.2166)
home- NAFTA, host- Non NAFTA					0.0303		0.2150
					(0.3091)		(0.3274)
Constant	-24.4175***		-25.8483***	-23.2640***	-24.2331***	-24.8850***	-27.8543***
	(2.8914)		(3.0099)	(2.7513)	(3.0956)	(2.8905)	(3.3759)
Observations	6897		6897	6897	6897	6897	6897
AR(1) test	-3.75***		-3.83***	-3.79***	-3.77***	-3.76***	-3.96***
AR(2) test	-1.20		-1.12	-1.16	-1.21	-1.20	-1.01
J-test~χ2(378)	392.99		393.53	392.95	392.88	392.91	392.34
J-test: p-value	0.287		0.280	0.287	0.288	0.288	0.320

Notes: All regressions are estimated over the period 1995–2016 using a dynamic two-step system GMM estimator (Blundell & Bond,1998) with finite sample correction to the variance-covariance matrix (Windmeijer, 2005). Huber–White robust standard errors are reported in parenthesis. ***, **, and * denotes statistical significant at 1%, 5%, and 10% level, respectively. Panel coherent serial correlation tests (AR(*p*)) are for order *p=1,2* (Arellano & Bond, 1991). The J-test statistic with p-values related to over-identifying restrictions (Hansen, 1982).

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 ~$\chi^2(1)$ is reported in the second row for each long run coefficient. Denoted by ***, **, and *, coefficients are statistically significant at 1%, 5%, and 10%, respectively.

TABLE (3)

Robustness results

Table (3) presents the results on the gravity model including the effect of time zone and the 'Death of Distance'. Columns (3) and (4) investigate whether the UK has special advantages above the rest of the EU countries

Independent Variables	**Column (1)**	**Column (2)**	**Column (3)**	**Column (4)**	**Column (5)**
$y_{i,j,t-1}$	0.1064**	0.1050**	0.1048**	0.1048**	0.1051**
	(0.0482)	(0.0482)	(0.0482)	(0.0482)	(0.0486)
$\log(GDP_{i,t})$	0.4909***	0.4767***	0.4727***	0.4699***	0.4547***
	(0.0854)	(0.0857)	(0.0858)	(0.0861)	(0.0845)
$\log(GDP_{i,t})$	0.5728***	0.5625***	0.5598***	0.5556***	0.5475***
	(0.0835)	(0.0839)	(0.0836)	(0.0850)	(0.0845)
$\log(EXP_{i,i,t})$	0.3596***	0.3584***	0.3610***	0.3633***	0.3680***
	(0.0658)	(0.0658)	(0.0659)	(0.0661)	(0.0665)
$R_{i,t}$	0.0412***	0.0407***	0.0406***	0.0406***	0.0368***
	(0.0072)	(0.0071)	(0.0071)	(0.0072)	(0.0075)
$R_{j,t}$	0.0355***	0.0363***	0.0356***	0.0351***	0.0316***
	(0.0078)	(0.0076)	(0.0077)	(0.0078)	(0.0079)
$\log(DIS_{i,i,t})$	-0.3490**	-0.3708**	-0.4245***	-0.4205***	-0.4180***
	(0.1691)	(0.1615)	(0.0960)	(0.0959)	(0.0919)
$Lang_{i,j}$	2.1767***	2.0181***	1.9698***	1.9809***	2.2345***
	(0.7441)	(0.7145)	(0.6412)	(0.6330)	(0.7289)
$CU_{i,j,t}$	-0.0853	-0.0663	-0.0577	-0.0520	-0.1008
	(0.1326)	(0.1302)	(0.1252)	(0.1294)	(0.1228)
$\log(RULC_{i,t})$	-0.0469	-0.0478	-0.0484	-0.0494	-0.0005
	(0.1172)	(0.1173)	(0.1171)	(0.1172)	(0.1086)
$\log(RULC_{j.t})$	0.3372**	0.3315**	0.3342**	0.3390**	0.4043***
	(0.1454)	(0.1459)	(0.1455)	(0.1457)	(0.1483)
$EU_{i,j,t}$	0.3926**	0.4210**	0.4229**	0.4186**	0.4375**
	(0.1784)	(0.1767)	(0.1746)	(0.1754)	(0.1736)
$NAFTA_{i,j,t}$	-1.2316				
	(0.8191)				
$TimDiff_{i,j,t}$	-0.0308	-0.0183			
	(0.0381)	(0.0354)			
Tdistance					0.0010
					(0.0007)
home- Non EU, UK (host)			0.0336		
			(0.3845)		
UK (host)				0.0740	
				(0.2195)	
Constant	-25.8043***	-24.9617***	-24.4227***	-24.2991***	-23.9127***
	(3.0567)	(3.0018)	(2.8867)	(2.9082)	(2.9522)
Observations	6897	6897	6897	6897	6897
AR(1) test	-3.76***	-3.75***	-3.75***	-3.75***	-3.72***
AR(2) test	-1.20	-1.20	-1.20	-1.20	-1.21
J-test~χ2(378)	392.90	393.00	393.00	393.03	392.22
J-test: p-value	0.288	0.287	0.287	0.286	0.296

