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Brain Drain with FDI Gain? Factor Mobility between Eastern and Western Europe*

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Abstract

A growing strand of literature highlights that skilled migration may favour growth-enhancing technology transfer, trade and foreign direct investments between the source and the host economies of migrants (network effects). We explore a specific channel through which the possible "diaspora externality" associated with the current emigration of both poorly and highly educated workers may occur: the removal of informational, cultural and reputational barriers that could prevent firms of high-income countries from investing in the low-income immigrants' economies of origin. By means of a straightforward gravity specification, we take a fragmentation and multinational production model in the fashion of Venables (1999) to the data. The focus is on the mobility of capital and workers between the advanced European Union countries (EU15) and New Member States (NMS) in the 1994-2005 period. The evidence points to a significant correlation between the volume of EU15's activities in NMS and the total stock of NMS' own-migrants in the EU15 economies. Furthermore, the larger is the share of skilled workers in the total emigration stock the larger is the inward FDI flow.

Key words: Skilled Migration, Brain Drain, FDI, Offshoring, Multinational firms, Fragmentation of Production, Informational Barriers, Network Effects, Diaspora Externality, Gravity Model

JEL classification: F11, F14, F15, F21, F22, F23

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1 Introduction

Foreign investors may face external uncertainties and a higher business risks when they lack exhaustive information on social, political and economic conditions in potential destination economies for their investment. This may lead to risk-adverse location decisions that could be avoided with a better access to direct knowledge about the business environment in foreign markets (Dunning, 1998, He, 2002). In fact, information is a valuable asset and might play a crucial role in determining the level of the fixed cost implied by firms' internationalization strategies. Kinoshita and Mody (2001) point out that foreign investors' choices rely on both publicly-available information (market size, economic growth, infrastructure, foreign investment policies) and privately-held information (functioning of labour markets, practical implementation of foreign investment policies, strategies for selecting partners, deep knowledge of the local legal regime); but while the former type is available to all potential investors the latter type, often much more critical in their decisions, is less accessible.

Being insiders of their own economy, migrants can serve as a source of valuable information to their foreign employers. Network effects might arise from migrants' social ties with people in their country of origin (Lucas, 2005) allowing for a reduction of the informational and reputational barriers that could discourage investors from entering into the local market.

The beneficial effects associated to such a "diaspora externality" have been extensively acknowledged in the international trade literature[1]. The presence of people with the same ethnic or national background on both sides of a boundary may help to overcome many contractual and informational barriers and to give a boost to mutually beneficial international transactions. Since foreign investors might face an even more substantial information asymmetry than exporters, one could expect the beneficial effects of migration networks to be even larger for foreign direct investment (FDI).

The aim of this paper is to assess to what extent the immigration of New Members States' labour force into advanced economies of European Union (EU15) might mitigate the informational constraint faced by old members' multinational firms willing to invest in migrants' countries of origin.

The closest antecedents to our work are the contributions by Kugler and Rapoport (2005), Docquier and Lodigiani (2006), and Javorcik et al. (2006). Our paper differs from these previous works under several respects concerning the theoretical framework, the empirical methodology and the case study.

Both Kugler and Rapoport (2005) and Docquier and Lodigiani (2006) rely on a theoretical setting mainly related to the economic growth literature (convergence of the whole economy to the optimal stock of capital per worker) and assume that network effects impact the country-risk premium that influences investment choices. This approach permit a neat treatment of the issue and a simple empirical implementation, but does not allow for a comprehensive discussion of localization choices of firms. Furthermore, it is not developed in a strict

[1] Gould (1994), Head and Ries (1998), Rauch and Trindade (2002) and Combes et al. (2005) have now become standard references on the topic.

bilateral setting that is the only one that would permit a clear-cut identification of possible network effects. Docquier and Lodigiani (2006) estimate diaspora externality effects on aggregate FDI inflows in migrants' countries of origin. On the other hand, Kugler and Rapoport (2005) manage to set on a bilateral basis the empirical investigation on U.S. data on labour inflows and capital outflows with 55 partner countries.

Javorcik et al. (2006) approach the issue from a strictly empirical viewpoint. The lack of a stylized conceptual framework impede an univocal interpretation of the results obtained by investigating the relationship between the presence of migrants in the United States and US foreign direct investment in 56 countries around the world. Even if they work in a bilateral setting and deal with possible endogeneity issues, they fail to control for possible specific characteristics of the source and the destination economies that might affect bilateral flows of factors. As a consequence, the unobserved heterogeneity in the sample increases the likelihood that estimated coefficients are in fact capturing spurious effects.

