Deep Economic Integration, Foreign Investment and International Trade: The Effects of Membership of the European Union*

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21th March 2018

*****We would like to thank, without implicating, Fabrizio Coricelli, Nicholas Crafts, Swati Dhingra, Peter Egger, Jan Fidrmuc, Michele Ruta, John Springford, John Van Reenen and seminar participants at Brunel University London, DIW Berlin, ECB Frankfurt, Kyoto University, Japan, LSE, NIESR and World Bank for valuable comments on previous versions. Dustin Voss provided alacritous research assistance.

Abstract

This paper investigates how deepening economic integration fosters foreign direct investment (FDI) and international trade. The paper makes three contributions: it proposes new ways to deal with selection and implementation lags; it investigates integration deepening; and it estimates the effects of integration on FDI and trade jointly. Within a structural gravity framework and using annual bilateral data from 34 OECD countries over 1985–2013, we find that deep (shallow) integration in the form of EU membership (EFTA) increases trade by about 100% and FDI inflows by about 25%. The FDI estimates are unaffected by the inclusion of trade, while our trade estimates are reduced once we account for FDI.

Keywords: deep economic integration, foreign direct investment, international trade, European Union, gravity model

JEL classification: F17, F21, F36

1. Introduction

This paper investigates the importance of deep economic integration, such as membership of the European Union, in fostering both foreign direct investment and international trade for member countries. Discussions about economic integration have tended to focus on trade (Anderson and Van Wincoop, 2003; 2004) though its potential impact on foreign direct investment (FDI) is also beginning to be recognized (Blomstrom and Kokko 2003; Egger and Pfaffermayr 2004; Baier, Bergstrand and Feng 2014). Even so, while the determinants and effects of FDI are well established in the economics literature (Helpman et al., 2004; Javorcik, 2004; Haskel et al., 2007), there is much less analysis of how FDI inflows are affected by international integration experience. Nowhere is this *lacuna* more conspicuous than concerning the evolution of the European Union. This has likely played an important role in fostering FDI as well as trade, both between member economies and with the rest of the world, as indicated by the impact of announcements about future EU membership on FDI into transition economies in the 1990s (Bevan and Estrin, 2004).

Our aim in this paper is to use frontier estimation methods to provide the best possible measures of the effects of economic integration on both trade and FDI jointly, and on FDI examined in much more depth separately. Our stress on estimation methods, particularly concerning FDI, is motivated by recent developments in the literature on the trade effects of deep economic integration. Notably, Glick and Rose (2015) find that their earlier estimates (Glick and Rose, 2002) of the positive impact of currency unions on trade are not supported when subjected to modern econometric techniques. Our results also provide an indication of the possible effect of EU exit on FDI for a current member, as it is likely to occur given the 2016 referendum vote by the UK.

Our analysis is based on the gravity model, a "work-horse" of the empirical international trade literature (Anderson, 2011). The gravity model has been successfully applied to explain most forms of bilateral cross-border flows, including trade, migration, and foreign direct investment in terms of the relative size and distance between countries and/or regions (Baldwin and Taglioni, 2011; Head and Mayer, 2014). The gravity model highlights the potential for trade and FDI between relatively large economies, which are close together geographically. A country's economic size is expected to have a positive effect on bilateral flows while distance is expected to have a (nonlinear) negative effect. Distance is often measured geographically but is usually taken to reflect a range of transactional and frictional costs associated with differences in regulations, tariff and non-tariff barriers as well as language and culture (North, 1991; Ghemawat, 2001). The last two decades have witnessed enormous research progress in the empirical application of gravity models including Anderson and van Wincoop (2003); Santos Silva and Tenreyro (2006); and Bergstrand and Egger (2007). The resulting new structural gravity approach (Fally, 2015; Blonigen and Piger, 2014) provides the necessary theoretical underpinnings as well as strong empirical support for the econometric estimation of gravity models.

We estimate a structural gravity model using data for 34 OECD countries between 1985 and 2013 for bilateral FDI flows, bilateral distance, GDP and GDP per capita (for sender and target countries) and the shares of manufacturing output, exports and imports in total GDP. Our data represent more than 70% of global FDI flows and, because the countries are all OECD members, they are collected in a homogenous manner and are of uniform and high quality.

We use a variety of econometric techniques and sensitivity analyses to ensure the robustness of our findings, including dynamic estimation, lags, stock rather than flow measures of FDI, and addressing selection issues. Our estimates of the impact of deep economic integration *via* EU membership underlines the role of FDI as a channel for benefits from deep integration. The effect of EU membership on FDI is always estimated to be positive, ranging by estimation method from 14% (Heckman) to 33% (OLS) to 38% (Poisson estimates).

Furthermore, when the impact of EU membership on trade and FDI are estimated *jointly* using seemingly unrelated regression (SUR) methods, the impact on FDI is again found to be positive and falling within the previously estimated range, while the effect on trade is also positive and larger, yet proportionately scaled down from previous estimates.

2. FDI, Trade and Integration: A Conceptual Framework

In this section, we propose a conceptual framework to consider the potential effects of economic integration on FDI and trade. The distinction between shallow and deep integration is important in this case: shallow integration is epitomized by the free trade area model and is restricted to economic integration, while deep integration combines economic and political aspects (Campos et al., 2015). An important case of deep integration is the customs union in which economic ties are supported by the creation of common institutions to manage conflict which may emerge regarding the common external tariff. The European Union represents perhaps the most sophisticated example of deep integration to date.

2.1 Exiting Evidence

The changing character and pattern of international trade is relevant when considering FDI and trade (Baldwin, 2016). Traditionally, international trade was understood to be driven by the exploitation of mutual comparative advantage, implicitly focusing on final products. However, in the last two or three decades, trade has in fact increasingly involved the exchange of parts and components within firms and industries value chains, rather than final goods, and has been increasingly driven by domestic absorptive capacity (Castellacci, 2011; Cohen and Levinthal 1990; Mowery and Oxley 1995; Kim 1998). Deep integration has contributed to this emergence of global value chains (GVCs) in which production is spread across various countries leading to a larger role for intra-industry trade. UNCTAD (2013) estimated that 60% of global trade was in intermediate goods and services.

Trade is a critical element of global integration but FDI plays a special role in the development of host economies because as a factor input, foreign direct investment can stimulate economic growth and efficiency through spillovers, both horizontally across the industry (Haskel et al., 2007) and vertically up and down the supply chain (Javorcik, 2004). Indeed, the entry of foreign firms in the domestic market can stimulate technological innovation (Alfaro et al., 2004), put pressure on domestic competitors (Mastromarco and Simar, 2015), and diffuse frontier management practices (Bloom et al., 2012). FDI may also exhibit complementarity patterns not only with respect to international trade, but also with other elements of financial globalization (Greenaway and Kneller 2007;Lane and Milesi-Ferretti 2008).

