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Abstract

In this paper we examine the importance of migrant stocks on FDI flows from a sample of 19 developed countries to around 150 partner countries using a modified version of the gravity model. Based on recent advances in the modelling of trade using the gravity model we include a variety of fixed effects to control for various sources of endogeneity and deal with the issue of many zero and negative values of FDI. We further adopt an instrumental variables approach to deal with potential simultaneity. Results suggest that migrant stocks are positively associated with higher FDI inflows and outflows, with the effects working largely by enhancing the strength of existing FDI relationships rather than developing new relationships. We find little evidence of heterogeneous effects by skill level of the migrants.

Keywords: Migration, FDI Flows, Gravity Equation

JEL classification: F22, F23

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TABLES AND FIGURES

1. Introduction

In this paper we consider whether the stock of migrants in a sample of developed host countries impacts upon the outflow and inflow of Foreign Direct Investment (FDI) of these countries with respect to a broader set of migrant origin countries. From a theoretical point of view, FDI and migration can be either complements or substitutes. Kugler and Rapoport (2007) argue that one aspect of migration is to reduce the number of workers in an economy, which will decrease the domestic return to capital and generate a compensating outflow of capital. FDI and migration are substitutes in this case with more migration leading to less FDI and vice versa. They go on to emphasise the importance of the composition of migration. A skilled labour force is a key determinant of FDI inflows. Emigration that is more skill intensive will lower the proportion of skilled workers in the home population and potentially deter FDI inflows into the origin country.

Other literature would suggest that the relationship between FDI and migration are complements. Cross border flows of goods, services and capital are likely to suffer from informal trade barriers, including information difficulties related to potential market opportunities, enforcing contracts across national boundaries, and so on (Javorcik et al, 2011). Gould (1994), Head and Ries (1998), Rauch and Trindade (2002) and Combes et al. (2005) amongst others argue that the presence of people with the same ethnic or national background on both sides of a border may alleviate these problems. This can be achieved through a number of channels. Firstly, the language skills of migrants and their familiarity with both their 'home' and 'adopted' country can significantly lower communication costs. Such individuals are also likely to possess information on market structure, consumer preferences, business ethics and commercial codes in both their home and adopted countries, which can encourage new business opportunities and cross-border links. The knowledge of migrants can also help by decreasing the costs of negotiating and enforcing contracts.

Based on these latter arguments a number of studies beginning with the seminal studies of Gould (1994) and Head and Ries (1998) have used the gravity equation to consider the relationship between the stock of immigrants and the amount of trade (exports, imports or total trade) with their country of origin, with the evidence tending to indicate a positive relationship. Gould (1994) found that both US exports and imports were positively correlated with the stock of migrants from the partner country present in the US, with Head and Ries (1998) reaching a similar conclusion when examining Canadian data and Combes et al. (2005) finding similar results using information on intra-regional economic activity in France. Genc et al (2011) analyse the distribution of immigration elasticities of imports and exports across 48 studies and 300 observations using meta-analysis. Their results indicate that immigration complements rather than substitutes for trade flows between host and origin countries. After correcting for heterogeneity and publication bias, they find that an increase in the number of immigrants by 10% increases the volume of trade by around 1.5% on average.

While the empirical literature on migration and trade is quite extensive, that relating to the relationship between migration and FDI is much smaller, despite the above arguments suggesting an important role for migrants in driving FDI flows. As with the case of trade we may expect that migration by reducing

transactions costs will help facilitate – both inward and outward – FDI. The fixed costs of setting up production capacity in a foreign location includes not only the cost of building physical production facilities but also the cost of gathering information on prevailing business conditions, local regulations, labour relations, availability of suppliers, and so on. Ethnic networks, through their role as an information provider, can reduce the costs of obtaining information and thus lower the fixed cost of undertaking FDI. Indeed, as discussed by Javorcik et al (2011), FDI activities are subject to even larger information asymmetries than international trade transactions. Javorcik et al (2011) argue that FDI generally requires a long-term focus and interactions with diverse groups of economic agents from suppliers, workers and consumers to government officials. Moreover, investors need to have detailed knowledge of retail, labour and input markets as well as the legal and regulatory regimes in the host country. Evidence suggests that information asymmetries hinder international capital flows (Portes et al. 2001, Portes and Rey 2005, Gelos and Wei 2005), while FDI flows have been shown to be "substantially more sensitive to information frictions than investment in portfolio equity and debt securities" (Daude and Fratzscher, 2008). As discussed above, language skills of migrants and familiarity with both their 'home' and 'adopted' country can significantly lower communication costs, while the information they possess on both economies can help in identifying new business opportunities. By transferring knowledge and information across borders, migrant networks can reduce the costs of obtaining information and lower the fixed cost of undertaking FDI.

Despite these theoretical arguments, the empirical literature on the link between ethnic networks and FDI is quite small. Bhattacharya and Groznik (2008) and Buch et al. (2006) find a positive relationship between migration and FDI for the US and Germany respectively, while Kugler and Rapoport (2007) find that migration and US FDI inflows are negatively correlated contemporaneously, suggesting substitution effects, but that migration is associated with an increase in future FDI. Gao (2003) finds a positive relationship between the stock of FDI in China and the population share of ethnic Chinese in the cross-section of source countries. Tong (2005) shows that the strength of ethnic Chinese networks between country pairs, measured with the number of ethnic Chinese in both countries, is positively correlated with the cumulative amount of their reciprocal FDI. Javorcik et al (2011) find that US FDI abroad is positively correlated with the presence of migrants from the host country, and that the relationship between FDI and migration is stronger for migrants with tertiary education. Cuadros et al (2016) also show evidence of a positive association between migration and FDI inflows into the migrant's origin country. They further show that the effect of migration is strengthened for origin countries with strong financial frictions, which they argue can arise if migrants provide information on alternative financial possibilities in their homeland. In the presence of banking crises however, the effect of migrants on FDI flows is found to be weaker, which it is argued can arise if migrants transmit distorted information about their homeland in the presence of crises.