In order to overcome the described drawbacks of previous contributions, we address the issue by developing a simple 2x2x2 model of a fragmentation and multinational production in the fashion of Venables (1999) and define transaction costs in a way that enables us to account for positive network effects associated with the presence of immigrants in the domestic economy. The basic idea is that private-held knowledge is both extracted from previous investment in the foreign economy and conveyed by immigrants. As in Kugler and Rapoport (2005), we assume that high-skilled and low-skilled immigrants carry with them complementary types of information, with the former taking part into business networks and the latter improving the awareness of foreign employers about the characteristics of the labor force in their country of origin. Our theoretical framework enjoys a straightforward gravity specification that allows one to control for destination- and origin- specific effects in the empirical implementation. Our focus is on the mobility of capital and workers between EU15 and New Member States (NMS)[2] over the crucial time span 1994-2005. First, we run regressions on a cross-section with production data. Then we replicate the exercise over a panel with FDI data. In both cases results point to a significant correlation between the volume of EU15's production activities in CEECs and the stock of CEECs' own-migrants in the EU15 economies. When differentiating across skills of migrants in the panel sample, we find that both highly-skilled and less-skilled immigrated workforce have a positive and significant impact on the flow of FDI from EU15 toward migrants' countries of origin. On the other hand, in the cross-section sample we find a different impact of the two skill groups of migrants on the level of EU15's production activities in CEECs. In particular, the larger is the share of skilled emigrants the stronger is the inward FDI linkage, indicating a possible beneficial outcome of otherwise detrimental "brain drain" experienced by NMS.

The paper is organized as follows. We present the conceptual framework

[2] We use New Member States and Central Eastern European Countries (CEECs) definitions interchangeably in the paper. Countries in our sample are: Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia.

and its fixed-effects specification in Section 2. After a brief introduction to the EU15-NMS case, we present the data employed in the empirical part and report results of estimates in Section 3. Section 4 concludes.

2 The Model

There are two countries, Home and Foreign (H and F), two factors of production, capital and labour (K and L), and two industries (X and YZ) operating under constant returns and perfect competition, both producing homogenous goods. The structure of demand presents homothetic preferences and is assumed to be identical in the two economies. In particular, consumers spend their income purchasing both goods and have identical preferences described by a utility function defined on X and YZ. The utility function of the representative consumer from country j ($j = H, F$) takes a Cobb-Douglas form of the following type:

$$U^j = \left(C_X^j\right)^{\mu} \left(C_{YZ}^j\right)^{1-\mu} \tag{1}$$

where $0 < \mu < 1$.

2.1 Capital Mobility

In order to focus on the impact of immigrants (emigrants) on outward (inward) foreign direct investments, we try to simplify as much as possible the conceptual framework related to the cross-border organization of production. The idea is to single out FDI options among the different internationalization strategies available to the firm. We build on the factor-proportion model introduced by Venables (1999) in which just one type of spatial fragmentation is taken into account: all activities remain within a single firm that might decide to offshore some of them to either gain market access (horizontal FDI) or to save on production costs (vertical FDI) or both. Thus fragmentation necessarily involves multinationality (intra-firm trade) and we abstract from the possibility that a firm outsources specific production activities to independent firms abroad (trade between firms).

The good produced by industry X is freely tradable (it acts as the numeraire) and will always be produced both domestically and abroad according to the following unit cost function:

$$c(w^H, r^H) = c(w^F, r^F) = 1 \tag{2}$$

where (w^H, r^H, w^F, r^F) are factor prices at home and in the foreign country that impact positively the cost of X.

The other industry has an upstream activity where an intermediate good Y is produced and a downstream activity that leads to the final output Z. Factors are employed according to fixed proportions in both activities. So unit cost levels for Y and Z are

$$b_Y^H = \alpha w^H + (1-\alpha) r^H, \qquad b_Y^F = \alpha w^F + (1-\alpha) r^F,$$

$$b_Z^H = \beta w^H + (1-\beta) r^H + \delta p_Y^H, \qquad b_Z^F = \beta w^F + (1-\beta) r^F + \delta p_Y^F, \tag{3}$$

where the coefficients α and β represent the primary factors contributions to the production of one unit of output, and δ is the amount of upstream good Y required to obtain one unit of good Z.

Perfect competition implies that all markets are supplied by the lowest cost producer: $p_i^H = \min\left[b_i^H, \tau_i b_i^F\right]$, $p_i^F = \min\left[b_i^F, \tau_i b_i^H\right]$, $i = (Y, Z)$, where τ_i is an ad valorem trade cost. A high τ_i will discourage trade in good i making domestic firms in both countries more competitive in their own markets. In that case, possible specialization patterns of countries will be determined by comparative advantages only.