Our empirical analysis follows the literature in being based on the gravity model, a staple of international economics (Anderson and van Wincoop, 2003). The gravity model and its associated econometric framework was originally developed to explain international trade flows, but has also been applied to FDI flows and integration effects (Blonigen, 2005; Anderson, 2011). The seminal paper in the modern econometric evaluation of free trade area agreements literature is Baier and Bergstrand (2007). This paper is one of the first to make the point that moving away from a cross-section design to one based on panel data in a gravity framework was necessary in order to deal with endogeneity bias (see also Baier and Bergstrand, 2004; Egger and Pfaffermayr, 2004; Baier et al. 2014).

This literature generates specific estimates of the economic benefits of deep vis-à-vis shallow integration. For instance, Baier et al. (2008) calculate that membership of the European Union leads to increases in bilateral international trade of the order of between 127 and 146%, ten to fifteen years after joining. This compares favourably with equivalently estimated benefits from shallow integration; they also find that membership in the European Free Trade

Association (EFTA) generates increases in bilateral trade that are of about one quarter of the size of those generated from deep integration agreements (such as the EU and the EEA). EFTA effects are estimated at only about 35% over the 10 to 15-year period following the start of membership.

There has also been important research on individual aspects of deep integration on FDI inflows. Of interest in our case is the impact of deepening monetary integration (for instance, by using a single currency) on trade and FDI inflows. De Sousa and Lochard (2011) is particularly relevant in this respect because they investigate whether the creation of the euro (in the context of the European Monetary Union, EMU) in 1999 explains the sharp increase in intra-European investment flows. They tackle this question using a gravity model for bilateral foreign direct investment (FDI). Their main finding is that the euro increased intra-EMU FDI stocks by around 30% percent. More importantly, they find evidence that this effect varies over time and across EMU members: it is significantly larger for outward investments of less-developed EMU members.[1]

One important additional issue to investigate is the complex relationship between international trade and FDI flows. This has been traditionally framed in terms of tariff-jumping FDI decisions (Motta, 1992) and has gained further impetus with recent work on the choice between trade and FDI by heterogeneous firms (Helpman et al., 2004). Econometric evidence for the model is presented focusing on US affiliate sales and US exports in 38 countries and 52 sectors. Two particularly salient findings for the impact of deep integration are (1) strong negative effects on export sales relative to FDI from sector and country-specific transport costs

[1] There has also been an important stream of studies from a regional economics perspective, of which a good example is that of Basile et al. (2008). This paper uses panel firm-level data over the period 1991–1999 covering more than 5500 foreign subsidiaries in 50 regions of eight different EU countries. The methodology they use is the mixed logit location choice model, which allows the investigation of the effects of EU regional policy (Structural Funds) in the location choice of foreign subsidiaries. Their main conclusion is that, accounting for agglomeration economies and various regional and country-level characteristics, those regional policy instruments are found to be an effective factor in explaining FDI location.

and tariffs and (2) strong support for the effects of firm-level heterogeneity on the relative export and FDI sales with greater firm heterogeneity found to lead to significantly more FDI sales relative to export sales.

A more recent take on this issue is analysed in Conconi et al. (2016), which looks at how uncertainty affects the trade-off between exports and FDI. They argue that firms initially choose to export in order to learn about the market and the country and, once learning takes place, they may choose to substitute these exports by investing directly, hence the trade-off may be resolved over time. Conconi et al. (2016) find support for this prediction of long term complementarity between trade and FDI in that the probability that a firm starts investing in a foreign country significantly increases with its export experience in that country. Hence one might expect that long-term institutions underpinning deep economic integration might have a positive impact on both trade and FDI by amplifying this complementarity.

2.2 Theoretical Framework for the Gravity Model

Although the gravity model started out as a purely empirical model, it has now been given solid theoretical foundations to explain cross country trade patterns (Anderson and Van Wincoop, 2003). Maybe the simplest way to derive theoretically the gravity equation for trade is to impose a market-clearing condition on an expenditure equation. We follow Baldwin and Taglioni (2007) and, using CES preferences for differentiated varieties, write the expenditure equation as

$$\vartheta_{od} \equiv \left(\frac{p_{od}}{p_d}\right)^{1-\sigma} E_d \qquad (1)$$

where the left-hand side represents total spending in country d on a variety produced in country o (d for destination, o for origin), p_{od} is the consumer price in country d of a variety produced in country o, p_d is the price index of all varieties in country d, σ is the elasticity of substitution among varieties (assumed greater than 1) and E_d is the total consumer expenditure in the destination country.

Profit maximization by producers in country o yields $p_{od}=\mu_{od}m_o\tau_{od}$ where μ_{od} is the optimal mark-up, m_o is the marginal cost, and τ_{od} represents bilateral trade costs. Assuming monopolistic or perfect competition, the mark-up is identical for all destinations. For the case of Dixit-Stiglitz monopolistic competition, the mark-up is $\sigma/(\sigma-1)$ which means that consumer prices in country i are $p_{oo}= (\sigma/(\sigma-1))\ m_o\tau_{oo}$ and $\tau_{oo}=1$ if we assume there are no domestic barriers. Assuming symmetry of varieties for convenience and summing over all varieties yields

$$V_{od} = n_o p_{oo}^{1-\sigma} \quad \frac{\tau_{od}^{1-\sigma}}{p_d^{1-\sigma}} E_d \tag{2}$$

where V_{od} is the aggregate value of the bilateral trade flow from origin to destination and n_o is the number of varieties produced in origin and sold in destination.

The market-clearing condition requires that supply and demand match: when summing equation (2) over all destinations (including own sales) is equal to the country total output (Y_o). The condition can then be stated as

$$Y_o = n_o p_{oo}^{1-\sigma} \sum_d \frac{\tau_{od}^{1-\sigma}}{p_d^{1-\sigma}} E_d \tag{3}$$

and solving it yields $n_o p_{oo}^{1-\sigma} = Y_o/\Omega_o$where $\Omega_o$is an index of market-potential. Substituting this market-clearing condition on the expenditure function yields the gravity equation:

$$V_{od} = \tau_{od}^{1-\sigma} \frac{E_d Y_o}{p_d^{1-\sigma}\ \Omega_o} \tag{4}$$

For the econometric implementation of (4), E_d is proxied by the destination (host) country's GDP, Y_o is proxied by the origin (source) country's GDP, $p_d^{1-\sigma}\ \Omega_o$ is the multilateral trade resistance term, and τ is proxied by bilateral distance. The intuitive interpretation of the model is that bilateral trade is a positive function of the size of the economies of the two trade partners and a negative function of the distance between them[2]. Hence while there is a theoretical derivation of the gravity model for trade, currently the assumed relationship is empirical for the FDI gravity equation (Anderson, 2011).

