Beyond the Unobservable: Inferred Openness to Foreign Direct Investment and Migration*

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Abstract:
Using a method commonly used to infer trade costs for goods, I construct bilateral openness measures to foreign direct investment (FDI) and to migration, for OECD country pairs. For FDI, barriers are reduced the most for three emerging hubs, the UK, the Netherlands and Switzerland. Little happens to bilateral openness to migration. Across country pairs and over time, FDI and migration openness are interdependent.

I also infer a country's overall barriers to FDI for OECD countries. These barriers decline over time, a fact which must be corrected for in bilateral FDI regressions to avoid misspecification. Based on inspection of the inferred barriers, I propose to add country-specific trends. By decomposing the growth in bilateral FDI, I show that the surge in FDI has mainly been driven by lower barriers to FDI (76%), not by economic growth. For the US, the contribution of bilateral barriers is lower (62%).

Keywords: Foreign direct investment, migration, economic integration

JEL-codes: F13, F15, F21, F22

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1 Introduction

Inferred trade barriers is a well-established and valuable tool for measuring trade costs comprehensively and for tracking the up- and downturns of globalization (Head and Mayer (2004), Eaton and Kortum (2005), Jacks, Meissner and Novy (2008), Novy (2008), Novy and Chen (2009)). To get a full picture of international economic integration, it is important, however, to examine other channels than trade in goods, such as cross-border movements of capital and people, especially with the surge in foreign direct investments (FDI) of recent decades. Yet, neither measures of FDI barriers nor migration barriers are not readily provided by the existing economic apparatus.

This paper shows how the method of inferring bilateral barriers can be extended from trade in goods to FDI and to migration. The resultant measures of bilateral openness to FDI and to migration are based solely on observed data and can easily be compared across country pairs and over time. The theoretical interpretation of the measures is the "inverse of the net costs" of doing FDI, respectively migrating, between two countries, with the great advantage that all unobservable costs and benefits of FDI or migrating are included.[1] For FDI, I also infer a measure of a country's overall barriers to FDI, inspection of this measure raises concerns of misspecification in earlier studies of the cross-country determinants of FDI.

I compute the bilateral openness measures for FDI and migration for OECD country pairs, over the period 1985-2007 (FDI) and 1986-2006 (migration). Openness to FDI increases for most country pairs, especially for those involving the Netherlands, the UK and Switzerland, three countries that emerge as hubs to FDI. For migration, there is a small overall increase in bilateral openness, not visible through graphical inspection; only the net costs of migrating between Northern and Southern Europe and between Eastern and Western Europe fall at any substantial rate. Due to this overall stagnation in migration openness, the main topic in this paper will be examining the increased FDI openness.

The openness measures decrease with distance and increase if countries share a border or a language or have past colonial ties, just as one would expect from previous studies of FDI and migration. Interestingly, I also discover that the inferred openness measures to FDI and migration are highly interdependent (partial R^2 of 0.192, slightly above the one for distance) even after controlling for distance, common languages, colonial ties and country fixed effects. The changes in FDI and migration openness are also related, although more weakly so.

The method of inferring barriers departs from the gravity equation, which has been found empirically to fit both FDI and migration patterns well.[2] Instead of estimating, the procedure takes the empirically established gravity equation as given and solves it for the bilateral cost of doing FDI, respectively migrating. In this manner, the cost of doing FDI, respectively migrating, is expressed as a function of observed bilateral and intra-country stocks. The underlying intuition is that by dividing bilateral stocks of FDI or migration with a country's stock of FDI or migration "to itself", country-specific spurs or impediments cancel out, leaving only bilateral factors. These bilateral factors then give an inverse

[1] An example of unobsevable determinants of FDI is costs of monitoring or coordinating with foreign divisions; migration choices presumably depend on unobservable individual preferences. Legal restrictions and cultural differences make both migration and foreign direct investment (FDI) costlier, but are hard to quantify.

[2] For FDI, see for instance Eaton and Tamura (1994), Wei (2000), Bénassy-Quéré, Fontagné and Lahrèche-Révil (2001) and Bénassy-Quéré, Coupet and Mayer (2007). Studies of migration flows have been inspired by Newton's gravity equations since the work of Ravenstein (1885) and Young (1924). Recent applications include Zavodny (1997) or Lewer and van den Berg (2008).

measure of the "net cost" of doing FDI or migrating.

For FDI, the underlying theory, due to Head and Ries (2008), also suggests the inference of a country's overall barriers, the FDI counterpart of the 'multilateral resistance' introduced by Anderson and van Wincoop (2003) for trade in goods. Overall barriers to FDI generally show substantial declines over the examined time period (1985-2007). European countries experience the largest openings, the evolution is strongest for the aforementioned hubs (UK, Netherlands, Switzerland) and European countries in general. Japan and Korea remain hermetically closed to FDI.

My finding that the inferred overall barriers to FDI differ across countries and fall substantially over time raises a misspecification issue in existing studies of determinants of bilateral FDI stocks. The problem is similar to that of failing to correct for multilateral resistance when estimating bilateral trade in goods, as Anderson and van Wincoop (2003) show. If a country is more open to FDI, its FDI inflows from individual partners will be suppressed, as competition for the assets in the country increases. This crowding-out effect must be accounted for in regressions, even the country fixed effects employed by Head and Ries (2008) are insufficient. Based on inspection of the inferred overall barriers, I suggest adding country-specific trends.

The generated time series of bilateral openness and overall barriers allow for a decomposition of the growth of bilateral FDI into reductions in net bilateral barriers, economic growth and third-country crowding out effects. The growth in FDI has largely been driven by the increased bilateral openness, it is responsible for 76% of the growth. For country pairs involving the US, this proportion is lower, 62%.

The following section presents the methodology of inferring bilateral barriers to FDI and to migration, as well as the data used for computation. Section 3 presents results, beginning with graphical inspection of first the openness to FDI then to migration. Subsection 3.3 turns to determining the components of FDI and migration openness. Overall barriers to FDI are computed in subsection 3.4, and subsection 3.5 provides the decomposition of the growth in FDI using the inferred measures. Section 4 concludes.