YZ production will be integrated as long as τ_Y will be high enough to prevent cross-border production and shipping of Y to occur. At lower levels of trade costs (τ_Y) the fragmentation of production becomes viable.

Following Venables (1999) we can assume that the initial specialization patterns are determined by factor endowments and domestic factor price such that the Foreign economy is specialised in X sector production and has a relatively low wage-rental ratio (w^F/r^F), whereas Home produces both X and integrated YZ at a higher wage-rental ratio ($w^F/r^F < w^H/r^H$)[3].

Progressive reductions in the cost of shipping the intermediate good Y make fragmentation of production increasingly profitable. Firms in Home will start to offshore the production of Y (assumed to be less capital intensive than Z activities) to the Foreign economy. This is a profit maximizing strategy that will be undertaken as long as trade costs are low enough. In the extreme case in which all barriers are removed, production of YZ is completely fragmented in a capital intensive (high value added) Z stage conducted at Home and a labour intensive (low value added) Y stage conducted abroad.

2.2 Labour Mobility

Even though capital is perfectly mobile across countries, we assume that wages are higher in the more advanced economy (Home) due to persistent technological gaps. Provided that factor endowments are sufficiently different, fragmentation of production does not necessarily lead to convergence of factor prices. This allows for further capital movements and induces mobile workers to migrate from the low-wages location (Foreign) to the high-wages one (Home). However, labor is imperfectly mobile internationally due to the presence of migration costs

[3] In other words, at given domestic factor prices (w^H/r^H), the endowment ratio at Home, $(K/L)^H$, is more capital intensive than combined YZ production, but less capital intensive than X production. This implies that Home will produce both X and integrated YZ. As opposite, the Foreign country fully employs its factor endowment, $(K/L)^F$, in the X industry at its own domestic prices (w^F/r^F).

(possibility coupled to liquidity constraints that prevent profitable migration investments) and to restrictive (quotas) and selective (skills) immigration policies in Home. Wage-differentials, migration costs and immigration policy determine the pattern of migration.

Described constraints on migration possibilities ensure that the scope of workers movement is limited. This implies that wages differentials are not substantially affected by migration[4]. Furthermore, since we allow for reversability of factor intensities, possible Rybczynski outcomes that lead to Factor Price Equalization cannot emerge in the present framework[5].

However, the theory suggests that there will be a certain degree of simultaneous determination of capital and labour flows between Home and Foreign and we need to take care about the interdependence of these flows when trying to implement the model empirically.

2.3 Information Constraints on FDI and the Role of Immigrants

Foreign production of the intermediate good Y arises when production activities of the YZ good are internationally fragmented. Since Y is transferred within firms, its output can be seen as Home affiliates' output in the Foreign economy, AS^{HF}, and defined as follows:

$$AS^{HF} = \delta p_Y \theta (1-\mu) M \tag{4}$$

where the level of foreign affiliates' production (intermediate input production) depends positively on the total demand for the final good YZ as captured by the fraction $(1-\mu)$ of income (M) consumed to buy the composite good in the two economies, on the price of the produced input (p_Y), on the fraction δ of intermediate input Y required to produce good Z, and on the amount θ intermediate good production offshored to the Foreign country[6].

The share of Y production offshored to the host country, θ, will be increasing in the divergence of countries' endowments $(K^H/L^H, K^F/L^F)$ which will determine the wage-rental ratios prevailing in the two economies $(w^H/r^H, w^F/r^F)$ and decreasing in the transaction costs (τ_Y):

$$\theta = g\left[\underset{-}{\tau_Y}, \left(w^H/r^H \overset{+}{-} w^F/r^F\right)\right]. \tag{5}$$

[4] By and large, empirical evidence does not support the idea of a significant negative effect of immigration on domestic wages and employment rates, but there is not conclusive evidence on the issue. An overview of the literature is in Dustmann and Glitz (2005).

[5] The insensitivity of local wages to immigration depend on how local production absorbes changes in factor endowments. One way would be by an expansion in size of those industries that use labour more intensively with fixed relative factor inputs within industries; alternatively, industries can adjust their production process and switch to a technology that uses the labour more intensively. The latter hypothesis has been finding an increasing empirical support in recent years. See Lewis (2004) on USA, Gandal et al. (2004) on Israel, González and Ortega (2008) on Spain, and Dustmann and Glitz (2008) on Germany.

[6] A similar approach is followed by Kleinert and Toubal (2005).