3. Reduced Form Model

Our modelling strategy to explain the impact of deep economic integration on FDI and trade therefore follows the *structural gravity approach*: a similar specification is used for example by Baier and Bergstrand (2007) and Baier et al. (2008). The empirical gravity equation model for FDI parallels the specification for equation (4) above in the literature for trade (e.g. Bergstrand and Egger, 2007):

$$ln(bilateral\ flow\ of\ FDI_{o,d,t}) = \alpha_0 + \alpha_1 lnX_{o,t} + \alpha_2 lnX_{d,t} + \mathrm{I}_t + \eta_{o,d} + u_{o,d,t} \quad (5)$$

where *ln(.)* stands for a natural logarithm of a unidirectional flow and the $X_{o,t}$ is a vector of characteristics of the origin country, *o*, in year *t*. Similarly, $X_{d,t}$ is a vector of destination nations' characteristics in year *t*. As for trade these include measures of the size of the economy (GDP) of the countries as well as indicators of *time-varying* economic distance. We also include a full set of time dummies to control for global macroeconomic shocks, I_t.

However, many of the key host and home economy variables in a gravity equation, including almost all potential indicators of distance (transportation costs, cultural affinity, geography, etc.), common borders, landlocked countries, ocean harbours, lack of mountains, customs, different language/money, regulation, legal origin, are either invariant or do not

[2] However, one cannot apply a parallel argument to derive a gravity model for FDI, because as a factor input it cannot be aggregated across product markets.

change greatly over time for each pair (dyad) of countries. For these reasons, we instead include an *unordered*[3] dyadic fixed effect ($\eta_{o,d}$) as a dummy variable for each pair of countries. The coefficients of interest, the variable indicating deeper ties of integration such as the EU membership are identified from the impact of changes in trading/economic/political relationships (and other economic variables) *over time* on the change in FDI flows *over time*. Being a member of the EU will be one of the *time-varying* observable characteristics of a country that enters the $X_{o,t}$ and $X_{d,t}$ vectors of characteristics specific to a country and will include things like *time-varying* pair proxy for trade/investment costs and *time-varying* regulatory cultural distance. The $u_{o,d,t}$ is the idiosyncratic error term. The standard errors are clustered by dyadic pair to allow for serial correlation of the errors.

In our FDI equations, we first estimate a baseline model using the natural logarithm of bilateral unidirectional FDI flows; second, we estimate a Poisson model (Santos Silva and Tenreyro, 2006) controlling for dyadic fixed effects and time dummies. The use of bilateral fixed effects helps to minimise the effects of the exclusion of many of the usual suspects in explaining FDI flows. They control for country pair unobserved heterogeneity and hence, implicitly, for factors such as cultural distance, bilateral regulatory agreements, etc. Concerns regarding omitted variable bias is mitigated in this way in these types of models. Year fixed effects are also important in that they reflect the macro phenomena that are common across all country-pairs. In our joint FDI and trade equations, with which we commence our analysis, we estimate only the baseline equation using SUR methods, i.e. the simultaneous effects of deeper integration on trade and FDI together estimating two equations jointly using seemingly unrelated regression analyses to identify the separate impacts of EU membership.

In the FDI equations, we undertake a variety of robustness checks, for example using

[3] The use of ordered dyadic dummies would account for asymmetric 'distances'. Following the literature, we use unordered ones.

stock rather than flow measures of foreign investment and considering dynamic specifications as well as lag structures. We also consider the impact of other integrative institutions such as the NAFTA and EFTA.

4. Empirical Analysis

4.1 The effects of EU membership on FDI and trade; SUR methods

First, we consider the effects of deeper economic integration through EU membership on both trade and FDI together. The literature has analysed extensively structural gravity models separately for trade and EU membership (Baier and Bergstrand, 2007; Dhingra et al. 2016, 2017). Our approach is to use seemingly unrelated regression (SUR) modelling to estimate structural gravity models on FDI and trade jointly. In the joint regressions, we estimate our baseline fixed effect specification for FDI and trade derived from equation (5). The trade equation is not identical to the FDI equation because, unlike in the FDI literature (Bevan and Estrin, 2004) trade equations do not control for GDP per capita. This is because FDI equations capture cross country flows in a factor input, which is argued to be sensitive to levels of development in the host economy and the economic distance between the home and host economy in a way that output flows are not. Hence, the factors are not considered to be of comparable relevance in modelling flows in goods markets. Thus, the trade equation does not contain GDP per capita of the source and host economy. We estimate a SUR gravity model for both FDI-imports and FDI- exports and the results are reported in Table 1.

The findings for GDP of the home and host economies as well as for GDP per capita are as expected and conform to the gravity literature. Our focus is the estimated effects of deep economic integration. We identify positive effects on EU membership on both FDI and exports, and FDI and imports. The estimated coefficients on FDI have the same sign and significance when estimated jointly with imports or exports, though are somewhat smaller than in our FDI-only regressions. However, the estimated trade effects of EU membership are somewhat larger than for FDI, with the difference more pronounced for exports than imports. The effect is in fact 13% for FDI (vis-à-vis 29% for import) in the first SUR model and 14% for FDI (vis-a-vis 41% for export) in the second SUR model.

[Insert Table 1 about Here]

4.2 Baseline Specification

Table 2 shows estimates of the gravity equation (5) with the dependent variable being bilateral FDI flows. We compare the baseline panel FE estimator with the Poisson Pseudo-Maximum Likelihood (PPML) model for two main reasons: the current stage in the evolution of modelling gravity equations is the PPML estimator (for an account of the advantages see Santos Silva and Tenreyro, 2006); we do not exclude from the data the bilateral flows observations of zero (see description section) and the PPML estimator can deal well with the resulting highly right-skewed nature of the distribution of flows[4]. We analyse the regressors in order. The size of the two countries is measured by GDP and the level of development is measured by GDP per capita. The size of both sender and target significantly and positively affects FDI, as we would expect from the gravity model flows. The level of development -GDP/capita- is significant only for the sender country and even this result is not robust to the PPML estimation.

The main variable of interest is again the one capturing deep economic integration *via* EU membership, namely the estimated coefficients for the EU *target* dummy for the host economy. This takes values between 33% and 38% for the Panel FE and PPML estimators

[4] The results are robust to the use of the Gamma-PML instead indicating that the conditional mean is correctly specified.

respectively.[5] These are all statistically significant. The robustness analysis section is described below.

[Insert Table 2 about Here]

4.3 Robustness Analysis

We subject the baseline estimation results to four demanding alternative specifications and estimation methods to test the robustness of our results concerning the impact of EU membership on FDI. These allow us to explore the effects of gradual adjustment to EU membership through a distributed lag structure and to address possible sample selection bias. We report and discuss these results in the sub-sections below.