2 Inferring the Barriers to FDI and Migration

Consider the gravity equation for FDI derived in Head and Ries (2008). Their underlying model concerns mergers and acquisitions, which is the bulk of FDI flows. A firm in country i wishes to acquire a firm in j, it makes a bid for the firm, and if the offer is good enough, the firm in i purchases (or merges with) the firm in j. In the aggregate, a gravity equation emerges. The predicted stock of FDI that firms in i own in j, F_{ij}, is

$$F_{ij} = \exp\left(\mu_i/\sigma - \mathbf{D}_{ij}\boldsymbol{\theta}\right) s_i^m K_j B_j^{-1}. \tag{1}$$

μ_i is the average valuation that firms in country i put on *any* asset, a higher average valuation (for instance if the country is rich) means that firms will be willing to pay more for all assets, increasing their expected stock of FDI in any country. The variance of the valuations is denoted by σ. These valuations are affected by $\mathbf{D}_{ij}\boldsymbol{\theta}$, a vector of bilateral factors $\mathbf{D}_{ij}$ weighted with their coefficients $\boldsymbol{\theta}$. Bilateral factors include both observables such as distance and language barriers, and unobservables like cultural barriers or monitoring costs.

If more of the world's firms are located in i, i will also win bids more often and own more assets in any country, this effect is captured by s_i^m, the share of the world's firms located in i. K_j is the capital stock in j, all else being equal,

the more firms there are to buy in j, the higher will be the (absolute) value of firms owned by foreigners. The term B_j^{-1}, "bidder competition", captures third country effects: If firms from other countries bid intensively for firms in j, firms in i will have a harder time winning the bids, lowering F_{ij}. Bidder competition is the FDI counterpart to the multilateral resistance introduced by Anderson and van Wincoop (2003) for trade in goods.[3] It is an aggregate of country j's barriers: $B_j^{-1} = \sum_{h=1}^{M} \exp\left(\mu_h/\sigma - \mathbf{D}_{jh}\boldsymbol{\theta}\right) s_h^m$.

The method of inferring the bilateral factors $\mathbf{D}_{ij}\boldsymbol{\theta}$ from observed stocks of FDI (F_{ij}) relies on the fact that the theory also has a prediction of country i's "stock of FDI in itself". That is, how much of the capital stock is still on domestic hands, after both foreign and domestic firms have made their bids for firms in i. Domestically owned capital stock, F_{ii}, will be given by

$$F_{ii} = \exp\left(\mu_i/\sigma - \mathbf{D}_{ii}\boldsymbol{\theta}\right) s_i^m K_i B_i^{-1}. \tag{2}$$

The same factors affect F_{ii} and F_{ij}. There might be country-specific reasons why firms in i place particular value on domestic assets, captured by $\mathbf{D}_{ii}\boldsymbol{\theta}$.

Consider the measure

$$\phi_{ij}^{FDI} = \sqrt{\frac{F_{ij}F_{ji}}{F_{ii}F_{jj}}}.$$

The domestically and foreign owned capital stocks are determined by the same variables, which all enter multiplicatively. The index therefore simplifies to

$$\phi_{ij}^{FDI} = \sqrt{\frac{\exp\left(\mathbf{D}_{ii}\boldsymbol{\theta}\right)\exp\left(\mathbf{D}_{jj}\boldsymbol{\theta}\right)}{\exp\left(\mathbf{D}_{ij}\boldsymbol{\theta}\right)\exp\left(\mathbf{D}_{ji}\boldsymbol{\theta}\right)}}.$$

Country-specific variables have cancelled out, and we are left with the bilateral factors that make up the net barriers between i and j. More precisely, ϕ_{ij}^{FDI} measures the inverse of the net cost of holding foreign capital between country i and country j (the inverse measure is chosen for easier comparison across country pairs).

Bilateral barriers cannot (and perhaps should not) be distinguished from a "domestic bias" in capital holdings ($\mathbf{D}_{ii}\boldsymbol{\theta}$), an international barrier is always measured as relative to a domestic one. More problematically, ϕ_{ij}^{FDI}, the inferred openness between i and j, is the geometric mean of how open country i is to country j and how open country j is to country i. If the two countries have similar openness the average is a good measure, it will be less informative for country pairs with asymmetric barriers.

ϕ_{ij}^{FDI} measures aggregate openness; all bilateral costs or benefits of FDI, whether observable or not, are included and weighted with their coefficients:

$$\mathbf{D}_{ij}\boldsymbol{\theta} = \theta_1 d_{1ij} + \theta_2 d_{2ij} + \theta_3 d_{3ij} + ...$$

The advantage of inferring the FDI costs rather than compiling observable costs are clear: It gives an easy to compute measure of the overall net openness to FDI, which is what matters for investment decisions, including the impact of unobservable barriers or benefits. The measure is comparable across country pairs and through time. Its downside is that whereas this variation can be clearly observed, its causes cannot: Determining whether increased openness is caused by better communication technology, legal liberalizations or changing factor prices requires further analysis. Such analysis is straightforward, however; results are presented in section 3.3.

[3] In particular, bidder competition corresponds to inward multilateral resistance.

For migration, bilateral openness between i and j, ϕ_{ij}^{Mig}, can be inferred in the same way:

$$\phi_{ij}^{Mig} = \sqrt{\frac{M_{ij}M_{ji}}{M_{ii}M_{jj}}}.$$

M_{ij} is the stock of migrants from country i in country j. M_{ii} is "a country's migrant stock in itself", that is, how much of a country's population that chose not to migrate. I compute M_{ii} as a country's population minus its stock of foreign migrants, $M_{ii} = Pop_i - \sum_{h \neq i} M_{hi}$.

There is little theorizing on why migration patterns are well described by gravity equations. The inferred migration openness ϕ_{ij}^{Mig} therefore has no direct theoretical underpinnings. Nevertheless, as long as the true relationship is multiplicative (like gravity equations are), country-specific variables cancel out: Factors common to why Germans want to migrate to France and why Frenchmen want to stay at home (good job opportunities, for example) will cancel out, as will size effects. What is left is bilateral factors, just as for FDI. The inferred migration openness measure has the same strengths and limitations as the FDI openness measure.

