

# Does FDI affect migration flows? The role of human capital

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## Abstract

Global trade and capital movements across countries are increasing along with significant international workers mobility. The aim of this paper is to analyse the link between FDI inflows and emigration waves across developing countries. We test the twofold direction that this link may follow, either through complementarity or substitution effects. By using a cross section analysis for the year 2000 with a sample including 91 developing countries, it is shown that both of them are at work. While a strong positive relationship (complementarity) between migration flows and FDI arises, FDI may also be seen as a substitute for migration through direct and indirect labour demand effects. In particular, we find evidence that human capital is a channel for the substitutability effect.

**Keywords:** International migration, human capital, FDI, economic development, skilled migration.

## Introduction

Over the last three decades of the twentieth century, the increasing expansion of global trade and of capital movements across countries was accompanied by a significant international mobility of workers.

The stock of international migrants in the world rose from 77 million people in 1970 to 191 million in 2005 and 214 million in the year 2010. Migration pressure is particularly evident on the developed countries: 33 million out of the 36 who migrated between 1990 and 2005 ended up in industrialized countries (United Nations, 2006). Developing countries are the main source of migration flows of both skilled and unskilled workers. Simultaneously, since the 1970s, with the progressive liberalization of capital movements, a large amount of financial resources has reached developing countries. During the last three decades, the external resource flows to developing countries have changed and foreign direct investments (henceforth, FDI) have emerged in the 1990s as the predominant source of external finance for developing countries. According to the latest UNCTAD estimates, FDI inflows to the developing world continued to rise to US \$274 billion in 2005 and up to 574 billion in 2010.

The aim of this paper is to examine whether there is a link between skilled migration from developing countries and FDI inflows. The relationship has not been widely analysed in migration literature which has mainly focused on

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different push factors as the main determinants of increasing world migration<sup>1</sup>. Among the economic causes, it is widely recognized that emigration from poor countries is related to wage differentials between sending and receiving countries. Economic literature suggests also that some non-economic factors, such as network effects, colonial links, environmental disasters, wars, etc., are very important in migration decisions. To our knowledge, the relationship between FDI and skilled migration has only recently started to be investigated. Ivelves (2006) shows the link between the exogenous migration shocks and endogenous FDI flows in a SOE setting. The author finds that this economy is exposed to an increase in the volume of inflows of factors: migration of high-skilled workers and FDI flows are always complements because of higher marginal product of capital. Kugler and Rapoport (2005) find through an empirical analysis that skilled migration is associated with future increases in FDI inflows and that there is a substitution relationship between FDI inflows and current migration of people with secondary education. Bugamelli and Marconi (2006), in their preliminary empirical exercise, affirm that a positive link between skilled migration and FDI inflows is conceivable. Checchi et al (2007) analyse how the presence of foreign firms in the domestic economy and the emigration of skilled workers affect domestic school enrolment. They also investigate whether the existing supply of skilled labour is a significant determinant of inward flows of foreign capital. Their results support the presence of a virtuous circle between these flows and human capital accumulation.

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Using a general equilibrium model, Bergstrand et al. (2011) illustrate that bilateral FDI and bilateral flows of skilled migrants are affected by the same factors. The analysis argues a two way flows of highly skilled workers and capital are positive correlated. Indeed, migration flows arise in the presence of horizontal and vertical Multinational Enterprise (MNE) and this relation seems stronger in case of intra-firm MNE.

While almost all of these studies analyse the impact of skilled-migration on FDI flows, our analysis is focused on the reverse causality, to explain how FDI can affect migration flows from developing countries. One of the works approaching this topic more directly is Aroca and Maloney (2005) who show that FDI and trade discourage outmigration. This substitution effect is partly due to better domestic labour market conditions. In addition, some tentative inferences presented about the impact of increased FDI on migration from Mexico towards U.S. migration show that FDI inflows lead to a 1.5%-2% drop in migration. Akkoyunlu (2010, 2012) finds that trade and factor flows play an important role in Turkish migration to Germany, both in the long-run and in the short-run. Gupta and Moody (2006) study provide evidence that developing countries which attract more FDI tend to hold within their domestic labour force, alleviating migratory pressure.

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<sup>1</sup> See for example, Hatton and Williamson (2002) and for a review of international migration literature see Zlotnik (1998) and Massey et al. (1993).

This paper aims to make an original contribution to this literature analysing whether and through which mechanisms FDI can significantly influence the economic and non-economic determinants of migration decisions. We intend to show our interesting results about a possible driver in explaining the FDI/migration nexus. Further, we present empirical contribution for stepping forward in understanding whether FDI has a complementary effect or whether it may be considered as a "substitute" for migration. In fact, FDI can affect migration through different channels. The first one is the direct effect on labour demand for skilled and unskilled workers in the migrants' origin countries.