Following Combes et al. (2005) we can think of transaction costs consisting of two different elements: physical transport costs, T^{HF}, and information costs, I^{HF}, that increase the risk associated with the investment in the Foreign economy:

$$\tau_Y = T^{HF} I^{HF}, \tag{6}$$

where transport cost are modeled as a positive function of the distance between the two markets

$$T^{HF} = \left(d^{HF}\right)^{\alpha}, \tag{7}$$

and the information costs are structured as a negative function of the stocks of both high-skilled (mig^{FH}_{high}) and low-skilled (mig^{FH}_{low}) Foreign emigrants in the Home economy and the level of past Home's FDI in the Foreign market (FDI^{HF}):

$$I^{HF} = \left(1 + mig^{FH}_{high}\right)^{-\beta} \left(1 + mig^{FH}_{low}\right)^{-\gamma} \left(1 + FDI^{HF}\right)^{-\rho}. \tag{8}$$

The two groups of immigrants carry with them complementary kinds of information. As Kugler and Rapoport (2005) point out, high-skilled migrants tend to take part in business networks while low-skilled migrants convey information on the characteristics of the home country labor force. Previous investment in the Foreign economy increases the direct knowledge of local market and relax the information constraint[7]. Thus, immigrants and past FDI play an important role in reducing transaction costs, encouraging the delocalization of Y activities from Home to Foreign[8].

Rearranging (4) on the basis of what is stated in (5)-(8) we have the following equation:

$$\begin{aligned} AS^{HF} &= \delta p_Y (1-\mu) M \\ &\quad g\left[\underset{-}{d^{HF}}, \underset{+}{mig^{FH}_{high}}, \underset{+}{mig^{FH}_{low}}, \underset{+}{FDI^{HF}}, \left(w^H/r^H - w^F/r^F\right)\right] \end{aligned} \tag{9}$$

where we highlight the impact of dyadic (bilateral) variables on the total production of Foreign affiliates of Home firms.

[7] See Head et al. (1995).

[8] A relaxation of the information constraint might be induced also by the presence of Home's emigrants in the Foreign economy. Since we are dealing with factor flows among an advanced Home economy and a less advanced Foreign economy, we can expect flows of migrants from h to f and flows of capital from f to h to be very limited. In particular, one can reasonably expect that h's workers mainly move into f's economy along with investments (managers, coordinators, etc.) and thus the positive effects of their direct knowledge would work through the FDI channel.

2.4 A Fixed Effects Specification

Equation (9) yields a fixed effects specification consistent with the theoretical model[9]. In order to focus solely on variables determining the amount of production offshored from Home to Foreign economy one could replace all destination-specific, origin-specific and country pair-specific variables by three groups of destination-, origin- and country pair- fixed effects. Being the ones of interest, dyadic variables originating from the way we model transaction costs in (5)-(8) are the only indicators left in the regression equation. This would help to disentangle, among the others, the role immigrants in promoting outward investment to their country of origin.

Using a simple log-linear form we derive the following general fixed-effects specification:

$$\begin{aligned} \ln AS_t^{HF} &= f_t^H + f_t^F + f^{HF} - \alpha \ln d^{HF} + \beta \ln\left(1 + mig_{high,t}^{FH}\right) \\ &\quad \gamma \ln\left(1 + mig_{low,t}^{FH}\right) + \rho \ln\left(1 + FDI_t^{HF}\right) + u_t^{HF} \end{aligned} \tag{10}$$

where f_t^H, f_t^F and f^{HF} are destination-, origin- and country pair- fixed effects respectively, and u_t^{HF} is a stochastic error term.

3 Factor Mobility between EU15 and CEECs

EU15's direct investment position in CEECs went up by a factor of 8.7 between 1997 and 2005 (Eurostat). Boeri and Brucker (2005) estimate that cumulative net emigration since 1989 from the ten new member states toward the old EU members can be estimated at around 1.1 million people, which equals 1% of their population.

The consequences and implications of these massive flows of factors within an increasingly integrated area have been capturing the attention of a mounting number of scholars, but none of them has so far investigated how the emergence of migration networks could affect capital flows from the developed block towards the less advanced economies of the union.

We aim to fill this gap by taking the model presented in the previous section to the data.

3.1 A Cross-section Analysis

3.1.1 Data and specification

Data on aggregate production value of country h's affiliates in country f, $AS_t^{h,f}$ (where $h \in \{EU15\}$ and $f \in \{CEECs\}$), are provided on a bilateral basis by Eurostat for years spanning from 2003 to 2005. Given the limited availability of some of the explanatory variables for transition economies over recent years,

[9] Hummels (1999), Redding and Venables (2004), Combe et al. (2005) follow a similar approach to investigate trends in bilateral trade flows.

we run a cross-section analysis where our dependent variable is obtained as the average value of production in the three available years. This allows us also to smooth out possible cyclical effects.