Notes: See definitions at the bottom of Table 2.

TABLE (4)

Results for dynamic panel-data estimation using two-step SYS-GMM, for FDI stocks.

Table (4) presents the results on the gravity model testing whether joining the EU boosted FDI stocks in the Accession countries, the last two columns cover the problem of missing observations.

Independent Variables	**Column (1)**	**Column (2)**	**Column (3) (without Japan)**	**Column (4) (without Japan)**
$y_{i,j,t-1}$	0.1179**	0.1162**	0.1179**	0.1269**
	(0.0480)	(0.0480)	(0.0493)	(0.0494)
$\log(GDP_{i,t})$	0.4565***	0.5002***	0.4322***	0.4511***
	(0.0867)	(0.0861)	(0.0845)	(0.0879)
$\log(GDP_{i,t})$	0.5337***	0.5676***	0.5384***	0.5451***
	(0.0828)	(0.0833)	(0.0848)	(0.0855)
$\log(EXP_{i,j,t})$	0.3888***	0.3304***	0.3685***	0.3366***
	(0.0671)	(0.0647)	(0.0660)	(0.0661)
$R_{i,t}$	0.0500***	0.0501***	0.0396***	0.0525***
	(0.0085)	(0.0083)	(0.0075)	(0.0094)
$R_{j,t}$	0.0303***	0.0312***	0.0320***	0.0247***
	(0.0082)	(0.0081)	(0.0080)	(0.0085)
$\log(DIS_{i,i,t})$	-0.3151***	-0.3900***	-0.4221***	-0.3645***
	(0.1097)	(0.0986)	(0.0991)	(0.1059)
$Lang_{i,j}$	2.3330***	2.2683***	2.1631***	2.6938***
	(0.6857)	(0.6808)	(0.6095)	(0.7163)
$CU_{i,j,t}$	-0.0752	-0.0518	-0.0724	-0.0752
	(0.1341)	(0.1306)	(0.1251)	(0.1325)
$\log(RULC_{i,t})$	-0.0710	-0.0624	-0.0234	-0.0763
	(0.1168)	(0.1188)	(0.1293)	(0.1357)
$\log(RULC_{j,t})$	0.2873**	0.3592**	0.1924	0.2441
	(0.1462)	(0.1455)	(0.1476)	(0.1492)
$EU_{i,j,t}$	0.9028***	0.7854***	0.4543***	0.9962***
	(0.3059)	(0.2836)	(0.1756)	(0.3212)
home- Non EU, host- EU	0.1874	0.1132		0.1839
	(0.2168)	(0.2047)		(0.2298)
home-EU, host- Non EU	0.5067**	0.4821**		0.6621**
	(0.2336)	(0.2304)		(0.2663)
Before joining EU	0.6351***			
	(0.2007)			
After joining EU		0.0990		
		(0.1591)		
Constant	-25.3503***	-25.9454***	-22.3119***	-23.8296***
	(2.9610)	(3.0071)	(2.8557)	(2.9988)
Observations	6897	6897	6592	6592
AR(1) test	-3.96***	-3.86***	-3.79***	-3.89***
AR(2) test	-1.22	-1.17	-1.18	-1.06
J-test~χ2(378)	393.84	394.34	377.03	380.16
J-test: p-value	0.277	0.271	0.504	0.459

Notes: See definitions at the bottom of Table 2.