In this paper we examine the relationship between migrant stocks and both FDI inflows and outflows from 19 reporting, developed, migrant host countries to (up to) 154 partner, migrant origin countries using panel data from 1985 to 2010. We estimate a variant of the gravity equation, following recent developments in the modelling of trade flows using the gravity equation, by including a variety of fixed effects to control for endogeneity. We also deal with the problem of the large number of zero FDI flows and in the case of FDI flows the possibility of negative FDI flows. We further examine whether there are differences in the relationship between FDI flows and migrant stocks for low-, medium- and high-educated migrants. The reason for considering this latter distinction is that some studies (e.g. Aleksynska and Peri, 2014) argue that migrants in managerial/business-related occupations are those

likely to be directly involved in the diffusion of information relevant for foreign-oriented firms. Results indicate that there is a positive association between migrant stocks and both FDI outflows and inflows into the set of host countries, but that this effect often disappears when accounting for zero and negative FDI flows and when controlling for country-pair fixed effects and multilateral resistance. Considering migrants by education level, we find results for low- and medium-educated migration that are similar to those for all migrants, with positive effects tending to be found, but the significance of the effects disappearing once zero and negative flows, and country-pair fixed effects are controlled for. In the case of high-educated migrants however, we consistently find evidence of a positive and significant impact of high-educated migrant stocks on FDI flows. This latter result is suggestive of the importance of migrant networks in encouraging capital flows, with the results providing further support for the arguments of Aleksynska and Peri (2014) suggesting that it is high-educated migrants that encourage FDI flows.

The remainder of the paper is set out as follows: Section 2 describes the empirical approach; Section 3 discusses the methodology; Section 4 describes the results; and Section 5 concludes.

2. Empirical Model

The gravity model has been applied extensively to the study of trade flows, but has only more recently been applied when examining the determinants of FDI flows (see for example Braconier et al, 2005). Theoretical work has also recently begun to appear justifying the use of the gravity model to explain FDI flows (see for example Paniagua, 2011). In our analysis of the role of migration in influencing FDI flows we begin by adopting a fairly standard formulation of the gravity model replacing a measure of bilateral trade with a measure of bilateral FDI flows as our dependent variable. The basic specification of our model is:

$$\ln FDI_{ijt} = \alpha + \beta_1 \ln GDPPC_{it} + \beta_2 \ln GDPPC_{jt} + \beta_3 \ln DIST_{ij} + \beta_4 LANG_{ij} + \beta_5 BORD_{ij} +$$

$$\beta_6 COL_{ij} + \beta_7 BIT_{ijt} + \beta_8 PTA_{ijt} + \beta_9 POL_{jt} + \delta_1 \ln MIG_{ijt} + \varepsilon_{ijt} \quad (1)$$

where $\ln FDI$ is our measure of FDI flows (i.e. either the log of the outflow of FDI from reporting country i to partner country j in time period t, or the log of the inflow FDI into reporting country i from partner country j), $GDPPC_{it}$ and $GDPPC_{jt}$ are the per capita GDPs of the reporter and partner respectively, $DIST$ is the distance between reporter and partner, $LANG$, $BORD$ and COL are dummy variables taking the value one when countries share a common language, common border or share a common colonial history respectively, BIT and PTA are dummies taking the value one if countries are in a bilateral investment treaty together or are part of the same preferential trade agreement, POL is a measure of political constraints in the partner country (included as a measure of the strength of institutions), and MIG is a measure of the stock of migrants from country j resident in country i in period t.

We further extend equation (1) to account for recent developments in the estimation of gravity models (see for example Baldwin and Taglioni, 2006). In particular, we include: (i) country-pair fixed effects to control for endogeneity that arises due to self-selection, with migration and FDI flows likely to be jointly determined by other unobserved factors; (ii) time effects to capture unobserved heterogeneity in FDI flows across time; and (iii) controls for multilateral resistance following Anderson and van Wincoop (2003). Anderson and van Wincoop (2003) showed that trade between two countries is decreasing in their bilateral trade costs relative to the average of the two countries to trade with all their partners, rather than to absolute trade barriers. This they referred to as multilateral resistance. Paniagua (2011) derives a theoretically based gravity model for FDI flows and also obtains multilateral resistance terms. Since the multilateral resistance terms are found to be importer and exporter specific they are often captured by importer and exporter specific fixed effects. In a time-varying panel setting the possibility that the multilateral resistance terms are time-varying also arises. In this case, importer-time and exporter-time fixed effects can be used to capture the time-varying nature of the multilateral resistance terms. The inclusion of these fixed effects requires estimation of a large number of additional coefficients, and time-varying country-specific variables cannot be included alongside these fixed effects. Since this can be a significant drawback, we adopt the alternative approach of Baier and Bergstrand (2009), who suggest controlling for multilateral resistance by including GDP-weighted exogenous variables as multilateral

resistance controls. We therefore include as additional regressors the (logged) GDP weighted distance of the reporter and partner to all of the other partners and reporters, i.e.

$$\ln MR_{ijt}^{R} = \ln\left[\sum_{k=1}^{K} Dist_{ik,k\neq j} \times \frac{GDP_{kt}}{\sum_{k=1}^{K} GDP_{kt,k\neq j}}\right]$$

$$\ln MR_{ijt}^{P} = \ln\left[\sum_{l=1}^{L} Dist_{lj,l\neq i} \times \frac{GDP_{lt}}{\sum_{k=1}^{K} GDP_{lt,l\neq i}}\right]$$

$$\ln FDI_{ijt} = \beta_1 \ln GDPPC_{it} + \beta_2 \ln GDPPC_{jt} + +\beta_7 BIT_{ijt} + \beta_8 PTA_{ijt} + \beta_9 POL_{jt} + \delta_1 \ln MIG_{ijt} +$$

$$\theta MR_{ijt} + \alpha_{ij} + \tau_t + \varepsilon_{ijt} \qquad (2)$$

where the inclusion of the country-pair fixed effects means that we are not able to estimate coefficients on country-pair specific variables, such as distance and common language.