In a Heckscher-Ohlin framework, FDI inflows in developing countries should be concentrated in unskilled labour intensive sectors; therefore they should increase the wages of unskilled workers. At the same time, due to the complementarity between physical and human capital, foreign and domestic investments also increase the demand for skilled labour. These direct effects on domestic wages should reduce the incentive to migrate. The above mentioned complementarity between human and physical capital pushes multinational enterprises to directly finance education where they establish their productive activities. Additionally, the positive effect of FDI on the demand for skilled labour increases the return of private investments in human capital. Finally, workers' skills are improved through direct training received in multinational enterprises and the "spin-off" effect on local firms. In conclusion, FDI can be seen as a substitute for migration through its direct and indirect labour demand effect.

Therefore FDI implies a positive influence on human capital formation, but the impact of FDI on migration through the human capital channel is quite ambiguous because the higher wages that skilled workers can gain abroad can increase the incentive to migrate (brain drain effect)<sup>2</sup>.

Finally, a complementarity nexus between migration and FDI can result from the reduction of transaction and information costs for potential migrants due to the fact that FDI increase bilateral information and knowledge on employment and wage condition abroad as well as on values, practices and technical and organizational procedures in foreign enterprises. This information and transaction cost effect can be seen as an inverse of the network effect that recent literature has highlighted to explain a possible positive effect of migration and diaspora phenomena on FDI.

To empirically analyse these effects, in section 2 we explore the mechanisms that determine FDI/migration links by using a cross-section analysis. In particular we focus on the role that human capital training plays as a channel through which FDI influence migration flows. Our results show both a positive relationship between FDI and migration flows and between FDI and

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<sup>2</sup> This effect plays through the that skills acquired through the training activities of multinationals can often be more marketable abroad than formal education obtained in inadequate school systems or oriented by the needs of local labour markets.

human capital. We also find that the indirect net effect of FDI on migration through the human capital channel is negative. This implies that substitution effects are at work. However, our results indicate that, overall the complementarity effect prevails. An additional result is that, despite the brain drain effect, the accumulation of human capital acts as a reducing factor on emigration flows.

Understanding what channels are at work between FDI and emigration flows it is an important issue in designing development policies targeted to manage the migration pressure from developing countries. Our results substantially confirm Layard et al. (1992) and Gupta and Mody (2006) suggestions that if FDI flows and trade are increased, the pressures for migration will be mitigated because of higher immediate demand for their services and prospects of augmented productivity. The effects produced by these results are higher job opportunities, increasing wages and a declining incentive for emigration.

The policy implication of this analysis is twofold: because the receiving countries may benefit from reducing pressure for emigration (for instance by reducing the pressures on the social assistance systems; limiting domestic dislocation, reducing the strains on domestic public finances, etc.) their policy-making should be oriented to provide the sending countries with the necessary public goods to remain attractive destinations: FDI should mainly support high skilled human capital formation and finance his internal absorption.

### **Migration, FDI and Human Capital nexus: a cross section analysis**

In this section, we aim to investigate the role of human capital formation in developing countries in relation to both emigration and investment flows. Therefore we attempt to empirically assess the relationship between FDI, human capital formation and migration decisions<sup>3</sup>. We adopt as our empirical strategy a cross sectional study in order to take into accounts all the nexus at work.<sup>4</sup>

FDI have an ambiguous indirect effect on migration through their contribution to human capital formation. Higher skills acquired through learning by doing process in multinational enterprises can be sold abroad. However, higher human capital can boost FDI's substitution effect which takes place by improving labour market conditions, thereby contributing to reduce the income gap between developing and developed countries. Therefore, both complementarity and substitutability effects of FDI on migration also act through their impact on human capital formation. This latter link has been analysed in

<sup>3</sup> On the general relationship between Migration and Education, see reference, Dustmann and Glitz (2010), Mountford (1997), Stark et al. (1997), Vidal (1998), Beine et al (2001), (2008), and (2010).

<sup>4</sup> An alternative approach is to use a panel data structure. However for the purpose of our analysis information about highly skilled migration and education data are not fully available.

several studies. Ramos (2001)<sup>5</sup> supports the idea that FDI lead to higher rates of human capital accumulation. FDI increase the incentives for individuals to pursue further education. The opportunity cost of spending time in education - i.e. through postponement of current wages and decrease in present consumption - is lowered by FDI which may both directly finance education and help growth (see also, Bils and Klenow, 1998). FDI also accelerate technical change which further increases incentives for individuals to seek formal training. In this way FDI signal future growth processes which may further favour higher wages for skilled workers.

In addition, FDI directly contribute to human capital formation. It is well documented that multinational enterprises (henceforth, MNEs) often support and promote the development of formal education (in terms of curriculum, educational equipment, infrastructure, technical support, and so on) in the developing countries where they have production facilities. Miyamoto (2003) cites examples of investments in tertiary education realized by Intel Company in China and Costa Rica, and by Toyota Motor Company in Indonesia. Moreover, the author shows how MNEs and institutions (such as Universities) cooperate in order to open educational branches in developing countries<sup>6</sup>.

Therefore FDI also act indirectly through stimulating human capital formation which can boost FDI's substitution effect on migration by improving internal labour market conditions. This offsets the incentive effect for high skilled workers to migrate to benefit from better opportunities abroad (the complementary effect).