4.3.1 Sample selection bias and Heckman estimation

Suppose that OLS and Poisson regressions are biased by the inclusion of 'positive only' data of bilateral FDI flows. 41% of the observations are zero and the OLS model traditionally deals with this by giving a value of $1 of FDI to the missing value so we can take logarithms. However, this is arbitrary and the fact that there are no bilateral trade flows between two countries may be telling us about the sunk costs of doing business between the particular dyad of countries. We address this issue by applying a Heckman selection model in which we first estimate a selection equation in which the likelihood of non-zero flows is modelled as a function of manufacturing, exports and import shares as well as per capita GDP of the destination country.

Notice that for some pairs of countries, no data are reported on bilateral FDI flows. The common practice in the literature seems to be recoding the missing values to zero and then simply ignoring these observations by estimating the gravity model on dyads which report strictly positive (and higher than 1) FDI flows (Santos Silva and Tenreyro, 2006).

[5] On the baseline OLS estimate of column (1) the effect is 33% being calculated as $e^{0.285}$-1, in the Poisson model of column (2) it is 38%= $e^{0.32}$ - 1.

Alternatively, other papers substitute missing/zero values with an arbitrarily small constant so that the natural log of these observations is defined and log-computable (Santos Silva and Tenreyro, 2006). There is no entirely satisfactory solution to this problem since the missing values could be because FDI is truly zero, or because it is non-zero and it is measured with error but relatively small and escapes statistical reporting or because it is non-reported for other unknown reasons. However, in all these cases, the estimation can lead to biased coefficients' estimate due to sample selection.

The Heckman sample-selection model works by estimating the determinants of being selected into the sample simultaneously with estimating the determinants of the levels of FDI flows for the dyads selected into the sample because they are non-zero. We therefore re-estimate the model for FDI inflows reported in Table 2 (columns 1 and 2) using the inverse Mills-ratio from the selection equation with the results reported in Table 3.

This procedure considerably reduces the estimated size of EU membership effect on FDI but not its significance. The effect is now estimated to be 14% (= $e^{0.13}$-1). In the selection equation, we have used three 'excluded' variables from the target country: manufacturing Value Added/GDP, export/GDP, import/GDP.

Three comments are in order. First, the manufacturing value added over GDP variable signals a positive selection into the sample, meaning that target countries with bigger manufacturing share as a percentage of GDP tend to also experience positive (vis-à-vis none) FDI inflows. Second, the trade pattern in the target countries works in two directions, with exports having a negative and imports a positive selection effect for non-zero FDI flows. Finally, and most importantly, the coefficient on the inverse Mills-ratio is positive indicating positive selection; this means that, without the correction, the estimate of the impact on FDI would have been upward-biased.[6] However, even after taking sample selection into account, the estimated impact on FDI remains positive and significant.

[Insert Table 3 about Here]

4.3.2 Adjustment effects and distributed lags

The effects of deep economic integration may not be felt contemporaneously. Indeed, the impact could be gradual, or anticipated prior to EU membership. These possibilities led us to explore the dynamics of the relationship between EU membership and FDI. In this regression model, FDI inflows are the dependent variable and EU membership variables have been lagged. The reported specifications include up to the fourth lag effects, and one forward effect. The estimates of the lagged EU coefficients are presented in Table 4.

[Insert Table 4 about Here]

The coefficients of FDI target country EU membership dummies in columns (1) to (4) demonstrate a stable long-term positive effect of EU membership on FDI inflows, which is more than 1.5 times larger than our baseline specifications. For column (5), because we have a forward term, the first lead dummy represents the long-term positive effect, which is also significant and positive.

We also find that by adding up the coefficients of contemporaneous and lagged terms of EU membership (target), the baseline overall impact can be gauged as a sum of between 16 and 18% which is a more conservative estimate than we have shown above.

[6] We note that the *lambda* term is significant and negative, suggesting that the error terms in the selection and primary equations are negatively correlated, so the selection equation is needed.

4.4 Alternative scenarios

We consider two further extensions to our framework. We first analyse the impact of joining the EU on FDI, having not previously been a member, rather than the average effect of EU membership as we did before. We also study the effects on FDI of membership in other economic integration structures rather than WTO membership as the alternative to EU membership. These might be realistic alternatives for countries either joining or leaving the EU, and as such might provide a more positive alternative scenario, therefore reducing the size of the EU membership effect.

4.4.1 The effect of joining the EU

In our sample, 11 countries joined the EU during the sampled period[7], 13 countries were never in the EU[8], and 10 countries have always been a member in the period of our focus[9]. To investigate the joining effect of EU membership, we further restricted our sample to FDI flows between countries that joined EU *between* 1985 and 2013. Table 5 reports the results for the three main methods of estimation of the base regression used in the paper; OLS, Poisson and Heckman methods respectively. The estimated effects of EU membership on FDI inflows for these countries are unambiguously larger than for all EU members as reported in Table 5. Notice that we are not estimating the average treatment effects of EU membership on FDI, but a more specified "joining effect" of EU membership.

[Insert Table 5 about Here]

[7] These are Austria in 1995, Czech Republic in 2004, Spain in 1986, Estonia in 2004, Finland in 1995, Hungary in 2004, Poland in 2004, Portugal in 1986, Slovakia in 2004, Slovenia in 2004, and Sweden in 1995.

[8] These countries are Australia, Canada, Switzerland, Chile, Israel, Iceland, Japan, Korea, Mexico, Norway, New Zealand, Turkey, and USA.

[9] These countries are Belgium, Germany, Demark, France, Great Britain, Greece, Ireland, Italy, Luxemburg, and the Netherlands.

4.4.2 Being a member of NAFTA or EFTA as an alternative to EU membership

European Free Trade Association (EFTA)[10] and North American Free Trade Agreement (NAFTA)[11] are two important 'Free Trade Areas' (FTAs), which include some of the OECD countries in our dataset. The reason why we might want to control for the membership to those FTAs *above and beyond* EU is that so far, we have been implicitly treating the counterfactual to EU membership as the standard membership of the World Trade Organization (WTO). This might be an implausible hypothesis for some of the wealthy countries such as Norway (EFTA) and USA and Canada (NAFTA) within OECD economies. In the estimates reported in Table 4, we add these two dummy variables one each for the sender and recipient. We observe that the NAFTA and EFTA coefficients are statistically insignificant for the recipient while the EU recipient dummy, instead, remains positive and significant. This suggests that being a member of the EU influences FDI significantly, even when controlling for close alternatives.