2.1 Data

Data on bilateral FDI stocks F_{ij}, are taken from the OECD online database (outward FDI positions). The time period is 1985-2007 with some holes due to lack of data. Due to the difficulties of dealing with countries with asymmetric barriers, the samples for both FDI and migration are confined to OECD members. Data on bilateral migration stocks have been kindly provided by Mariola Pytlikova. A thorough description of this extensive migration data set can be found in Pedersen, Pytlikova and Smith (2008); its time period is 1986-2006, again with missing data for some country pair years.

The precision of inferred openness depends on how well a country's investment or migration stock in itself (F_{ii} and M_{ii}, respectively) is measured. Computing M_{ii} is straightforward, finding or constructing a good measure of F_{ii} is more cumbersome. In this paper, I obtain a measure of a country's capital stock, $\tilde{K}_i$, by compiling OECD data on investments (gross fixed capital formation minus dwellings) using a perpetual inventory method.[4] Because foreign firms have merged with or acquired firms in country i, some of this capital stock will not be domestically owned. To get to domestically owned capital, the stock of inward M&A in i must be subtracted; if a share λ_i of the stock of inward FDI in i come in the form of mergers and acquisitions, F_{ii} can be computed as:

$$F_{ii} = \tilde{K}_i - \lambda_i \sum_{j \neq i} F_{ji}$$

As an estimate of λ_i I use the average share of M&A in FDI inflows to country i from 1988 to 2006, computed with FDI and M&A flow data from the UNCTAD database.

The total capital stock in i, disregarding ownership and including what comes in as greenfield FDI is given by

$$K_i = F_{ii} + \sum_{j \neq i} F_{ji}.$$

[4] Depreciation rate of $d = 0.07$ and initial guess $K_{i0} = (Pop_{i0})^{1.022} (Y_{i0}/Pop_{i0})^{0.964}$, where Y_{i0} is GDP at the date from which investment data is available. The guess is based on Head and Ries (2008)'s finding that 93% of the variation in their measure of capital stock can be explained with a log-log regression yielding the relation above. The capital measures are inflated for each year using the ratio of nominal to real investments.

An alternative capital measure would be stock market capitalization, the total value of country i's stock market. An alternative measure of $\tilde{K}_i$ could be the total value of country i's stock market, smoothed in an appropriate manner to dampen the booms and busts.[5]

3 Results

3.1 Bilateral Openness to FDI

Figure 1: Bilateral openness to FDI

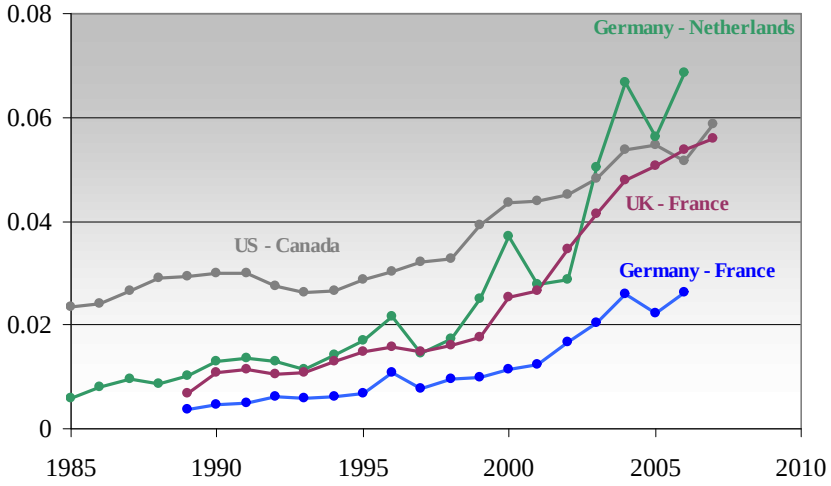
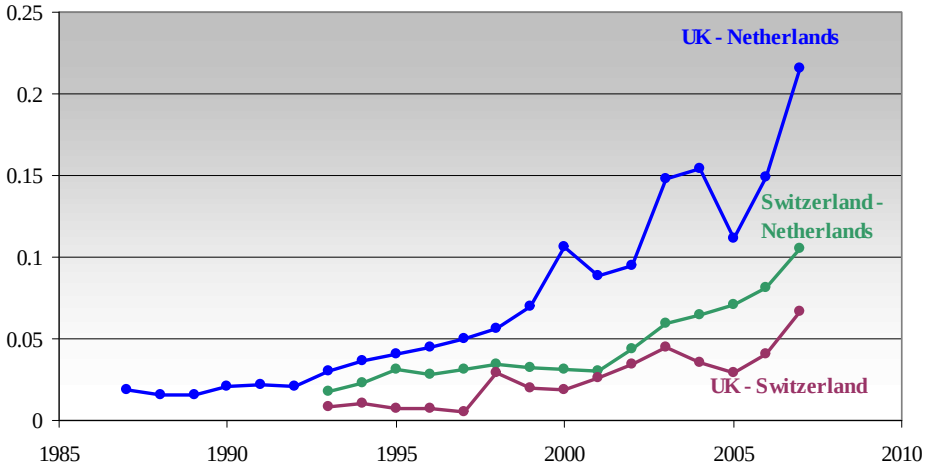


Figure 1 depicts the inferred bilateral openness to FDI for US - Canada and three European country pairs. In 1985, US-Canada was the most integrated country pair (in the world, in fact), the openness value of $\phi_{ij}^{FDI} = 0.029$ implies that at that time, owning domestic capital in the US or Canada was $1/0.023 = 42$ times more attractive than owning it in the other country. Net costs of bilateral investments have fallen so that in 2007, foreign assets were $1/0.059 = 17$ times less attractive. The increase in bilateral openness is even larger for UK - France and Germany - Netherlands, with the latter pair reaching a higher level of integration than the US and Canada.

Openness to FDI increases between virtually all OECD country pairs, but the increases are rather unevenly distributed. During the examined time period, the Netherlands, the UK and (to a somewhat lower degree) Switzerland emerge as hubs to FDI, in the sense that they become important partners to most other OECD countries.