In order to control for earlier investment which would reduce information costs, we constructed for each country pair (h, f) a variable measuring the scale of the existing stock of FDI, where data on FDI position on a bilateral basis are drawn from the OECD statistics. The variable ($FDI\_lev_t^{h,f}$), that ranges from 1 to 4, is built by calculating for a given EU15's investor the amount of FDI undertaken in a given CEECs' recipient relative to the investment done by the same investor in all other CEECs. For instance, the variable would take the value 4 if the stock of h's FDI in f was above 75% of the average of h's FDI towards all other f in the sample in a given year; it would takes the value of 3 if the stock was between 50-75%; 2 with a stock between 25-50%, and 1 for a stock below 25%. Complementary reasons for further investment in a given location would be a tendency to reinvested profits and/or the exploitation of scale economies. The second would be better highlighted in a sectoral level analysis. Nevertheless, both of them are unlikely to be captured by our regressor that is defined essentially as a qualitative measure of the involvement of country h's firms in a given market f relative to their presence in all other destination markets.

Bilateral data on migration stocks were obtained from OECD that reports Census data for EU15's members for the year 2000 round and from national statistical offices when Census data are unavailable. Stocks of foreign born individuals by nationality are provided by differentiating across skills. We consider as high-skilled migrants ($mig_{high,t}^{f,h}$) those with tertiary education while we consider as low-skilled migrants ($mig_{low,t}^{f,h}$) those with lower educational attainment.[10]

Distance ($d^{h,f}$) was taken from Clair et al. (2004) and it is calculated following the great circle formula, which uses latitudes and longitudes of the relevant capital cities. Summary statistics and the correlation matrix for all the indicators adopted in the cross-section specification are reported in Appendix A.

In the cross-section analysis we cannot deal with possible country-pair effects by means of time invariant dummies ($f^{h,f}$) along with country-specific fixed effects (f^h, f^f) as specifide in the general regression equation (10). In fact, this would clean away the effect of other time invariant dyadic variables (distances, migration stocks) because of multicollinearity. As an alternative strategy, we decided not to estimate specific country-pair effects but to cluster residuals on a country-pair basis in our OLS estimates.

Since migration stocks of high- and low-skilled workers from CEECs into EU15 are highly correlated in our sample, we did not to include both the regressors in a single specification to avoid collinearity problems. So we estimated different equations trying to single out the different impact of the two groups

[10] Unfortunately, data on outward flows of migrants from EU15 toward CEECs are provided with a very poor coverage, and we are not allowed to single out possible positive effects on transaction cost of h's emigrants in f's economy (see footnote 7 above).

of CEECs' migrants on the aggregate production value of the affiliates of the EU15 members in migrants' country of origin.

So the final version of (10) for the cross-section analysis is the following:

$$\ln AS^{h,f} = f^h + f^f - \alpha \ln d^{h,f} + \beta \ln \left(1 + mig_k^{f,h}\right) + \rho FDI\_lev^{h,f} + u^{h,f}, \quad (11)$$

where the subscript k for the migration stock stands for high/low/total according to the group definition employed and we omitted the time (t) subscript.

3.1.2 Results

The results of the regressions for the cross-section sample are presented in Table 1. Columns (1) to (3) report specifications with the total stock of migrants, the stock of high-skilled migrants, and the stock of low-skilled migrants respectively. The last two columns refer to specification where the share of high-skilled in the total stock (4) and the share of low-skilled in the total stock (5) are included along with the total stock of migrants . All different specifications have origin and destination country fixed effects that are not presented in the table. Moreover, we cluster the standard errors according to country–pairs.

[Table 1 about here]

The variable capturing the level of own existing FDI is significant under all specifications. The impact is positive and witnesses a significant relaxation of the informational constraint by means of the acquisition of direct information on the local market through past investment. If a country already invested in the migrant's home country it is more likely to further offshore production to that country, as we argue in our model.

Having a large stock of workers from CEECs in the domestic economy helps EU15's firms to establish in the New Member State's markets. The variable is significant at ten percent (column 1) and indicates that the higher is the stock of migrants from a given country f, the higher is the aggregate production value of country h's firms localised in f. Comparative evidence from column (2) to (5) highlights that the positive impact is driven by high-skilled migrants. In fact, when considered on their own, the coefficient increases in size and statistical significance. The opposite hold for low-skilled migrants that seem to carry with them information that is less valuable to EU15's outward investors.