Following the majority of the literature using the gravity equation, we wish to apply a log transformation to our FDI measures, as a way of reducing the skewness of the distribution and allowing our estimator to provide an estimate of the percentage change in FDI due to a percentage change in migration (i.e. an elasticity). Unfortunately, a routine application of the log transformation will exclude from consideration the large number of zero flows along with the negative values of FDI flows that involve instances of reverse or dis-investment.[1] Our base specification adopts the standard log transformation, and therefore only allows us to focus on the effects of migration on FDI flows for the sub-sample of positive flows. To retain the zero and negative observations in our analysis we make use of the inverse hyperbolic sine transformation (for more details see Burbidge et al, 1988), which is defined as $\ln\left(y + \left(y^2 + 1\right)^{1/2}\right)$. Except for small values of y, this is approximately equal to $\ln(2) + \ln(y_i)$, meaning that coefficients can be interpreted in the same way as when using logs. This transformation has the advantage of being directly defined for zero and negative values and has been used in a number of recent papers (see for example Aisbett et al., 2016, Berger et al., 2013, Falvey and Foster-McGregor, 2017).

Javorcik et al (2011) highlight a further source of endogeneity related to simultaneity or reverse causality. FDI inflows bring capital, new technology and know-how and in this way stimulate economic growth in host countries. Entry of multinationals can also produce better employment opportunities and higher paying jobs. Through these channels FDI inflows can lower the incentives to migrate. The presence of FDI inflows can also have a positive effect on migration however, as local employees can be transferred by their foreign employer to the company headquarters or to its other subsidiaries abroad. The experience of working for a multinational can also help enable employees to move to other countries. The presence of multinational firms in a country can encourage workers to acquire skills appropriate for the global economy – such as learning foreign languages – which would facilitate their migration. These effects are likely to be stronger for highly educated workers who possess the skills required by foreign multinationals. With the exception of Javorcik et al (2011) few studies to date deal

[1] In the literature on the gravity equation attempts have recently been made to deal with a form of endogeneity that arises due to the presence of zero (trade) flows. Helpman et al (2008) for example propose a modified Heckman selection type model, while Santos and Tenreyro (2006) suggest using a Pseudo Poisson Maximum Likelihood model. Both of these suggestions are for data with a natural truncation (at zero) and are not applicable to cases where negatives are also possible such as the current case.

with this simultaneity bias. Javorcik et al (2011) use an instrumental variables approach to deal with this issue, using as instruments the costs of acquiring a national passport in the migrants' country of origin, the total migrant stock from each source country present in the US 30 years earlier normalized by the total population size of the source country, distance to the European Union (EU) as an alternative destination for migrants, presence of a US military base in the migrant country of origin 20 years earlier, and a dummy indicating whether the migrant's country of origin allows its citizens to hold dual citizenship.

We attempt to deal with the issue of simultaneity in a number of ways. Initially when estimating equations (1) and (2) we regress the initial stock of migrants on the average flow of FDI in the subsequent five years. Using the effective lagged values of migrant stocks in our analysis can help alleviate simultaneity issues, though since we expect migrant stocks to be highly autocorrelated this can only be considered a partial solution at best. In robustness analysis we therefore use an instrumental variables approach. We experimented with a number of instruments, including data on the presence of migration related aspects in preferential trade agreements (Hofmann et al, 2017), unemployment rates and differences in unemployment rates between recipient and partner (from the World Development Indicators database), and indices of migration policy in the reporting countries from Rayp et al (2017). Results using these instruments were usually disappointing, in particular usually failing to be valid instruments according to the Sargan test. Finally, we settled on variables constructed using the DEMIG dataset.[2] Using the DEMIG dataset we constructed a set of variables capturing work permit and mobility related policies. These data are reported for both high and low skilled workers, with the data for all workers being used in our analysis.

After including the (logged) total migrant stock linearly we extend our regression model to include the (logged) stocks of low-, medium- and high-educated migrants separately. Some studies of the effects of migration have looked to examine whether the make-up of the migrant stock affects the relationship between migration and the flows of trade and FDI, arguing that the effects of migration are likely to depend upon the extent of the network effects, which are likely to be stronger when high educated and when business managers make up a larger share of the migrant stock. Felbermayr and Jung (2009) consider the importance of the level of education of the migrant stock and find few differences in the effect of migration on trade by education level, while Javorcik et al (2011) find that the relationship between FDI and migration is stronger for migrants with tertiary education. Aleksynska and Peri (2014) consider the share of migrants employed in managerial/business-related occupations and find that this share has an additional effect on trade.

[2] https://www.imi.ox.ac.uk/data/demig-data/demig-policy-1/download-the-data/demig-policy-data-downloads (accessed August 2017).

3. Data and Descriptive Statistics

Data on FDI inflows and outflows come from the OECD international direct investment database, and are in millions of US dollars. This dataset reports on a bilateral basis FDI flows and positions (inward and outward) for a sample of OECD reporting countries with a much larger set of partner countries. In our analysis we use data for 19 reporting countries (Australia, Austria, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Ireland, Luxembourg, Netherlands, Norway, New Zealand, Portugal, Sweden and the USA) and up to 154 partner countries.