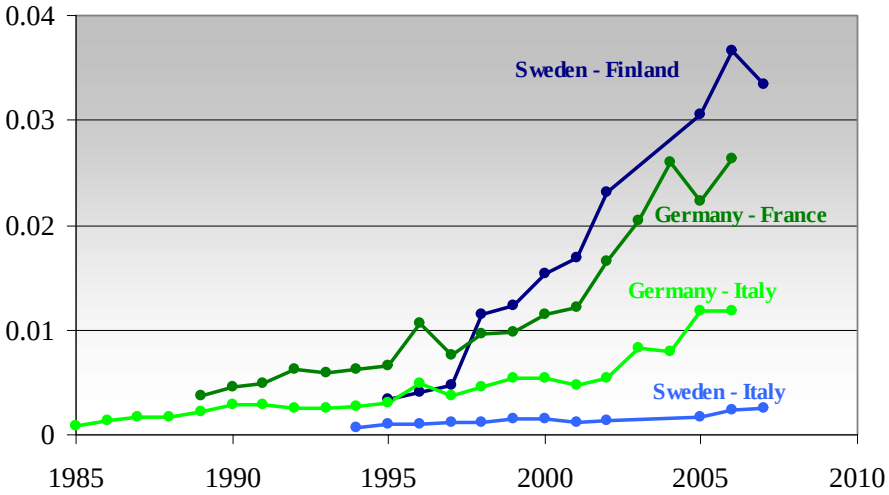
[5] Unfortunately, the results of basing the capital stock on stock market capitalization did not make it into this version of the paper.

Figure 2: Bilateral FDI openness. Hubs:



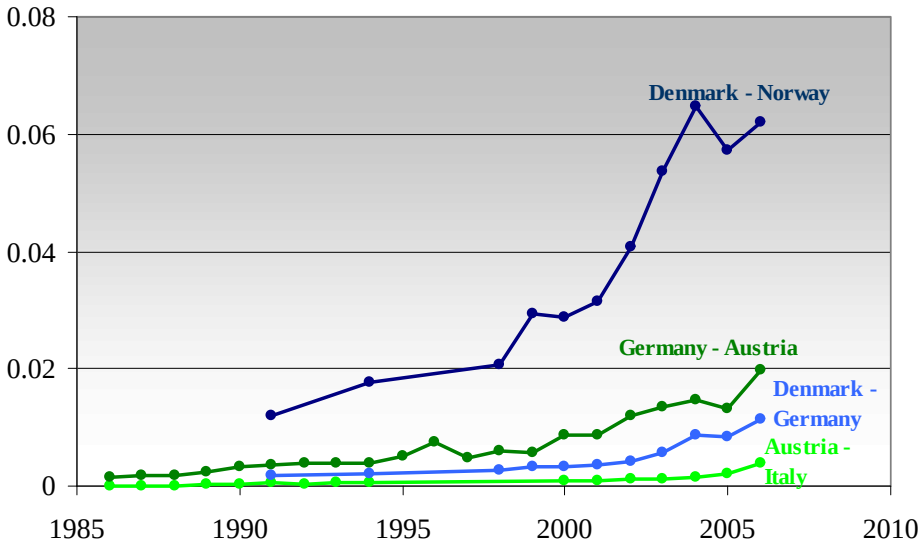
Integration between the three hubs also increases, as illustrated in figure 2, with the UK - Netherlands becoming the world's most integrated country pair by a considerable margin. In 2007, bilateral barriers to asset holdings between the UK and the Netherlands are only $1/0.22 = 4.7$ higher than those to owning domestic assets.

Figure 3: Bilateral FDI openness: Distance matters



Multiple studies have shown distance to be an important impediment to FDI, and as figure 3 shows, the openness measures decrease with distance.

Figure 4: Bilateral FDI openness: Common Language



Language barriers, another barrier to FDI presented by various studies, are also clearly visible in the inferred openness measures, as Figure 4 illustrates. The country pairs displayed are all adjacent, and country pairs sharing a language have markedly higher FDI openness.

3.2 Bilateral Openness to Migration

For migration, the picture is rather different. There is very little movement in the bilateral migration openness ϕ_{ij}^{Mig}, and no clear sign of increased integration, although regressions do reveal a small, but significant, positive time trend.

Figure 5: Bilateral Migration Openness, EU pairs

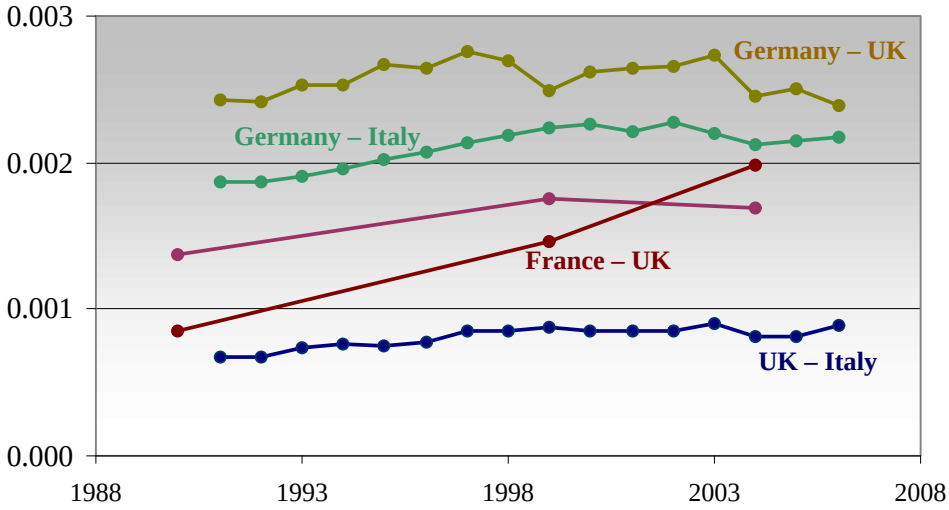
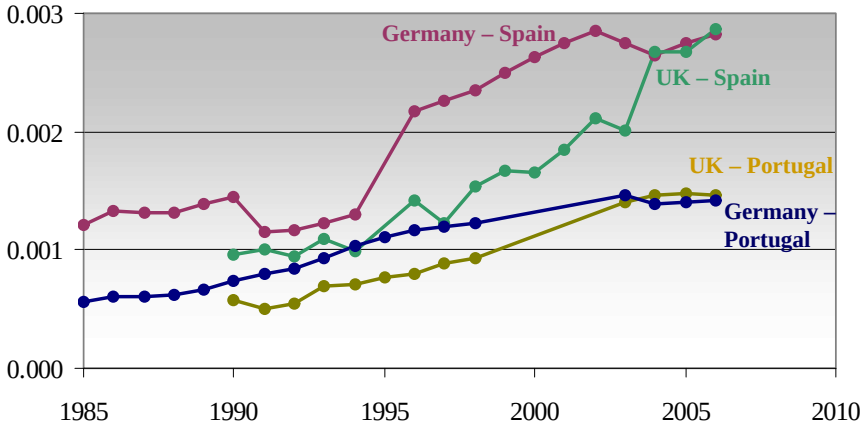


Figure 5 demonstrates this stagnation for pairs of larger EU countries. On the cross-sectional dimension, there are some country pairs that display a high

level of integration; in descending order: Australia - New Zealand, Sweden - Finland, Belgium - Netherlands and Australia - UK. With the exception of Australia and New Zealand, the country pairs most open to migration with each other show no increase (or evolution whatsoever) in their openness.