When we include skill-shares along with the total stock of migrants we have a further corroboration of these results. Both total migration and the share of high-skilled migrants have a positive and significant coefficient in column (4). This indicates that more offshoring takes place between countries with higher stocks of high-skilled migrants relative to low-skilled migrants. In fact, the last column the share of low-skilled in the total immigrants stock displays a coefficient which is negative and significant (although weakly).

As regards the physical component of transaction costs, we observe that the further away countries are located from each other, the less offshoring takes place.

We believe that results obtained by means of such a cross-section analysis do not significantly suffer from possible endogeneity biases. In fact, we use data on stocks of migrants referred to year 2000 while data on affiliates' production is a 3-year average over the subsequent period (2003-2005), and this should reduce the scope of actual reverse causality.

However, in order to investigate the robustness of our results and to better deal with possible endogeneity biases, in the next section we replicate the analysis on a panel dimension.

3.2 Panel Data Analysis

3.2.1 Data and specification

We rely on a panel spanning from 1994 to 2003 where we employ data on FDI flows as our dependent variable ($\dot{FDI}_t^{h,f}$). This second specification implies a slight change in the interpretation of results that now relate the amount of country f's own migrants in country h with the flow of country h's capital toward f's economy and not directly to the scope of offshored production.

In order to deal with the intrinsic volatility of FDI flows we take three-years averages. Data of four points in time are then used for the regressions: $t = 1994, 1997, 2000, 2003$. FDI flow data were drawn from the OECD statistics.

Time series on bilateral migration stocks data were obtained by complementing information on bilateral stocks in 2000 from OECD with bilateral flows data taken from Eurostat in the attempt to cover the whole period[11].

We expanded our dataset with information on bilateral FDI positions and distances drawn from the same data sources used in the cross-section analysis. Summary statistics and the correlation matrix for all the indicators adopted in the panel specification are reported in Appendix A.

The final equation taken to data looks like (11) but with a time (t) subscript:

$$\ln \dot{FDI}_t^{h,f} = f_t^h + f_t^f - \alpha \ln d^{h,f} + \beta \ln \left(1 + mig_{k,t}^{f,h}\right) + \rho FDI\_lev_t^{h,f} + u_t^{h,f}. \quad (12)$$

We adopt an instrumental variable strategy using a simultaneous equations estimation technique. We employ as an additional predictor for migration flows a measure of the social security spending per capita in the receiving country relative to the one in migrant's country of origin, $ln\left(soc_t^h/soc_t^f\right)$. This variable,

[11] Missing values were interpolated. As a robustness check we run all the estimates over a sample that did not include the interpolated values. We obtained results that are both qualitatively and quantitatively similar to those presented in the paper. These estimates are available from the authors upon request.

obtained from Eurostat for all the relevant years, should account for what has been called "welfare induced migration"[12].

Thus, the migration equation takes the following form:

$$\ln\left(1+mig_{k,t}^{f,h}\right) = f_t^h + f_t^f - \gamma \ln d^{h,f} + \psi \ln\left(soc_t^h/soc_t^f\right) + e_t^{h,f}. \qquad (13)$$

3.2.2 Results

Four specifications (column 1 to 4) differentiated over the skill content of the migration stocks are presented in Table 2. All of them include time-varying origin and destination fixed effects. In all cases, we report estimates of both equations in the system: the FDI equation (a) and the migration equation (b).

[Table 2 about here]

As in the cross-section analysis, we find that the level of existing FDI stock has a significant and positive effect on the value of foreign direct investment flows. The total stock of migrants between given country pairs again has a positive effect on bilateral FDI flows (1a). Differently from the cross-section results, both high- and low-skilled migrants have positive and significant effects on FDI flows (columns 2a and 3a respectively). When we run a final regression with a specification including both total migrants and the share of high -skilled migrants, we observe that the latter variable is positive however not significant. As predicted by the model, distance increases transaction costs and thus have a negative effects on FDI.

The results on the migration equation indicate that our chosen instrument, the relative per capita social spending of the recipient country to the migrant's home country, works well as a predictor of possible *pull factors*. The cost of migration (proxied by distance) acts as a *restraint factor*.

Thus using panel data, the results confirm what we already observed in the cross section analysis: the stock of own migrants in the foreign economy has a positive effect on the size of the capital inflows from that economy. On the other hand, we do not find clear evidence of a larger positive impact of highly skilled migrants with respect to less skilled migrants.

[12] Welfare benefits as a possible pull factor for immigrants have received a good deal of attention in the economic literature. See Borjas (1999) for a comprehensive discussion. McKinnish (2005) is one of the latest contribution investigating with micro-level data how attractive the US welfare benefits are to immigrants. De Giorgi and Pellizzari (2006) explore the issue of welfare migration across the 15 countries of the pre-enlargement European Union and find a significant effect of the generosity of welfare on migration decisions.