[Insert Table 6 about Here]

4.4.3 Time-Varying Multilateral price terms

Finally, Following Baier and Bergstrand 2007 (section 5.5) and Baier et al. 2008 (section *e*) we account for time-varying multilateral price terms (see also the theoretical derivation in equation 4), by estimating a First-Differenced Panel Gravity Equation:

$$log(1+FDI)_t - log(1+FDI)_{(t-1)} = \alpha_1 dEU_{o,t-(t-1)} + \alpha_2 dEU_{d,t-(t-1)} + MRT_{(ot)} + MRT_{(dt)} + u_{o,d,t-} u_{o,d,(t-1)} \quad (7)$$

The results reported in Table 7 confirm the EU effect on FDI of 40%= $e^{0.335}$ - 1.

[Insert Table 7 about Here]

[10] Iceland, Lichtenstein, Norway, and Switzerland.
[11] Canada, Mexico, and USA.

4. Conclusions

How much additional FDI does a country receive because it chooses to engage in deep economic integration, for example through EU membership? This is obviously an important question for which, surprisingly, one still finds very few answers. We estimate that EU membership increases FDI inflows by between 14% and 38% depending on the choice of econometric technique so, between 1985 and 2013, EU membership led FDI inflows to be greater, on average, by about 28%. In our database we do not include most developing countries (e.g. China and India), which have played an increasing role in global FDI only after 2000, though. However, we do include all OECD countries, covering more than 70% of global FDI flows.

We undertook a thorough and systematic robustness analysis of these estimates *via* four further checks. First, we sought to address potential sample selection bias in the data, which may arise because the pattern of missing or zero flows is not random, hence our models would 'select' only countries that are prone to have bilateral FDI. We show that this selection effect is relevant and leads us to overstate the impact of deeper economic integration though this is still found to have a positive and significant impact on FDI. Next, we looked at the possibility that impact of EU membership on FDI might not be instantaneous, but rather subject to either forward or backward lags. We find evidence for such lagged effects which actually strengthen our proposition about the effects of EU membership and confirm that the EU membership 'expectations' build up until the year of joining and then beyond the date of membership. We next performed two extensions to the framework. In the first, we focused on the effects of joining the EU rather than being a member of it. This was found to be larger than the effects of membership more generally. Secondly, we compared other levels or depths of economic integration; namely membership of EFTA and NAFTA as the alternative to EU membership, rather than (implicitly) WTO rules. The impact of EU membership on FDI is also not changed substantially by this adjustment.

Finally, we consider the effects of EU membership on FDI and trade jointly. We find that deep economic integration such as has developed within the EU has the most marked effects on trade, but simultaneously does increase FDI significantly, to a level within our original range of estimates.

These results have enormous implications for the European integration project and for countries like the UK, that are currently considering substantial changes of the terms of their relationship with the EU (Dhingra et al., 2016). Countries that choose to leave the European Union may suffer significant falls in the inflows of foreign direct investment in addition to major disruptions to their trade flows. While the impact on trade are greater, the effects on FDI are also large, in the order of 14 to 38%. Given the strong spillover effects from FDI to the host economy identified in the literature (Javorcik, 2004), this suggests that the broader economic effects of leaving a deeply integrated trade group such as the European Union might be considerable and negative.

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Table 1: SUR Models

VARIABLES	FDI inflow logFDI	Import Log(IM)	FDI inflow logFDI	Export Log(EX)
logGDP_sendercon	0.54279***	1.07595***	0.52139***	1.27347***
	0.10202	0.02701	0.1017	0.03163
logGDP_recipient	0.46585***	1.06920***	0.44566***	1.57108***
	0.10193	0.02704	0.10162	0.03177
logGDPercapita_sender	1.42511***		1.48426***	
	0.04478		0.04483	
logGDPercapita_recipient	1.48477***		1.48426***	
	0.04482		0.04483	
EU Recipient	0.12489**	0.25311***	0.12772***	0.34140***
	0.04953	0.01329	0.04953	0.01411
EU Sender	-0.15472***	0.41270***	-0.16459***	0.22626***
	0.04967	0.01319	0.04968	0.01405
Constant	-28.61701***	-23.85910***	-28.58989***	-20.48800***
	3.0882	0.82949	3.07894	0.64634
Observations	25,113	25,113	25,109	25,109
R-squared	0.46559	0.94236	0.46558	0.94697
Year FE	Yes	Yes	Yes	Yes
Bilateral FE	Yes	Yes	Yes	Yes
Clustered	pairid	pairid	pairid	pairid

*** p<0.01, ** p<0.05, * p<0.1

Notes: Standard errors (clustered by 630 bilateral country pair in first two columns) in brackets. All regressions include fixed effects for years and dyadic pair. The 34 OECD countries included are Austria, Australia, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK and the US. "Target" indicates the country which is the recipient of the FDI and "sender" indicates the country is the sender of the FDI.

Table 2: Panel estimates of the effects of EU membership on FDI inflows

	(1)	(2)

Dependent variable:	Panel Fixed Effects	PPML
EU member (target)	0.285***	0.320*
	(0.077)	(0.163)
EU member (sender)	-0.01	0.828***
	(0.079)	(0.191)
Ln(GDP, target)	0.473***	3.799***
	(0.056)	(1.432)
Ln(GDP, sender)	0.500***	3.903***
	(0.154)	(1.462)
Ln(GDP per capita, target)	0.18	-1.489
	(0.158)	(1.513)
Ln(GDP per capita, sender)	1.450***	-1.125
	(0.154)	(1.623)
Constant	-25.208***	-27.125***
	(2.958)	(5.130)
Observations	32,528	32,147
R-Squared	0.470	0.423
Year FE	Yes	Yes
Bilateral FE	Yes	Yes
Clustered	Country Pair	Country Pair

Notes: *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level. Coefficients with standard errors (clustered by 630 bilateral country pair in first two columns) in brackets. All regressions include fixed effects for years and dyadic pair. Column (1) is estimated by OLS. Column (2) is estimated by Poisson PML. The 34 OECD countries included are Austria, Australia, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK and the US. "Target" indicates the country which is the recipient of the FDI and "sender" indicates the country is the sender of the FDI.

Table 3: Panel estimates of the effects of EU membership on FDI inflows-Heckman selection

	Heckman	
Dependent variable:	Ln(1+FDI)	Dummy 1(FDI>0)
EU member (target)	0.132***	
	(0.050)	
EU member (sender)	0.199***	
	(0.050)	
Ln(GDP, target)	0.686***	
	(0.226)	
Ln(GDP, sender)	0.766***	
	(0.226)	
Ln(GDP per capita, target)	-0.01	0.230***
	(0.255)	(0.017)
Ln(GDP per capita, sender)	1.655***	
	(0.254)	
Manufacturing value added/GDP (target)		0.005***
		(0.002)
Exports/GDP		-0.013***
(target)		(0.001)
Imports/GDP		0.011***
(target)		(0.002)
Mills' Ratio	1.043***	
	(0.164)	
Observations	32,528	32,528

Notes: Standard errors (clustered by 630 bilateral country pair in first two columns) in brackets. All regressions include fixed effects for years and dyadic pair. The 34 OECD countries included are Austria, Australia, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK and the US. "Target" indicates the country that is the recipient of the FDI and "sender" indicates the country is the sender of the FDI.