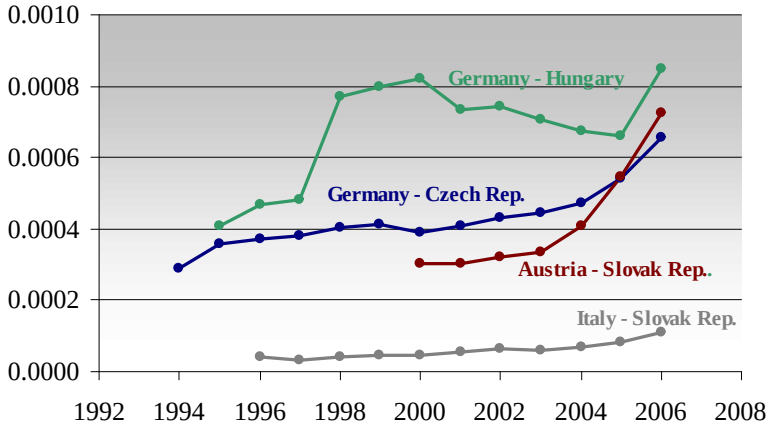
Compared to FDI openness, bilateral openness to migration is on a very different scale, although the values of ϕ_{ij}^{Mig} and ϕ_{ij}^{FDI} should not be compared to each other directly. For Englishmen and Germans, the net costs of living in the other country were $1/0.0024 = 418$ times higher than that of staying at home.

Figure 6: Bilateral Migration Openness. Sunshine Migrants.



One thing does happen in Figure 5, increased integration between France and the UK. This is part of a bigger picture, presented in Figure 6: Lower net costs of migration from rainy to sunny parts of Europe (the changes in inferred openness are driven by migration from the UK to Spain, not the other way round)..

Figure 7: Migration Openness, EU15 and CEE pairs



The only other clear evolution in the data is the move of migrants from the new Central European EU members to the EU15, depicted in Figure 7. The

scale is still low, reflecting that the barriers to migration between Eastern and Western Europe are asymmetric: there are very few people migrating the other way.[6]

It is perhaps surprising that there is very little overall sign of lower barriers to migration within the EU and among OECD countries in general. One caveat with the analysis is the use of stocks rather than flows: Migrant stocks can decline if migrants return home, move elsewhere or achieve citizenship in the resident country; increased outflow of migrants therefore does not necessarily reflect higher barriers. Using migration flows would assess this problem, but this modification would require another measure of internal migration, the best candidate being some measure of how much people move within a given country. Another possibility would be to use working permits data, but I would first need to show whether gravity equations fit the international grants of working permits.

Still, it is a noteworthy finding that overall barriers to long-term migration stays have not declined. A potential explanation suggested by the two counterexamples above is that legal barriers to migration indeed have fallen within the EU, enabling Northern Europeans to seek sunshine abroad and Central Europeans to migrate for work opportunities, but that the principal barriers to migration are individual preferences, cultural or language barriers, which are still unchanged.

3.3 The Components of Migration and FDI Barriers

In this section, I dig into the underlying components of the openness measures for FDI and migration. I examine the relative contribution of "the usual suspects", distance (measured as the distance between the countries' capitals), and dummies for neighboring countries, a common language and colonial ties. I also examine whether openness to migration and FDI are related, finding clear evidence that this is the case.

[6] Unfortunately, the migration stock data for Poland are only available for the year 2002. The migration openness between Poland and Germany is rather high, 0.003, reflecting that the net cost of moving from Germany to Poland is not too high.

Table 1 The components of bilateral openness to FDI, ϕ_{ijt}^{FDI}, and migration, ϕ_{ijt}^{Mig}.			
Specification	(1)	(2)	(3)
Dependant variable	$\log(\phi_{ijt}^{FDI})$	$\log(\phi_{ijt}^{Mig})$	$\log(\phi_{ijt}^{FDI})$
Log(Distance)	-0.764 [a]	-0.687 [a]	-1.079 [a]
	(0.044)	(0.045)	(0.081)
Neighbors (0,1)	0.621[a]	1.075 [a]	0.548 [a]
	(0.082)	(0.071)	(0.115)
Common language (0,1)	0.980 [a]	0.680 [a]	1.014 [a]
	(0.089)	(0.079)	(0.128)
Colonial ties (0,1)	0.505 [a]	2.271 [a]	1.438 [a]
	(0.162)	(0.184)	(0.262)
Migration openness residual, u_{ijt}^{Mig}	–	–	0.623 [a]
			(.0403)
Time trend	0.094 [a]	0.024 [a]	0.101 [a]
	(0.004)	(0.003)	(0.007)
Sender and receiver F.E.	Yes	Yes	Yes
No. of Obs	2311	2929	1050
R^2	0.79	0.74	0.84
Results from OLS regression of the constructed FDI and migration openness measures on country pair specific variables, a time trend and sender/receiver fixed effect. Standard errors in parentheses. [a] Significant at the 1% level.			

Table 1 presents results from regressing the log of the inferred openness measures for FDI and migration on log(distance) and dummies for neighboring countries, a common language and colonial ties as well as sender and receiver fixed effects (country dummies for both i and j) and a time trend. The log specification is chosen to follow the assumption underlying gravity regressions that bilateral factors enter multiplicatively.