4 Conclusion

Skilled migration may favour growth-enhancing technology transfer, trade and foreign direct investments between the source and the host economies of migrants. Migrants can reduce the informational, cultural and reputational barriers that could prevent the high income destination economies to invest in the immigrants' countries of origin. In this paper we assessed to what extent the immigration of New Members States' labour force into old Member States' economies of the European Union (EU15) might mitigate the informational constraint faced by old members' multinational firms willing to invest in the migrants' countries of origin. In particular, we explored a specific channel in which the possible "diaspora externality" associated with the current emigration of both highly educated and less educated workers may occur.

We developed a 2x2x2 model of a fragmentation and multinational production in the fashion of Venables (1999). We incorporated migration into this framework by postulating that immigrated labour force has a transaction cost reducing effect through the relaxation of the information constraint faced by foreign investors. Furthermore, we assumed that high-skilled and low-skilled immigrants carry with them complementary types of information, with the former taking part into business networks and the latter improving the awareness of foreign employers about the characteristics of the labour force in their country of origin.

In the empirical part of the paper we used a gravity model corresponding to our theoretical framework. First, we run regressions on a cross-section with foreign subsidiaries production data as the dependent variable. Then we replicated the exercise over a panel dataset with FDI flows data as the dependent variable. Based on both the cross-section and the panel results we found that there is a significant correlation between the volume of activities and investments of EU15's firms in Central Eastern European Countries (CEECs) and the stock of immigrants from CEECs into EU15. The cross-section highlights that the larger is the share of skilled migrants the higher is inward FDI, indicating a possible beneficial outcome of otherwise detrimental brain drain experienced by New Member States. The results obtained with panel sample are somewhat more ambiguous on the different role played by skilled and unskilled migrant. In fact, both groups of migrants had an inward FDI enhancing role over the time span 1994-2005.

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Table 1: Cross-section analysis with production data

	1	2	3	4	5
	$\ln AS^{h,f}$	$\ln AS^{h,f}$	$\ln AS^{h,f}$	$\ln AS^{h,f}$	$\ln AS^{h,f}$
$FDI\_lev^{h,f}$	0.338	0.328	0.346	0.361	0.335
	(0.170)**	(0.165)**	(0.171)**	(0.166)**	(0.174)*
$\ln\left(1+mig_{total}^{f,h}\right)$	0.213			0.429	0.378
	(0.116)*			(0.166)**	(0.162)**
$\ln\left(1+mig_{high}^{f,h}\right)$		0.357			
		(0.165)**			
$\ln\left(1+mig_{low}^{f,h}\right)$			0.161		
			(-0.101)		
$share_{high}^{f,h}$				3.237	
				(1.497)**	
$share_{low}^{f,h}$					-2.193
					(1.283)*
$\ln d^{h,f}$	-0.848	-0.691	-0.925	-0.553	-0.650
	(0.387)**	(0.412)*	(0.375)**	(-0.401)	(-0.407)
$Constant$	9.429	8.573	10.426	4.84	8.288
	(3.534)***	(4.362)*	(3.339)***	(-4.211)	(3.552)**
Obs	93	93	93	93	93
R-sq	0.83	0.84	0.83	0.84	0.84

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2: Panel analysis with FDI flows data

	1		2		3		4	
	a	b	a	b	a	b	a	b
	$\ln \dot{FDI}_t^{h,f}$	$\ln(1+mig_{total}^{f,h})$	$\ln \dot{FDI}_t^{h,f}$	$\ln(1+mig_{high}^{f,h})$	$\ln \dot{FDI}_t^{h,f}$	$\ln(1+mig_{low}^{f,h})$	$\ln \dot{FDI}_t^{h,f}$	$\ln(1+mig_{total}^{f,h})$
$FDI\_lev^{h,f}$	0.849		0.945		0.966		0.902	
	(0.133)***		(0.144)***		(0.162)***		(0.148)***	
$\ln\left(1+mig_{total}^{f,h}\right)$	0.253						0.317	
	(0.103)**						(0.131)**	
$\ln\left(1+mig_{high}^{f,h}\right)$			0.254					
			(0.121)**					
$\ln\left(1+mig_{low}^{f,h}\right)$					0.164			
					(0.065)**			
$share_{high}^{f,h}$							1.76	
							(-1.241)	
$\ln d^{h,f}$	-0.581	-1.85	-0.568	-1.585	-0.344	-3.722	-0.503	-1.84
	(0.138)***	(0.103)***	(0.137)***	(0.080)***	(0.135)**	(0.196)***	(0.151)***	(0.100)***
$\ln(soc_t^h/soc_t^f)$		3.773		3.224		7.387		3.762
		(0.181)***		(0.140)***		(0.344)***		(0.175)***
Obs	249	249	232	232	232	232	232	232