The reason that the number of OECD reporting countries is limited to 19 is due to the migration data, which comes from the Institute of Employment Research (http://www.iab.de/en/daten/iab-brain-drain-data.aspx) and which reports data on the total number of foreign-born individuals aged 25 years and older, living in each of 20 considered OECD destination countries, by year, gender, country of origin and educational level, where educational levels are split into low-, medium- and high-educated migrants.[3] The data is available every five years from 1980 to 2010, but given that the FDI data doesn't begin until 1985, we use data from 1985 to 2010 giving us up to six time-series observations per country-pair.

Data on GDP and population are from the World Bank's World Development Indicators, while gravity variables such as distance, common language, colonial history and common border are from CEPII. Data on migration policies are from the paper of Rayp et al (2017) and can be accessed at http://users.ugent.be/~sastanda/MPI/MPI.html. Data on PTAs are taken from the Global Preferential Trade Agreements Database (http://wits.worldbank.org/gptad/), while the index of political rights was developed by Henisz (2000) and has recently been updated to 2011.[4] The index ranges between zero (the executive has complete discretion and can change policies at any time) and one (a change of existing policies is infeasible)[5] and is an indicator of the ability of political institutions to make credible commitments to an existing policy regime. It is argued by both Henisz (2000) and Neumayer and Spess (2005) to be the political variable most relevant to potential investors.

As already mentioned, to help alleviate the issue of endogeneity – and reverse causality in particular – we use the average of FDI flows in each five-year period (i.e. 1985-89; 1990-94; 1995-99; 2000-04; 2005-09; 2010-2013[6]), but the values of each of the explanatory variables in the initial year of each five-year period.

Table 1 reports some basic descriptive statistics on inward and outward FDI flows (both the logged values and values calculated using the inverse hyperbolic sine transformation) and on migrant stocks (also by skill level). The table indicates that FDI outflows from our sample of 19 countries are on average larger than inflows. This is to be expected, given that our sample of 19 reporting countries are highly developed countries with

[3] Chile is not included in our analysis as a reporting country, as its level of development is considered significantly lower than the other reporting countries.

[4] Data can be downloaded from http://www-management.wharton.upenn.edu/henisz/

[5] As a robustness check we use an indicator of the extent of checks and balances on the executive from Beck et al (2001), which has been updated to 2012. Results using this alternative indicator of political stability are available upon request, and are consistent with those reported here.

[6] Data on FDI is only available up to the year 2013.

significant FDI outflows, while the sample of partner countries also includes a large share of developing countries that engage relatively little in outward FDI. Differences in average migrant stocks by skill level are not as pronounced as may be expected. While, on average, the stock of low-skilled migrants is largest, values for medium- and in particular high-skilled are not hugely dissimilar.

Table 1 / Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Log inward FDI	4,018	2.494	3.405	-8.517	11.390
IHST inward FDI	21,090	0.504	2.125	-9.792	12.083
Log outward FDI	5,459	3.111	3.068	-7.418	11.057
IHST outward FDI	21,090	0.843	2.505	-9.879	11.750
Total migrant stock	16,945	16,972.1	129146.4	0	9,234,340
Low skilled migrant stock	16,260	6,950.7	73276.4	0	5,292,107
Medium skilled migrant stock	16,042	4,743.4	37378.1	0	2,626,342
High skilled migrant stock	16,432	5,993.2	34950.6	0	1,315,891

Notes: this table reports the mean, standard deviation, minimum and maximum of our dependent and main explanatory variables. IHST refers to the inverse hyperbolic sine transformation.

4. Results

4.1. BASIC RESULTS

Table 2 reports the results for outward FDI flows (i.e. from the sample of advanced countries to the broader sample of developed and developing countries), with the first four columns reporting results when using the simple log of FDI flows (and therefore ignoring the zero and negative FDI outflows) and the latter four columns reporting results when using the inverse hyperbolic sine transformation (IHST) (and thus including zero and negative FDI flows). Within each set of results the different columns report results including different sets of fixed effects (time and country-pair fixed effects) and controls for multilateral resistance.

Considering the control variables we observe negative coefficients on the distance variable, though they are only significant when using the IHST. Coefficients on the per capita GDP of both reporter and partner are positive and significant, with the coefficients tending to be larger for the reporter's per capita GDP. A common border and a common colonial history between country-pairs are associated with larger FDI flows, though the effect of common language is not significant. Being partners in a bilateral investment treaty has a positive impact on FDI flows – an effect that is larger for positive FDI flows (for contrary evidence see Falvey and Foster-McGregor, forthcoming) – as does being members of the same PTA at least when using the IHST. Stronger political constraints in the partner country have a positive impact upon FDI flows, when significant. These results are largely in line with existing results and with expectations therefore, with the lack of significance on the distance variable perhaps being the most unexpected.

Turning to the migration variable we observe coefficients on the migration variable that are positive and that tend to be significant. Coefficients tend to be smaller when country-pair fixed effects are controlled for (and in the case of the IHST the coefficient becomes insignificant with country-pair fixed effects). Interestingly, coefficients when using the IHST are also somewhat smaller than the corresponding coefficients when using the simple log transformation. One interpretation of this result is that the effects of migration on FDI flows are larger for FDI flows that are already positive (i.e. the subsample of observations included with the log transformation) than for FDI flows that are initially zero or negative (i.e. observations also included in the IHST). In our preferred specification, a 1% increase in the migrant stock increases FDI outflows from advanced countries by 0.35% in the case of positive FDI flows, but by an insignificant 0.06% in the case of all FDI flows. While the specifications and variable definitions are somewhat different we can compare our results with others in the literature. In comparison to the paper of Javorcik et al (2011) the coefficients on the migration variables that we obtain are larger than the insignificant coefficients found in the OLS regressions of Javorcik et al (2011), but are not inconsistent with those from their instrumental variables estimation. Our estimates are somewhat larger than the effects of Cuadros et al (2016) however.