First of all, the results show that the openness measures are sensible: they are closely related to bilateral factors that other studies have shown to be impediments or spurs to migration and FDI. Although the bilateral explanatory variables are time-invariant, they do a reasonable job at explaining the openness measures, the R^2 is rather high. Regression (1) shows that a 1% increase in distance lowers the openness to FDI with around 0.8%, neighbors have a $\exp(0.621) = 1.9$ times higher openness, a common language increases openness with a factor of around 2.6, and colonial ties increases openness with a factor of 1.7.

Compared to FDI, migration openness has a similar sensitivity to distance, whereas migration openness between neighbors is 2.9 times higher. Colonial ties still boost migration, openness increases with a factor of 9.7, although the age for OECD countries are distant. Somewhat surprisingly, common language has a lower effect on migration openness, a factor of 1.8. Migration openness actually increases over time, although clearly much less than FDI openness (see also table 2), an evolution which is not apparent from visual examination of the series.

For both migration and FDI openness, the estimated distance coefficients *drop* markedly if both country i and j fixed effects are not included. Distance cannot explain why, for example, the Netherlands has low FDI barriers and Australia low migration barriers, but it can explain the distribution of these

barriers across partners, after controlling for whether these partners tend to have low or high barriers.

A natural question is whether countries' openness to FDI and migration are related. Regression (3) adds the residuals from regression (2) as an explanatory variable for FDI openness, to see whether the unexplained part of migration openness can predict FDI openness. This turns out indeed to be the case: Conditional on the observed bilateral factors, a 1% increase in migration openness is accompanied by a 0.6% increase in FDI openness.

Table 2 tries to assess the relative importance of the components of the aggregate openness measures with partial R^2 for each of the explanatory variables.

Table 2 Relative importance of the determinants of FDI and migration openness: Partial R^2.

Specification (from table 1)	(1) FDI	(2) Mig	(3) FDI
Log(Distance)	0.116	0.076	0.151
Neighbors (0,1)	0.025	0.074	0.022
Common language (0,1)	0.051	0.025	0.059
Colonial ties (0,1)	0.004	0.051	0.029
Migration openness residual, u_{ijt}^{Mig}	–	–	0.192
Time trend	0.194	0.021	0.185

Partial R^2 for the dependant variables from the regressions in table 1.

As seen, the residual migration openness is the most important determinant of FDI openness, just before distance. It may be that migration and FDI opennesses are directly related: Firms could send employees along when acquiring a foreign firm. It is certainly also possible that the high explanatory power is caused by unobserved factors that lower both the cost of FDI and migration, such as cultural similarities.

Regarding the other explanatory variables: Whereas distance is the main other determinant of the distribution of FDI barriers, a common border is as important for migration openness as distance. Although the partial R^2s are reasonably high, they are clearly far from the R^2s in table 1. The country fixed effects explain a large part of the variation in the bilateral openness measures.

Table 3. The changes in bilateral openness to FDI, ϕ_{ij}^{FDI}			
Specification Dependant variable	(1) $\Delta_6 \log(\phi_{ijt}^{FDI})$	(2) $\Delta_6 \log(\phi_{ijt}^{FDI})$	(3) $\Delta_6 \log(\phi_{ijt}^{FDI})$
Log(Distance)	-0.240 [a] (0.0250)	0.031 (0.042)	-0.151 [a] (0.050)
Neighbors (0,1)	-0.306 [a] (0.079)	0.060 (0.075)	-0.197 (0.139)
Common language (0,1)	-0.137 [c] (0.076)	0.082 (0.085)	0.053 (.169)
Colonial ties (0,1)	0.090 (0.133)	-0.249 [c] (0.142)	-0.049 (0.242)
Changes in residual migration openness, $\Delta_6 \log(u_{ijt}^{Mig})$	–	–	0.420 [a] (0.138)
Time trend (acceleration)	0.029 [a] (0.006)	.008 (.006)	0.026 [c] (0.015)
Sender/Receiver F.E. (slopes)	No	Yes	No
No. of Obs	904	904	274
R^2	0.15	0.44	0.09
Standard errors in parentheses. [a, b, c] Significant at the 1%, 5% and 10% level, respectively.			

The results in Table 3 shed light on two issues. First, whether growth in FDI openness can be attributed to changing sensitivities to distance, a shared border, common language and colonial ties. Second, how directly FDI and migration opennesses are related. The dependant variable is a 6-year difference on the log of FDI openness, $\left[\log\left(\phi_{ijt}^{FDI}\right) - \log\left(\phi_{ij(t-6)}^{FDI}\right)\right]$. Because the bilateral regressors are all time invariant, the regression should, according to the theory, estimate changes in their coefficients over the 6-year period.[7]

Regression (1) reveals that growth rates have been higher among closer countries, but that the importance of a common border for encouraging FDI is declining. When including country-specific (for both i and j) in regression (2), however, the effect disappears: The distribution of the growth rates in bilateral FDI openness is not skewed towards closer countries. Regression (1) may be picking up that more central countries experience larger declines in their bilateral barriers to FDI.

Regression (3) reveals that the changes in the measures of FDI and migration openness also co-vary, $\Delta_6 u_{ijt}^{Mig}$ is a 6-year difference on the residual migration openness from regression (2) in table 1. The interdependence may be caused by unobservables, but these unobservables will have to change over time. The examined time period is probably too short for changes in cultural differences to impact both migration and FDI costs The interdependence is much weaker for changes than for levels, the partial R^2 of $\Delta_6 u_{ijt}^{Mig}$is 0.033. When adding country-specific slopes (for i and j) as in regression (2), the estimated coefficient of $\Delta_6 u_{ijt}^{Mig}$ drops and loses significance.

[7] Theoretically, $\log(\phi_{ijt}^{FDI}) = \frac{1}{2}(\mathbf{D}_{ii}\boldsymbol{\theta}_t + \mathbf{D}_{jj}\boldsymbol{\theta}_t - 2\mathbf{D}_{ij}\boldsymbol{\theta}_t)$, $2\mathbf{D}_{ij}\boldsymbol{\theta}_t$ because the examined bilateral barriers are symmetric. The 6-year time difference will be $\Delta_6 \log(\phi_{ijt}^{FDI}) = \frac{1}{2}(\mathbf{D}_{ii}\Delta_6\boldsymbol{\theta}_t + \mathbf{D}_{jj}\Delta_6\boldsymbol{\theta}_t - \mathbf{2D}_{ij}\Delta_6\boldsymbol{\theta}_t)$; regressing $\Delta \log(\phi_{ijt}^{FDI})$ on $\mathbf{D}_{ij}$ should give estimates of $\Delta_6\boldsymbol{\theta}_t$.