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

A P P E N D I X

A Summary statistics and correlation matrices

Table 1a: Summary Statistics - Cross-section Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
$\ln AS^{h,f}$	93	5.11	1.89	0.53	9.39
$FDI\_lev^{h,f}$	93	2.86	1.16	1.00	4.00
$\ln\left(1+mig_{total}^{f,h}\right)$	93	7.30	1.91	3.22	11.21
$\ln\left(1+mig_{high}^{f,h}\right)$	93	5.93	1.80	1.61	9.43
$\ln\left(1+mig_{low}^{f,h}\right)$	93	6.83	2.00	2.64	11.11
$share_{high}^{f,h}$	93	0.27	0.10	0.07	0.57
$share_{low}^{f,h}$	93	0.65	0.17	0.24	0.93
$\ln d^{h,f}$	93	7.06	0.68	4.09	8.00

Table 1b: Summary Statistics - Panel Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
$\ln \dot{FDI}_t^{h,f}$	249	3.04	2.42	-5.14	8.27
$FDI\_lev^{h,f}$	249	2.95	1.10	1.00	4.00
$\ln\left(1+mig_{total}^{f,h}\right)$	249	7.80	2.17	2.20	13.06
$\ln\left(1+mig_{high}^{f,h}\right)$	232	6.44	1.97	1.18	11.53
$\ln\left(1+mig_{low}^{f,h}\right)$	232	14.59	4.42	2.67	24.54
$share_{high}^{f,h}$	232	0.26	0.10	0.07	0.55
$share_{low}^{f,h}$	232	0.69	0.16	0.24	0.93
$\ln d^{h,f}$	249	6.92	0.73	4.09	8.11
$\ln(soc_t^h/soc_t^f)$	249	2.80	1.30	0.37	6.64

Table 2a: Correlation matrix - Cross-section Sample

	$\ln AS^{h,f}$	$FDI\_lev^{h,f}$	$\ln\left(1+mig_{total}^{f,h}\right)$	$\ln\left(1+mig_{high}^{f,h}\right)$	$\ln\left(1+mig_{low}^{f,h}\right)$	$share_{high}^{f,h}$	$share_{low}^{f,h}$	$\ln d^{h,f}$
$\ln AS^{h,f}$	1							
$FDI\_lev^{h,f}$	0.18	1						
$\ln\left(1+mig_{total}^{f,h}\right)$	0.52	0.09	1					
$\ln\left(1+mig_{high}^{f,h}\right)$	0.52	0.04	0.98	1				
$\ln\left(1+mig_{low}^{f,h}\right)$	0.52	0.10	0.99	0.95	1			
$share_{high}^{f,h}$	-0.12	-0.24	-0.25	-0.05	-0.34	1		
$share_{low}^{f,h}$	0.16	0.07	0.26	0.11	0.40	-0.73	1	
$\ln d^{h,f}$	-0.55	-0.18	-0.19	-0.12	-0.23	0.33	-0.34	1

Table 2b: Correlation matrix - Panel Sample

	$\ln \dot{FDI}_t^{h,f}$	$FDI\_lev^{h,f}$	$\ln\left(1+mig_{total}^{f,h}\right)$	$\ln\left(1+mig_{high}^{f,h}\right)$	$\ln\left(1+mig_{low}^{f,h}\right)$	$share_{high}^{f,h}$	$share_{low}^{f,h}$	$\ln d^{h,f}$	$\ln(soc_t^h/soc_t^f)$
$\ln \dot{FDI}_t^{h,f}$	1								
$FDI\_lev^{h,f}$	0.35	1							
$\ln\left(1+mig_{total}^{f,h}\right)$	0.56	0.28	1						
$\ln\left(1+mig_{high}^{f,h}\right)$	0.59	0.27	0.98	1					
$\ln\left(1+mig_{low}^{f,h}\right)$	0.59	0.29	0.99	0.97	1				
$share_{high}^{f,h}$	-0.25	-0.21	-0.45	-0.28	-0.46	1			
$share_{low}^{f,h}$	0.20	0.07	0.30	0.17	0.34	-0.75	1		
$\ln d^{h,f}$	-0.38	-0.28	-0.25	-0.20	-0.30	0.40	-0.35	1	
$\ln(soc_t^h/soc_t^f)$	0.00	-0.03	0.26	0.28	0.27	0.00	0.00	0.13	1

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