Table 4. Panel Gravity Equation with Bilateral Fixed and Time Fixed Effects-with lags

	(1)	(2)	(3)	(4)	(5)
VARIABLES	log(1+FDI)	log(1+FDI)	log(1+FDI)	log(1+FDI)	log(1+FDI)
EU member(target)	0.47750***	0.48156***	0.48485***	0.47971***	0.03956
	(0.11919)	(0.13189)	(0.13142)	(0.13091)	(0.11219)
EU member(sender)	-0.21377**	0.15597	0.13994	0.12660	0.16993
	(0.10610)	(0.11888)	(0.11864)	(0.11832)	(0.10385)
lag1EU member(sender)	0.36161***	-0.24870**	-0.25004**	-0.25004**	-0.25004**
	(0.09549)	(0.11551)	(0.11917)	(0.11922)	(0.11927)
lag1EU member(target)	-0.33219***	0.04467	0.02608	0.02608	0.02608
	(0.10476)	(0.12207)	(0.12894)	(0.12899)	(0.12905)
lag2EU member(sender)		0.58412***	0.03422	0.02915	0.02915
		(0.09623)	(0.11858)	(0.12706)	(0.12712)
lag2EU member(target)		-0.37082***	0.00573	0.10340	0.10340
		(0.10916)	(0.12750)	(0.13333)	(0.13339)

	(1)	(2)	(3)	(4)	(5)
lag3EU member(sender)			0.57328***	0.03776	0.03003
			(0.10252)	(0.11443)	(0.11475)
lag3EU member(target)			-0.29740***	0.41898***	0.41000***
			(0.11347)	(0.13511)	(0.13502)
lag4EU member(sender)				0.55228***	0.49703***
				(0.11373)	(0.11419)
lag4EU member(target)				-0.61537***	-0.65023***
				(0.11680)	(0.11627)
lead1EU member(sender)					-0.30928***
					(0.11329)
lead1EU member(target)					0.44527***
					(0.12597)
<u>Joint F-test EU membership of recipients</u>					
F	8.14000	7.21000	4.66000	7.75000	7.00000
p-values	0.00030	0.00010	0.00100	0.00000	0.00000
Constant	1.72163***	6.04786***	7.08343***	7.15384***	3.01739***
	(0.20174)	(0.04815)	(0.20906)	(0.20800)	(0.17251)
Observations	31,416	30,294	29,172	28,050	26,928
R-squared	0.45249	0.45074	0.44865	0.44671	0.4602
Year FE	Yes	Yes	Yes	Yes	Yes
Bilateral FE	Yes	Yes	Yes	Yes	Yes
Clustered	pairid	pairid	paired	paired	Paired

Table 5. Panel Gravity Equation with Bilateral Fixed and Time Fixed Effects-subsample

	Sample restricted to FDI recipient & sender countries who join EU between 1985-2013				
	OLS	Poisson	Heckman		
VARIABLES	log(1+FDI)	FDI_inflows	log(1+FDI)	Dummy 1(FDI >0)	mills
logGDP(sender)	0.42764***	0.39844	-1.03535		
	0.07727	2.63172	0.676		
logGDP(target)	0.59833***	0.46133	-0.91516		
	0.10929	2.6268	0.6774		
lnGDPPC(sender)	2.18083***	6.02201*	5.27941***		
	0.38417	3.15465	0.71058		
lnGDPPC(target)	0.05458	2.29574	1.35254*	0.34152***	
	0.35402	2.98444	0.72115	0.07218	
EU member(sender)	0.29005	0.08019	-0.26406*		
	0.18231	0.37916	0.14001		
EU member(target)	0.78282***	1.33315***	0.39554***		
	0.16365	0.207	0.14735		
share of industry				-0.03009***	
				0.00884	
share of export				-0.02569***	
				0.00695	
share of import				0.03009***	
				0.0069	
lambda					0.46495
					0.37946
Constant	-35.10623***	-68.19177***	-45.98066***	-3.26563***	
	7.46116	12.70742	9.65016	0.80567	
Observations	3,509	3,480	3,509	3,509	3,509
R-squared	0.4487	0.51735			
Year FE	Yes	Yes	Yes	Yes	Yes
Bilateral FE	Yes	Yes	Yes	Yes	Yes
Clustered	pairid	pairid	No	No	No

Table 6: Panel estimates of the effects of EU membership on FDI inflows

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel Fixed Effects	PPML	Panel Fixed Effects	PPML	Panel Fixed Effects	PPML
VARIABLES	logFDI	FDI	logFDI	FDI	logFDI	FDI
EU member (target)	0.31653***	0.35245**	0.30984***	0.50805***	0.30414***	0.52047**
	(0.07549)	(0.16365)	(0.07591)	(0.16132)	(0.09836)	(0.21072)

EU member (sender)	-0.03757	0.79253***	-0.04699	0.65443***	-0.00523	1.18216***
	(0.07742)	(0.18803)	(0.07653)	(0.18366)	(0.09599)	(0.28196)
NAFTA (target)			-0.19621	-0.38983	-0.20947	-0.61373**
			(0.14140)	(0.27098)	(0.14177)	(0.28089)
NAFTA (sender)			-0.21594	-1.11872***	-0.21004	-0.95284***
			(0.14492)	(0.3061)	(0.14640)	(0.33021)
EFTA (target)					-0.02428	-0.06165
					(0.14343)	(0.30001)
EFTA (sender)					0.11124	1.02931***
					(0.14742)	(0.37204)
ln (GDP, target)	0.42705***	3.80584***	0.43231***	5.20112***	0.42817***	5.26744***
	(0.05254)	(1.41892)	(0.05259)	(1.57988)	(0.05288)	(1.59064)
ln (GDP, sender)	0.44033***	3.90119***	0.44673***	5.37993***	0.45188***	5.47513***
	(0.05401)	(1.44654)	(0.05365)	(1.60983)	(0.05417)	(1.62015)
ln(GDPPC, target)	-0.40401***	-1.34307	-0.43776***	-3.16803**	- 0.42763***	-3.27052**
	(0.13285)	(1.42114)	(0.13523)	(1.61103)	(0.14490)	(1.65208)
ln(GDPPC, sender)	0.92933***	-0.95913	0.89598***	-2.57925	0.85867***	-2.75735
	(0.13217)	(1.52164)	(0.13314)	(1.70781)	(0.13829)	(1.73930)
Observations	32,538	30,535	32,538	30,535	32,538	30,535
R-squared	0.48208	0.4354	0.48228	0.44553	0.48236	0.45183
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Bilateral FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered	pairid	pairid	pairid	pairid	pairid	pairid