In Table 3 we extend the analysis to distinguish between different types of migrants – and in particular the skill level of migrants. We are interested in examining whether the effects of migrants on FDI flows differ by skill level and in particular whether the effects are stronger for high skilled labour. To do this we

initially run our gravity models separately for low, medium and high skilled migrant stocks. Results on the control variables are largely similar to those when using the total migrant stock, so we turn immediately to the results on the migration variable. In this table we focus on results including year and country-pair fixed effects and controls for multilateral resistance. In general, the pattern of results is similar to that for the total migrant stock, with positive coefficients on the migrant variable that are generally significant. Coefficients again tend to be larger when concentrating only on positive FDI flows, with the effects becoming small and occasionally insignificant when including all observations. Most importantly, we find little evidence of a differential effect of migration on FDI flows by skill type. The coefficients on the migration variable tend to be quite stable, irrespective of whether we measure the migrant stock using low-, medium- or high-skilled migrants. Despite the presence of multicollinearity we further include all three migrant variables simultaneously. When including only positive FDI flows we find coefficients that are positive, but that are only significant in the case of low-skilled migrants. When including all observations the coefficients are positive and significant in the case of both low- and high-skilled migrants, with the effects being insignificant (and negative) in the case of medium-skilled migrants. In general, our results provide little evidence to suggest that the impact of migrant stocks on FDI is larger in the case of high-skilled migrants, though coefficients appear more likely to be significant for high-skilled migrants.

Table 2 / Gravity Results for Outward FDI Flows (Total Migration)

	Log FDI				Inverse Hyperbolic Sine Transformation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\ln MIG$	0.568***	0.570***	0.606***	0.346***	0.263***	0.267***	0.273***	0.0580
	(0.0211)	(0.0211)	(0.0222)	(0.0675)	(0.0153)	(0.0154)	(0.0153)	(0.0391)
$\ln GDPPC_j$	0.873***	0.882***	0.879***	1.154***	0.337***	0.343***	0.344***	0.515***
	(0.0377)	(0.0377)	(0.0373)	(0.191)	(0.0251)	(0.0252)	(0.0248)	(0.0979)
$\ln GDPPC_i$	2.256***	2.323***	2.098***	2.086***	0.463***	0.552***	0.408***	2.294***
	(0.134)	(0.162)	(0.167)	(0.669)	(0.0753)	(0.0800)	(0.0837)	(0.441)
$\ln DIST$	-0.0502	-0.0472	0.0726		-0.190***	-0.156***	-0.0390	
	(0.0678)	(0.0692)	(0.0757)		(0.0555)	(0.0562)	(0.0713)	
$BORD$	0.525**	0.528**	0.520**		1.789***	1.795***	1.913***	
	(0.214)	(0.217)	(0.220)		(0.345)	(0.345)	(0.344)	
$LANG$	-0.0148	0.00265	0.232		-0.142	-0.147	-0.0660	
	(0.149)	(0.150)	(0.157)		(0.104)	(0.104)	(0.106)	
COL	0.689***	0.686***	0.387**		0.766***	0.760***	0.624***	
	(0.187)	(0.188)	(0.192)		(0.216)	(0.215)	(0.216)	
POL	0.156	0.138	0.0544	0.604**	0.384***	0.370***	0.346***	-0.0107
	(0.179)	(0.179)	(0.178)	(0.272)	(0.0877)	(0.0897)	(0.0897)	(0.120)
BIT	0.516***	0.531***	0.446***	0.548***	0.314***	0.350***	0.307***	0.337***
	(0.0929)	(0.0969)	(0.0965)	(0.109)	(0.0796)	(0.0802)	(0.0790)	(0.0884)
PTA	-0.0836	-0.0870	-0.0351	0.0421	0.121	0.196*	0.256**	0.337***
	(0.124)	(0.127)	(0.126)	(0.112)	(0.116)	(0.117)	(0.115)	(0.123)
Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
MR Terms	No	No	Yes	Yes	No	No	Yes	Yes
Country FE	No	No	No	Yes	No	No	No	Yes
Observations	4,778	4,778	4,778	4,778	13,757	13,757	13,757	13,757
R-squared	0.519	0.523	0.533	0.397	0.218	0.225	0.228	0.036
F-Stat	270.6***	190.8***	175.7***	113.3***	136.7***	98.67***	87.64***	35.84***

Notes: ***, **, and * indicate significance at the 1, 5, and 10% levels. Standard errors clustered at the level of the country-pair.

Table 3 / Outward FDI by Skill Level

	Log FDI				IHST			
$\ln MIG^L$	0.260***			0.165*	0.0668*			0.111**
	(0.0584)			(0.090)	(0.0371)			(0.056)
$\ln MIG^M$		0.246***		0.101		0.0263		-0.128*
		(0.0623)		(0.113)		(0.0374)		(0.068)
$\ln MIG^H$			0.242***	0.032			0.0661*	0.105*
			(0.0666)	(0.099)			(0.0372)	(0.061)
$\ln GDPPC_j$	1.176***	1.234***	1.145***	1.231***	0.508***	0.548***	0.526***	0.537***
	(0.194)	(0.187)	(0.192)	(0.187)	(0.103)	(0.104)	(0.102)	(0.110)
$\ln GDPPC_i$	2.293***	2.383***	2.101***	2.203***	2.296***	2.431***	2.358***	2.315***
	(0.667)	(0.668)	(0.683)	(0.681)	(0.454)	(0.454)	(0.449)	(0.472)
POL	0.620**	0.612**	0.617**	0.589**	0.00116	0.0138	0.00631	0.026
	(0.273)	(0.277)	(0.275)	(0.279)	(0.124)	(0.127)	(0.124)	(0.130)
BIT	0.551***	0.593***	0.578***	0.571***	0.326***	0.323***	0.335***	0.308***
	(0.108)	(0.109)	(0.109)	(0.109)	(0.0898)	(0.0903)	(0.0897)	(0.092)
PTA	0.0341	0.0511	0.0314	0.039	0.332***	0.344***	0.328***	0.338***
	(0.112)	(0.113)	(0.113)	(0.113)	(0.124)	(0.124)	(0.123)	(0.126)
Observations	4,733	4,716	4,757	4,670	13,280	13,227	13,507	12,840
R-squared	0.396	0.398	0.395	0.399	0.037	0.038	0.037	0.039
F-Stat	112.9***	113.7***	110.9***	98.36***	35.29***	36.01***	35.93***	31.22***

Notes: ***, **, and * indicate significance at the 1, 5, and 10% levels. Standard errors clustered at the level of the country-pair. All regressions include year fixed effects, country-pair fixed effects and controls for multilateral resistance.