3.4 Overall Barriers to FDI

The analysis so far has dealt with bilateral openness. For FDI, it is also possible to infer a country's overall barriers to FDI. Consider the fraction of a country's total capital stock which is on domestic hands:

$$\Phi_i^{FDI} = \frac{F_{ii}}{K_i}.$$

I construct total capital stock in country i as the investment-based domestic capital stock plus all inwards FDI stocks: $K_i = F_{ii} + \sum_{j \neq i} F_{ji}$. The share of a country's capital which is domestically owned is a quite intuitive way of measuring a country's FDI openness. Following the model of Head and Ries (2008) and (2) above, Φ_i^{FDI} can be written as

$$\Phi_i^{FDI} = \frac{\exp\left(\mu_i/\sigma - \mathbf{D}_{ii}\boldsymbol{\theta}\right) s_i^m}{\sum_{h=1}^{M} \exp\left(\mu_h/\sigma - \mathbf{D}_{hi}\boldsymbol{\theta}\right) s_h^m} = \frac{b_{ii}}{B_i},$$

where $b_{ii} = \exp\left(\mu_i/\sigma - \mathbf{D}_{ii}\boldsymbol{\theta}\right) s_i^m$ summarizes the strength of domestic bids, and B_i is the "bidder competition" defined in section 2. The interpretation of $\Phi_i^{FDI} \in [0,1]$ is therefore a measure of the advantage of domestic bidders, the higher Φ_i^{FDI}, the higher their advantage over foreign bidders. If a country has high net barriers to FDI ($\mathbf{D}_{ii}\boldsymbol{\theta}$ is lower than $\mathbf{D}_{hi}\boldsymbol{\theta}$ for $h \neq i$), domestic bidders will be favored. In this manner, Φ_i^{FDI} is an aggregate of the country's barriers to FDI. The measure is not entirely neutral to size, however. If a country is rich (implying higher average valuations, μ_i) or has relatively many firms (high s_i^m), Φ_i^{FDI} will increase as well.

Figure 8: Overall barriers to FDI

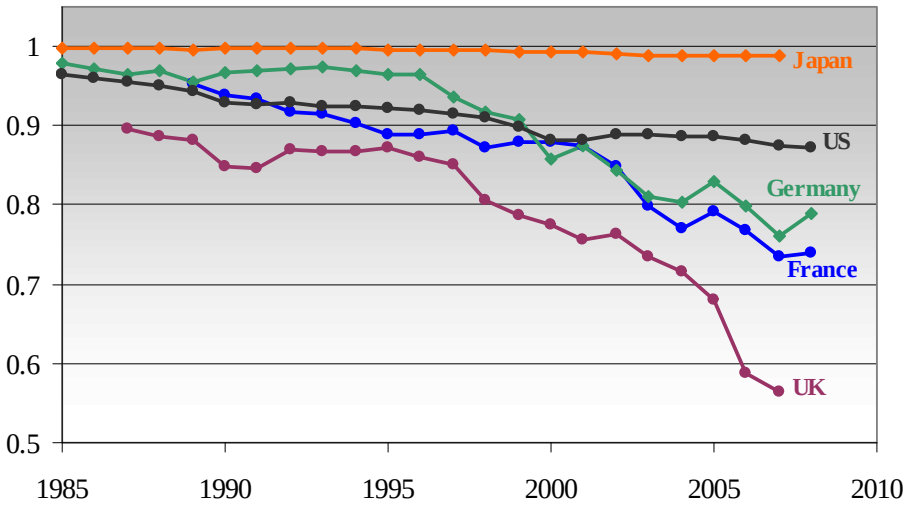


Figure 8 depicts Φ_i^{FDI} for Japan, the US, Germany, France and the UK. The chosen countries examples illustrate four tendencies in the data: Overall barriers fall for all countries, with Japan and Korea as sole exceptions remaining hermetically closed to FDI. Also, the openings are largest for European countries. Bilateral barriers do not seem to fall more for European country pairs, the driver is simply that more bilateral barriers fall for European countries, because they have more OECD countries in their proximity. The final tendency exemplified in Figure 8 is that the three aforementioned hubs (the UK, the Netherlands

and Switzerland) show the most marked fall in overall barriers to FDI, reflecting that they are increasingly important partners for many countries.

An important implication follows from Figure 8. The model of Head and Ries (2008) points out the necessity of correcting for country differences in bidder competition when estimating gravity equations for bilateral FDI stocks. Otherwise, regressions will suffer from omitted variables bias, as higher overall openness will tend to depress bilateral FDI stocks. Figure 8 shows that the solution applied by Head and Ries (2008), country fixed effects, is insufficient: Φ_i^{FDI}, which is closely related to bidder competition, changes, even over a relatively short time period.

The problem is similar to the one pointed out in Novy (2008) for trade in goods and changes in multilateral resistance. The reductions in Φ_i^{FDI} are proportionally larger than those in inferred multilateral resistance reported in Novy (2008)..

The debate on how to correct for time-variant multilateral resistance for trade in goods has not yet reached a conclusion, and as shown, the same problem applies to FDI. Correcting by including country-year fixed effects may require estimating too many parameters. Based on inspection of the Φ_i^{FDI} series, I recommend using country-specific *trends*, most of the evolution in a country's overall barriers can be approximated reasonably well with a negative log-linear trend. The correction is straightforward to implement in a panel, just add an interaction term between the time trend and the receiving-country fixed effect. In studies with long time periods, it may be necessary to inspect plots of Φ_i^{FDI} to check for breaks in the trends.

In principle, one can construct a similar measure of a country's overall openness to migration. However, the exact calculation and interpretation of overall openness is sensitive to the theoretical framework. A measure inferring overall openness to migration will have to wait for a theoretical framework to migration patterns.

3.5 Decomposing the Growth of FDI

Two countries may invest more in each other for three reasons: The bilateral barriers to FDI may fall, the two countries may experience economic growth, raising the nominal value of the desired FDI stock abroad, or the relative attractiveness of mutual investment may increase because the two countries' barriers to the rest of the world have gone up.