Table 7 Accounting for Multilateral Resistance Terms

Table : Panel estimates of the effects of EU membership on FDI inflows

	First-Difference Panel Fixed Effects
dEU member (target)	0.335***
	0.389
dEU member (sender)	-0.831
	0.677
Sender Year FE (dumS t-(t-1))	Yes
Recipient Year FE (dumR t-(t-1))	Yes
Observations	32,528

Online Appendix 1: Data description

Foreign direct investment (FDI) reflects the objective of obtaining a lasting interest by a resident entity in one economy ("direct investor") in an entity resident in an economy other than that of the investor ("direct investment enterprise"). The lasting interest implies the existence of a long-term relationship between the *direct investor* and the *enterprise* and a significant degree of influence on the management of the enterprise. In general, direct investment involves both the initial transaction between the two entities and all subsequent capital and income transactions between them. As far as measurement accounting is concerned, FDI flows record the value of cross-border transactions related to direct investment during a given period of time. Financial flows consist of equity transactions, reinvestment of earnings, and intercompany debt transactions. On the one hand, outward flows represent transactions that increase the investment that investors in the reporting economy have in enterprises in a foreign economy, such as through purchases of equity or reinvestment of earnings, less any transactions that decrease the investment that investors in the reporting economy have in enterprises in a foreign economy, such as sales of equity or borrowing by the resident investor from the foreign enterprise. On the other hand, inward flows represent transactions that increase the investment that foreign investors have in enterprises resident in the reporting economy less transactions that decrease the investment of foreign investors in resident enterprises. In our data, we look directly at unidirectional bilateral FDI flows (inflows for one country and outflow for the other) in millions of current US dollars. We use the OECD International Direct Investment Statistics as our primary data source[12]. It includes data on FDI into and out of OECD countries according to the benchmark definition (3rd edition). In this paper, we focus on FDI inward flows and in our sensitivity analysis on FDI stocks from the same dataset[13]. For the purpose of international comparison, we use millions of USD as currency units. The FDI data was merged with World Bank data[14] on macroeconomic indicators of these OECD countries including GDP and GDP per capita (the latter in USD, PPP). Furthermore, as required by the Heckman model set-up, we calculated the share of manufacturing output as percentage of total GDP, the share of export

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[12] The data are available online and can be accessed here: http://dx.doi.org/10.1787/bmd3-data-en.

[13] Some FDI flows are negative in sign. These instances of disinvestment arise because either equity capital, reinvested earnings or intra-company loans are negative and not offset by the remaining components. Negative flows have real economic meaning, and, because of their numerical importance, we cannot eliminate them without losing consistency, so we treat them as zero.

[14] WDI Database Archives (WDI-DA): http://databank.worldbank.org/data/reports.aspx?source=wdi-database-archives-(beta).

as percentage of total GDP, and the share of imports as percentage of total GDP from the World Bank dataset.

We constructed our key variable of interest for deeper economic integration, EU membership, on information provided on the European Union website[15]. Our EU membership variable is a binary time-variant variable equal to 1 if the country is in the EU at a specific year, 0 if the country is not in the EU at that year. The list of variables used in this paper is provided in Table A1. In our dataset, each observation contains information of FDI flows from source into the target country, EU membership status of both target and source countries, macroeconomic conditions of both target and source countries, and other relevant information such as if they are members of other multilateral agreements.

[Insert Table A1 about Here]

We conduct our research within the OECD framework, primarily because the international capital markets are well established between OECD countries allowing for the comparative analysis of bilateral FDI flows. Such data are rare or non-existent for developing and emerging markets over a reasonable period of time. The main disadvantage of our dataset is therefore the exclusion of most developing countries including China and India. Notice that a by-product of this drawback is that we are limited in the currency unions we can study (for example, vis-à-vis Glick and Rose, 2015). On the other hand, bilateral FDI flows within OECD accounts for 70% of global FDI inflows. Also, the data are easily available for those countries with reassuring quality standards. The 34 OECD countries included are Austria, Australia, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK and the USA. "Target/destination" indicates the country which is the recipient of the FDI and "Source/origin" indicates the country which is the sender of the FDI.

As far as the time span is concerned, we used all available years covered by the database (3rd edition), from 1985 to 2013. The maximum possible number of observations is 34*33*29=32,538. We constructed our data as a balanced panel with assigned zeros due to missing values (no flows). For many country-year pairs, especially before the 1980s, bilateral FDI flows were in fact zero. The missing values for FDI in the data reflect these zeros and as

[15] https://europa.eu/european-union/about-eu/countries/member-countries_en.

explained in the paper we used the Pseudo Poisson Maximum Likelihood (PPML) estimator (Santos Silva and Tenreyro, 2006; WTO, 2012) and Heckman selection model to address the non-random assignment of zero FDI flows. For missing values in other variables, we imputed the mean together with a missing dummy to flag the imputation. Basic statistics are provided in Table A2, which has the mean, standard deviation, minimum value, and maximum value of each variable.

[Insert Table A2 about Here]

Table A1: List of Variables

	Definition	Unit	Source
Bilateral FDI flows	Inward FDI flows (sender to target)	USD, Millions	OECD database
Bilateral FDI stocks	Inward FDI Stocks (sender to target)	USD, Millions	OECD database
Bilateral Imports	Bilateral Imports (sender to target)	USD, Millions	World Bank
Bilateral Exports	Bilateral Exports (sender to target)	USD, Millions	World Bank
GDP (sender)	Total GDP of FDI sender	USD, millions	World Bank
GDP (target)	Total GDP of FDI target	USD, millions	World Bank
GDP per capita (sender)	GDP per capita of FDI sender	USD, PPP	World Bank
GDP per capita (target)	GDP per capita of FDI target	USD, PPP	World Bank
EU member (sender)	Sender country is EU member	0,1	EU website
EU member (target)	Target country is EU member	0,1	EU website
Manufacturing share (target)	Share of manufacturing output as percentage of total GDP	%	World Bank
Export share (target)	Share of export as percentage of total GDP	%	World Bank
Import share (target)	Share of import as percentage of total GDP	%	World Bank