The previous two tables report results when considering outflows of FDI from our sample of advanced countries to the broader sample of recipient countries and thus captures the effect of migrants affecting outflows of FDI from their destination country to their country of origin. We may also expect that migrants – through network effects – can also encourage the inflow of FDI from their country of origin into their destination country. The following two tables therefore repeat the above exercise, but consider FDI inflows into our sample of 19 advanced countries.

Table 4 reports results when considering the total migrant stock. Results on the control variables are largely similar to those when considering FDI outflows, so we will focus on the results on the migration variable. The pattern of coefficients on the migration variable is also somewhat similar to that found when considering FDI outflows. Coefficients on the migration variable tend to be positive and tend to be significant. The coefficients are generally larger when country-pair fixed effects are excluded and when we focus on positive FDI flows only. Coefficients are also somewhat smaller than the corresponding coefficients in the case of FDI outflows, with a 1% increase in migrant stocks increasing FDI inflows into our sample of host countries by around 0.164% in the case of positive FDI inflows, and by an insignificant 0.05% in the case of all FDI inflows. In general however, these results suggest that migrants encourage both inward and outward FDI flows in our sample.

Considering the impact on FDI inflows of migrants by skill level, Table 5 provides some limited evidence of a stronger impact of high-skilled migrants on FDI inflows. When considering positive FDI flows only we observe a coefficient on the high-skill migrant stock that is larger than that for both low- and medium-skilled migrants (though coefficients are not significant when all three stock variables are included together). When considering all FDI flows we observe a similar pattern, with the only case of a significant coefficient found for high-skilled migrants when including all three stocks.

Table 4 / Gravity Results for FDI Inflows (Total Migration)

	Log Migration				IHST			
$\ln MIG$	0.485***	0.482***	0.494***	0.164*	0.129***	0.130***	0.128***	0.00496
	(0.0240)	(0.0242)	(0.0253)	(0.0946)	(0.0127)	(0.0128)	(0.0122)	(0.0389)
$\ln GDPPC_j$	1.291***	1.276***	1.259***	1.388***	0.365***	0.368***	0.363***	0.392***
	(0.0482)	(0.0488)	(0.0496)	(0.287)	(0.0227)	(0.0227)	(0.0220)	(0.0860)
$\ln GDPPC_i$	1.822***	1.551***	1.362***	1.309*	0.0734	0.0620	-0.00516	1.591***
	(0.142)	(0.176)	(0.176)	(0.728)	(0.0647)	(0.0691)	(0.0729)	(0.461)
$\ln DIST$	-0.114	-0.169**	0.0164		-0.246***	-0.240***	-0.163**	
	(0.0773)	(0.0792)	(0.0937)		(0.0492)	(0.0495)	(0.0668)	
$BORD$	0.223	0.200	0.331		2.060***	2.062***	2.150***	
	(0.264)	(0.260)	(0.267)		(0.370)	(0.370)	(0.371)	
$LANG$	0.264	0.275	0.458**		0.132	0.134	0.172*	
	(0.184)	(0.185)	(0.189)		(0.0905)	(0.0905)	(0.0913)	
COL	0.465*	0.461*	0.201		0.566***	0.564***	0.515**	
	(0.239)	(0.241)	(0.242)		(0.204)	(0.204)	(0.204)	
POL	-0.0809	-0.0472	-0.146	-0.200	0.250***	0.233***	0.215***	-0.226***
	(0.219)	(0.222)	(0.221)	(0.401)	(0.0628)	(0.0646)	(0.0645)	(0.0796)
BIT	-0.400***	-0.514***	-0.549***	0.135	-0.482***	-0.484***	-0.493***	-0.0805
	(0.118)	(0.123)	(0.123)	(0.187)	(0.0622)	(0.0626)	(0.0615)	(0.0609)
PTA	-0.0984	-0.219	-0.157	0.0972	0.166*	0.181*	0.215**	0.203*
	(0.151)	(0.156)	(0.153)	(0.158)	(0.0984)	(0.0988)	(0.0957)	(0.104)
Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
MR Terms	No	No	Yes	Yes	No	No	Yes	Yes
Country FE	No	No	No	Yes	No	No	No	Yes
Observations	3,524	3,524	3,524	3,524	13,757	13,757	13,757	13,757
R-squared	0.575	0.578	0.584	0.365	0.204	0.206	0.207	0.014
F-Stat	214.6***	154.8***	141.8***	70.23***	80.49***	55.16***	49.42***	11.35***

Notes: ***, **, and * indicate significance at the 1, 5, and 10% levels. Standard errors clustered at the level of the country-pair.