FDI activity has indeed grown in recent years. With time series for the inferred bilateral and overall barriers as well as total capital stocks at hand, it is possible to calculate the relative contributions of each of these three factors. Is the increase in FDI stocks mainly caused by lower costs of investing abroad, or is economic growth, in the form of domestic capital accumulation, driving the increase?

Rewrite the product of the FDI stocks between country i and j as follows:

$$F_{ij}F_{ji} = \frac{F_{ij}F_{ji}}{F_{ii}F_{jj}}\frac{F_{ii}}{K_i}\frac{F_{jj}}{K_j}K_iK_j.$$

The product of bilateral FDI stocks can then be expressed as

$$F_{ij}F_{ji} = \left(\phi_{ij}^{FDI}\right)^2 \Phi_i^{FDI}\Phi_j^{FDI}K_iK_j,$$

that is, the two country's domestic capital stock times the two countries' overall barriers to FDI times the bilateral openness squared. To get the contributions

of each of these factors over time, take logs and difference with the desired time period:

$$\Delta \log (F_{ij}F_{ji}) = 2\Delta \log \left(\phi_{ij}^{FDI}\right) + \Delta \log \left(\Phi_i^{FDI}\Phi_j^{FDI}\right) + \Delta \log (K_iK_j), \quad (3)$$

Table 4 presents these contributions of bilateral barriers (ϕ_{ij}^{FDI}), overall barriers to FDI ($\Phi_i^{FDI}\Phi_j^{FDI}$) and capital stocks (K_iK_j) in the growth of FDI stocks between 1985 and 2007..The growth rates are averaged across country pairs.

Table 4: Decomposing the growth of FDI, 1985-2007

	Growth in FDI		Contribution, change in FDI openness		Contribution, growth in capital stocks		Contribution, change in third-country barriers, bidder competition
OECD average	468% (100%)	=	357% (76%)	+	172% (37%)	+	-61% (-13%)
US	450% (100%)	=	278% (62%)	+	213% (47%)	+	-41% (-9%)
UK	471% (100%)	=	358% (76%)	+	186% (40%)	+	-73% (-16%)
Netherlands	503% (100%)	=	406% (81%)	+	194% (39%)	+	-97% (-19%)
Germany	501% (100%)	=	386% (77%)	+	164% (33%)	+	-49% (-10%)
France	492% (100%)	=	370% (75%)	+	176% (36%)	+	-54% (-11%)

The growth rates are computed by averaging (unweighted) across country pairs between Australia, Austria, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, Switzerland, the UK and the US, the rest are excluded due to too short time series.

The first observation is the dominance of falling bilateral barriers as drivers of the growth of FDI, they explain more than three quarters of the growth. Jacks, Novy and Meissner (2008) do a similar decomposition for trade flows. For the period 1950-2000, they find that falling trade costs (inferred in the same manner as FDI openness in this paper) explain only 33% of the growth in trade, the rest being attributable to economic growth. Novy (2008) report similar numbers for specific country pairs involving the US over the period 1970-2000, falling trade costs explain on average 40% of the growth in trade.

In fact, the numbers in table 4 are more in line with what happened to international trade in the period 1870-1913, the so-called first wave of globalization. In this period world trade boomed, and Jacks, Novy and Meissner show that 56% of that expansion could be attributed to falling trade costs. A policy lesson can be drawn from this analogy: As the collapse in global trade following the First World War and the Great Depression has shown, an expansion in trade or FDI, which is driven by reduced bilateral costs is more fragile. Barriers can be re-erected. Although trade costs in the late 19th century fell both for technological and political reasons, the protectionist era of 1921-39 brought trade costs back to their pre-Victorian level (see Jacks, Novy and Meissner (2008)).

Table 4 also reveals that falling net costs of FDI have played a smaller role for FDI growth between the US and its partners. The higher economic growth in the US and the lower degree of "FDI crowding out" due to changes in third country barriers compensates to some degree, the growth in the US' bilateral FDI stocks is not markedly below the average. Similar lower contributions of bilateral FDI openness hold for Japan and Australia.

All bilateral investment stocks are suppressed by the decline in third-country barriers. For small open economies, the negative contribution is larger. The extreme example is Portugal (excluded from the calculated average for this reason): Even though M&A makes up only around a fourth of the FDI inflows there, competition for the relatively small stock of portuguese capital has depressed the foreignly owned FDI stock with 364%. These magnitudes, and the variation across country pairs, show that the bias of failing to correct for changes in bidder competition is substantial.

4 Conclusion

This study shows how countries' openness (the inverse of net costs) to FDI and migration can be inferred from observed data, by extending a method hitherto used only for trade in goods. In principle, the method can be used to infer bilateral openness to any social or economic activity whose diffusion in space can be described by the gravity equation (patenting, traffic, etc.). The only condition is that a location's "diffusion to itself" (x_{ii}) can be properly measured.

The resulting inferred bilateral openness is intuitive and easy to apply and compare over time and space. Moreover, the measure includes costs and benefits that cannot be measured directly, and may be the only way of assessing these unobservables. My analysis documents their existence by showing the high degree of simultaneity between FDI and migration openness.

For FDI, inferred bilateral openness expose an increasing attractiveness of FDI across the board and a rising importance of three hubs, the UK, the Netherlands and Switzerland. In comparison, there is little happening for openness of migration, although migration openness increases slightly over the examined time period. Only easier access for migration from Northern to Southern Europe and from Central Europe to Western Europe are visible in the aggregate measures.

Using the inferred bilateral openess to FDI as well as an inferred measure of a country's overall FDI barriers, I have shown that if FDI has grown in recent decades, it is mostly because of these increases in bilateral openess (76%), economic growth plays only a secondary role. The picture is the opposite of the one for trade flows, where a previous study has shown that trade costs explain only 33% of the trade expansion of the last fifty years. The policy lesson is that the FDI expansion is fragile, if policy barriers are re-erected it may collapse.

Virtually all OECD countries become more open to FDI over time. This finding is not surprising, but a consequence is that the individual bilateral FDI stocks are depressed. These third-country effects on bilateral stocks must be taken into account when estimating the determinants of bilateral FDI. I suggest country-specific trends instead of the country fixed effect proposed by Head and Ries (2008).

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