Table A2. Descriptive Statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
Bilateral FDI flows (inward)	32,538	385.57	3157.74	-59483.33	117839.40
Bilateral FDI stock	32,538	3819.88	19102.98	-7346.23	486833.00
Bilateral Import	32,538	3156.96	12651.24	0.00	339074.10
Bilateral Export	32,538	3196.13	13315.90	0.00	353787.10
GDP	32,538	878344.70	1885361.00	4075.01	16700000.00
GDP per capita	32,538	24762.44	12632.88	3415.68	95587.31
Manufacturing share of GDP	32,538	18.04	4.29	5.06	31.37
Import/GDP	32,538	35.01	19.25	0.00	97.75
Export/GDP	32,538	34.91	20.43	0.00	99.83

Online Appendix 2: Robustness check: FDI stocks instead of flows as dependent variable

Information about FDI is available both as flow and stock data and is recorded in a country's Financial Account of the Balance of Payments (BOP) or International Investment Position (IIP), respectively. The inward FDI stock is the value of foreign investors' equity in the country and net loans to enterprises resident in the reporting economy. FDI stocks are therefore the (revalued) accumulation of past flows, while flows are the current transactions taking place in a certain period *t*. We should note here that FDI flows are generally not equal to the first difference of FDI stocks because revaluation, currency fluctuations and other factors.

FDI stock data has been used in the literature because it is more stable than flow data, which can be subject to large annual fluctuations, and has the advantage that FDI stock are unlikely to be negative. However, there are specification problems with estimating our equations using bilateral FDI stocks as dependent variable because the data series for the independent variables are flow variables (for a comparison of stock vs. flows FDI data see Beugelsdijk et al., 2010); FDI inflows are therefore more coherent with the theoretical derivation of the structural gravity model.

Table A4 reports estimates of the bilateral FDI stock equation replicating Table 3 (included in the main text) in using both panel fixed effects and Poisson estimation methods. As we would expect, the gravity model provides a less satisfactory explanation of FDI stocks than flows; indeed, the source and host GDP variables are not significant in the Poisson estimates and only source GDP in the fixed effects model. Even so, we continue to obtain a significant and positive estimated impact of EU membership of 0.34 log points (40% increase) from the Poisson regression.

[Insert Table A3 about Here]

Table A3: FDI Stock as dependent variable

	Panel Fixed Effects	PPML
logGDP(sender)	0.46807***	1.02995
	0.0777	0.84138
logGDP(target)	0.51009***	1.14044
	0.07765	0.8587
lnGDP$_{\text{(per capita)}}$ (sender)	1.61543***	2.86921***
	0.14324	0.93212
lnGDP$_{\text{(per capita)}}$ (target)	-0.0272	0.70833
	0.14671	0.91731
EU member(sender)	0.0514	0.93230***
	0.1076	0.16769
EU member(target)	0.16581	0.34052***
	0.1089	0.11255
Constant	-26.48975***	-63.14862***
	2.03021	11.07743
Observations	34,510	30,399
R-squared	0.64802	0.83714
Year FE	Yes	Yes
Bilateral FE	Yes	Yes
Clustered	Country Pair	Country Pair

Notes: *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level.

Online Appendix 2: Robustness check: First-differencing

When unobserved heterogeneity in FDI flows is temporally correlated, first-differencing the data offers clear advantages as an alternative estimator. This is because the panel fixed effects estimator is inefficient when *t* is large enough and the errors are highly serially correlated. We do incur this risk, because the year data points range from 1985 to 2013. First differences might therefore be a more appropriate estimation technique when the randomness tends to be correlated over time, while fixed-effects methods, as reported in Table 3 in the main text, might be more appropriate when randomness tends to dissipate between periods. In the trade literature, the former is often used due to the higher 'persistent' nature of data, but this is less clear-cut with FDI data. In other words, we use the first-differencing model to check if the time pattern *could* undermine our results from the baseline model.

Hence, we estimate equation (6); the gravity equation in first differences:

$$dln(bilateral\ flow\ of\ FDI_{o,d,t-(t-1)}) = \alpha_1 dlnX_{o,t-(t-1)} + \alpha_2 dlnX_{d,t-(t-1)} + v_{o,d,t-(t-1)} \quad (6)$$

We then rewrite the equation when we drop the GDP and GDP per capita from the regression and focus on the EU variables for the sender *(o)* and the target *(d)* only, now $v_{o,d,t-(t-1)} = u_{o,d,t} - u_{o,d,(t-1)}$ being a white noise

$$log(1+FDI)_t - log(1+FDI)_{(t-1)} = \alpha_1 EU_{o,t-(t-1)} + \alpha_2 EU_{d,t-(t-1)} + \alpha_3 EU_{o,(t-1)-(t-2)} + \alpha_4 EU_{d,(t-1)-(t-2)} + \alpha_5 EU_{o,(t-2)-(t-3)} + \alpha_6 EU_{d,(t-2)-(t-3)} + u_{o,d,t} - u_{o,d,(t-1)} \quad (7)$$

This specification has the advantage of eliminating the effects of possible auto-correlated disturbances, controlling at the same time for heterogeneity. Compared to standard fixed effects, first differencing removes by construction both source and target country dyadic effects, so that they are no longer identified.

The results are reported in Table A6. We again find consistently *significant and positive* estimates of the impact of EU target on FDI inflows in these specifications, the coefficients ranging from 0.299 to 0.509 in log points. Hence our findings still hold after taking into consideration auto-correlation over time. The ATE (average treatment effect) for the target is calculated in the last line of the table, being the sum of all statistically significant EU target coefficients.

[Insert Table A4 about Here]

Table A4. First differenced panel gravity model

VARIABLES		log(1+fdi)[t-t(t-1)]	log(1+fdi)[t-t(t-1)]	log(1+fdi)[t-t(t-1)]
D.EU member(target)	t-(t-1)	0.29890***	0.47226***	0.45682***
		(0.111)	(0.124)	(0.125)
D.EU member(sender)	t-(t-1)	-0.19203*	0.04356	0.02877
		(0.107)	(0.120)	(0.121)
LD.EU member(target)	(t-1)-(t-2)		0.34448***	0.47786***
			(0.113)	(0.129)
LD.EU member(sender)	(t-1)-(t-2)		-0.36655***	-0.10008
			(0.112)	(0.128)
L2D.EU member(target)	(t-2)-(t-3)			0.50283***
				(0.113)
L2D.EU member(sender)	(t-2)-(t-3)			-0.12123
				(0.111)
Total ATE (target)		0.30***	0.82***	1.44***
Observations		25,030	23,970	22,931
R-squared		0.5354	0.54313	0.5499
Clustered		Country Pair	Country Pair	Country Pair

Notes: *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level. Coefficients with standard errors (clustered by 630 bilateral country pair in first two columns) in brackets. The 34 OECD countries included are Austria, Australia, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK and the US. “Target” indicates the country which is the recipient of the FDI and “sender” indicates the country is the sender of the FDI.