Table 5 / Inward FDI by Skill Level

	Log FDI				IHST			
$\ln MIG^L$	0.136*			0.072	-0.0103			-0.037
	(0.0744)			(0.100)	(0.0338)			(0.043)
$\ln MIG^M$		0.144*		0.006		0.00650		-0.047
		(0.0821)		(0.128)		(0.0341)		(0.048)
$\ln MIG^H$			0.183**	0.106			0.0367	0.097*
			(0.0926)	(0.131)			(0.0322)	(0.050)
$\ln GDPPC_j$	1.364***	1.547***	1.370***	1.514***	0.425***	0.410***	0.423***	0.459***
	(0.288)	(0.257)	(0.287)	(0.259)	(0.0904)	(0.0917)	(0.0893)	(0.097)
$\ln GDPPC_i$	1.402*	1.394*	1.237*	1.319*	1.605***	1.619***	1.570***	1.595***
	(0.724)	(0.720)	(0.733)	(0.742)	(0.476)	(0.480)	(0.472)	(0.501)
POL	-0.227	-0.237	-0.196	-0.226	-0.220***	-0.230***	-0.229***	-0.219**
	(0.400)	(0.407)	(0.400)	(0.405)	(0.0827)	(0.0847)	(0.0815)	(0.087)
BIT	0.148	0.155	0.154	0.155	-0.0899	-0.0943	-0.0882	-0.103
	(0.188)	(0.190)	(0.185)	(0.192)	(0.0622)	(0.0628)	(0.0624)	(0.064)
PTA	0.0575	0.0943	0.0921	0.051	0.203*	0.202*	0.201*	0.201*
	(0.157)	(0.158)	(0.158)	(0.157)	(0.105)	(0.105)	(0.104)	(0.107)
Observations	3,490	3,471	3,506	3,442	13,280	13,227	13,507	12,840
R-squared	0.367	0.368	0.367	0.369	0.015	0.015	0.015	0.015
F-Stat	69.97***	69.73***	70.67***	61.36***	11.20***	11.04***	11.65***	10.08***

Notes: ***, **, and * indicate significance at the 1, 5, and 10% levels. Standard errors clustered at the level of the country-pair. All regressions include year fixed effects, country-pair fixed effects and controls for multilateral resistance.

4.2. INSTRUMENTAL VARIABLES ESTIMATION

The results reported above lend support to the hypothesis that the presence of migrants in a country encourages both FDI inflows and outflows, though the evidence in support of the hypothesis that these effects are stronger in the case of high skilled migrants is limited. In this section we address the issue of potential simultaneity more fully by adopting an instrumental variables approach, using as instruments variables constructed from the DEMIG database described above.

Table 6 / Outward FDI Flows – Instrumental Variables Regression

	Log FDI				Inverse Hyperbolic Sine Transformation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\ln MIG$	0.676***	0.642***	1.415***	2.227***	0.224***	0.320***	0.427***	-0.942
	(0.0744)	(0.0803)	(0.279)	(0.720)	(0.0505)	(0.0535)	(0.0797)	(0.902)
$\ln GDPPC_j$	0.863***	0.878***	0.867***	0.915***	0.346***	0.321***	0.302***	0.508***
	(0.0268)	(0.0265)	(0.0330)	(0.204)	(0.0238)	(0.0244)	(0.0261)	(0.113)
$\ln GDPPC_i$	2.296***	2.357***	2.559***	-1.126	0.423***	0.492***	0.347***	3.137***
	(0.116)	(0.132)	(0.225)	(1.339)	(0.0618)	(0.0678)	(0.0711)	(1.093)
$\ln DIST$	-0.0519	-0.0427	0.123*		-0.197***	-0.137***	-0.0175	
	(0.0463)	(0.0480)	(0.0669)		(0.0380)	(0.0395)	(0.0442)	
$BORD$	0.353	0.417*	-1.101*		2.024***	1.853***	1.751***	
	(0.220)	(0.224)	(0.605)		(0.207)	(0.209)	(0.249)	
$LANG$	-0.0995	-0.0407	-0.304		-0.0559	-0.174*	-0.197*	
	(0.137)	(0.141)	(0.246)		(0.0908)	(0.0934)	(0.110)	
COL	0.488***	0.542***	-1.094**		0.809***	0.606***	0.233	
	(0.165)	(0.169)	(0.516)		(0.153)	(0.157)	(0.214)	
POL	-0.0615	-0.0481	-0.829***	0.0118	0.383***	0.262***	0.145	0.251
	(0.141)	(0.145)	(0.303)	(0.309)	(0.0934)	(0.0942)	(0.108)	(0.272)
BIT	0.480***	0.524***	-0.0223	0.120	0.385***	0.316***	0.149	0.382***
	(0.0769)	(0.0784)	(0.193)	(0.179)	(0.0797)	(0.0793)	(0.110)	(0.117)
PTA	-0.111	-0.0878	-0.0931	0.145	0.188**	0.249***	0.297***	0.306**
	(0.0942)	(0.0954)	(0.124)	(0.122)	(0.0799)	(0.0799)	(0.0814)	(0.143)
Wu-Hausman	1.996	0.707	13.63***	N/A	0.531	1.031	3.88**	N/A
First Stage F-Stat	83.83***	71.26***	10.54***	N/A	230.31***	204.44***	97.46***	N/A
Sargan	2.043	0.15	0.069	0.137	0.097	5.90**	22.51***	0.153
Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
MR Terms	No	No	Yes	Yes	No	No	Yes	Yes
Country FE	No	No	No	Yes	No	No	No	Yes
Observations	4,491	4,491	4,491	4,491	13,337	13,337	13,337	13,337

Notes: ***, **, and * indicate significance at the 1, 5, and 10% levels. Standard errors clustered at the level of the country-pair. In the case of the panel fixed effects regression the Sargan text is calculated using the xtoverid command in Stata.

Table 6 reports the results for FDI outflows, with Table 7 reporting similar results for FDI inflows. Concentrating on FDI outflows initially, we again observe a similar pattern on the additional control variables and therefore concentrate our discussion on the results for the migration variable. In the cases where neither country-pair fixed effects nor multilateral resistance controls are included we find a pattern of results very similar to that found above. In particular, coefficients tend to be positive and significant, with the coefficients being larger when considering positive FDI flows only. When including multilateral resistance controls and country-pair fixed effects coefficients change quite dramatically. In the case where multilateral resistance is controlled for coefficients on the migrant variable increase in size, with the coefficients being significant and again larger in the case of positive FDI flows only. When including country-pair fixed effects the size of the coefficient on the migration variable increases again

dramatically in the case of positive FDI flows. In the case of all FDI flows the coefficient on the migration variable becomes large and negative (though insignificant). Tests of the validity of the instruments (Sargan test and F-statistic from the first stage regression) tend to support the view that the instruments are both relevant and exogenous. The test statistic on the Wu-Hausman test of endogeneity provides only mixed evidence in support of the presence of endogeneity however. To summarise, when looking to control for simultaneity using instrumental variables coefficients on the migration variable become more unstable, and in many cases extraordinarily large. The pattern however is consistent with results above and suggests that a larger migrant stock increases outward FDI flows, with this effect being much stronger for positive FDI flows.[7]

Finally, in Table 7, we report IV results in the case of FDI inflows. The results are very similar to those for FDI outflows suggesting positive and significant effects of the migrant stock on FDI inflows when country-pair fixed effects are excluded, with effects being larger for positive FDI flows only. Adding country-pair fixed effects removes the significance of the migrant stock in the case where all observations are included, with the coefficient increasing markedly in size (and remaining significant) when considering only positive FDI flows.

Table 7 / Inward FDI Flows – Instrumental Variables Regression

	Log Migration				IHST			
$\ln MIG$	0.436***	0.437***	0.655***	3.898***	0.182***	0.248***	0.327***	0.320
	(0.0761)	(0.0855)	(0.180)	(1.194)	(0.0433)	(0.0462)	(0.0693)	(0.757)
$\ln GDPPC_j$	1.300***	1.288***	1.265***	1.074***	0.344***	0.326***	0.311***	0.434***
	(0.0340)	(0.0338)	(0.0338)	(0.322)	(0.0204)	(0.0211)	(0.0227)	(0.0953)
$\ln GDPPC_i$	1.626***	1.349***	1.280***	-2.826*	0.00902	0.0109	-0.0781	0.793
	(0.120)	(0.141)	(0.161)	(1.597)	(0.0529)	(0.0586)	(0.0618)	(0.918)
$\ln DIST$	-0.119**	-0.167***	0.0599		-0.227***	-0.196***	-0.121***	
	(0.0566)	(0.0592)	(0.0701)		(0.0326)	(0.0341)	(0.0384)	
$BORD$	0.403	0.359	0.0612		2.248***	2.124***	2.033***	
	(0.246)	(0.256)	(0.426)		(0.178)	(0.181)	(0.216)	
$LANG$	0.305**	0.318**	0.358**		0.0758	-0.00366	-0.0310	
	(0.146)	(0.151)	(0.178)		(0.0778)	(0.0807)	(0.0954)	
COL	0.526***	0.522***	-0.118		0.428***	0.289**	0.0274	
	(0.194)	(0.203)	(0.367)		(0.131)	(0.136)	(0.186)	
POL	-0.0499	-0.0300	-0.398	-1.251**	0.184**	0.0964	0.0115	-0.261
	(0.185)	(0.196)	(0.268)	(0.596)	(0.0800)	(0.0814)	(0.0938)	(0.229)
BIT	-0.412***	-0.532***	-0.678***	-0.444	-0.553***	-0.619***	-0.738***	-0.108
	(0.0987)	(0.101)	(0.142)	(0.300)	(0.0683)	(0.0685)	(0.0953)	(0.0985)
PTA	-0.0972	-0.212*	-0.0939	0.132	0.143**	0.163**	0.192***	0.220*
	(0.116)	(0.121)	(0.125)	(0.213)	(0.0685)	(0.0691)	(0.0708)	(0.121)
Wu-Hausman	0.698	0.503	0.656	N/A	1.529	6.628**	8.549***	N/A
First stage F-Stat	85.103***	67.394***	16.414***	N/A	230.31***	204.44***	97.461***	N/A
Sargan	0.076	0.236	0.727	0.161	0.639	1.033	7.167***	2.283
Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
MR Terms	No	No	Yes	Yes	No	No	Yes	Yes
Country FE	No	No	No	Yes	No	No	No	Yes
Observations	3,264	3,264	3,264	3,264	13,337	13,337	13,337	13,337

Notes: ***, **, and * indicate significance at the 1, 5, and 10% levels. Standard errors clustered at the level of the country-pair. In the case of the panel fixed effects regression the Sargan text is calculated using the xtoverid command in Stata.

7 The general pattern of results when splitting by skill-level is not dissimilar to those reported in Table 3. As with the results in the previous sub-section they don't provide strong evidence of larger effects of high-skilled migrants. These results are omitted from the paper for reasons of brevity, but are available upon request.

5. Conclusions

This paper considers the relationship between FDI outflows and migrant stocks for a sample of OECD reporting countries and a larger number of partner countries. Despite a great deal of literature considering the importance of migration for trade, the relationship between FDI and migration is an area where extensive empirical literature is missing. There are good reasons to believe that networks due to migration help reduce informational asymmetries and encourage FDI however, though some limited evidence suggests that FDI and migration may in certain cases be substitutes.

Using a variant of the gravity model with panel data and controlling for potential endogeneity through the use of both country-pair fixed effects and an instrumental variables approach, this paper finds that migrant stocks are positively associated with FDI inflows and outflows, with the impact on FDI outflows tending to be somewhat stronger. The results provide a number of other interesting insights, most notably that the positive effects of migrants on FDI flows tend to work by enhancing existing FDI relationships (i.e. where FDI flows are already positive) rather than by developing new (or re-developing old) relationships. Different to some other existing studies and expectations our results also provide little evidence for a differential effect due to the skill levels of migrants, and in particular the hypothesis that network effects that may enhance FDI flows are stronger for high skilled migrants.

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