Therefore the overall effect of FDI on migration through the human capital channel may be ambiguous. Due to the fact that human capital data is scarce and limited in duration for developing countries, we explore these links by running a cross section analysis.

We estimate a simultaneous equations system that consists of the following two equations<sup>7</sup>:

$$hum_i = \beta_0 + \beta_1 mighigh_i + \beta_2 migfdi_i + \beta_3 fdipc_i + \beta_4 exedupc_i + \varepsilon_i \quad (1)$$

$$mig_i = \gamma_0 + \gamma_1 gdp9095pc_i + \gamma_2 \ln diff_i + \gamma_3 popdens_i + \gamma_4 fdipc_i + \gamma_5 hum_i + u_i \quad (2)$$

Where  $hum_i$ ,  $mighigh_i$ ,  $fdipc_i$ ,  $exedupc_i$ ,  $mig_i$ ,  $gdp9095pc_i$ ,  $\ln diff_i$ ,  $popdens_i$  denote respectively: a measure of human capital; high skilled emigration rates; inward FDI stock per capita in sending countries; public expenditures in ter-

<sup>5</sup> For more references, see also his bibliography.

<sup>6</sup> The *World Class Universities Programme* represents one of the most recent efforts by governments to expand educational MNEs' services. The programme aims to attract at least 10 world class education institutions.

<sup>7</sup> Since we consider two equations one to analyse human capital accumulation another look at emigration decisions. In each equation, we consider the other variable as explanatory variable, we considers the two ways of this link. Error terms in the regression equations could be also correlated. In order to address and alleviate endogeneity and heteroskedasticity issue we run a SUR model that accounts implicitly these questions

tiary education; total migration rate; GDP per capita in sending countries; a proxy for wage differentials with respect to G7 countries; and population density. The variable  $migfdi_i$  is the product of  $mighigh_i$  and a dummy variable that takes value 1 if sending country displays a value of FDI per capita higher than 0.0268 (i.e. more than about 30 dollars per capita). This variable captures the interaction effect of FDI and migration on human capital formation.

Table 1. Cross-Section Descriptive Statistics

| Variable | Definitions  | Source                       | Obs | Mean    | St.Dev   | Max      | Min     |
|----------|--|------------------------------|-----|---------|----------|----------|---------|
| mighigh  | emigration rates of high skilled workers (with tertiary education)                     | Docquier Morfouk (2005)      | 100 | 0.23 6  | 0.246    | 0.889    | 0.005   |
| Gdp95pc  | average GDP per capita in sending country in 1990-95;                                  | World Bank (average 1990-95) | 95  | 3788.59 | 3131.134 | 14336.85 | 504.567 |
| Indiff   | ln of GDP differentials between sending countries and G7 countries (average 1995-2000) | World Bank (average 1995-00) | 95  | 9.966   | 0.189    | 10.136   | 9.205   |
| popdens  | population density   | World Bank (average 1995-00) | 100 | 112.958 | 168.322  | 1006.760 | 2.579   |
| fdipc    | stock of inward FDI per capita in sending migration countries (average 1995-2000)      | UNCTAD (average 1995-00)     | 93  | 0.5792  | 1.009    | 5.616    | 0.0036  |
| expeduc  | public expenditure on education per capita (average 1995-00)                           | World Bank (average 1995-00) | 94  | 3.529   | 14.843   | 81.378   | 0.002   |
| hum      | % of people with higher education in the total population                              | Barro-Lee(2001)              | 73  | 4.849   | 2.032    | 8.830    | 0.840   |

*Note: The countries analysed in the cross section analyses are: Angola, Argentina, Burundi, Benin, Burkina Faso, Bangladesh, Bolivia, Brazil, Barbados, Botswana, Central African Republic, Chile, China, Cote d'Ivoire, Cameroon, Rep. of Congo, Dem. Rep. of Congo, Colombia, Comoros, Cape Verde, Costa Rica, Dominica, Dominican Republic, Algeria, Equador, Egypt, Ethiopia, Fiji, Ghana, Guinea, Gambia, Guinea Bissau, Grenada, Guatemala, Guyana, Honduras, Haiti, Indonesia, India, Iran, Jamaica, Jordan, Kenya, Saint. Lucia, Sri Lanka, Lesotho, Morocco, Madagascar, Mexico, Mali, Mozambique, Mauritania, Mauritius, Malawi, Malaysia, Niger, Nigeria, Nicaragua, Nepal, Oman, Pakistan, Panama, Peru, Philippines, Papua New Guinea, Syria, Chad, Togo, Thailand, Paraguay, Rwanda, Sudan, Senegal, Solomon Islands, El Salvador, Swaziland, Seychelles, Tonga, Trinidad and Tobago, Tunisia, Turkey, Tanzania, Uganda, Uruguay, Saint Vincent and the Grenadines, Venezuela, Vanuatu, Samoa, South Africa, Zambia, Zimbabwe*

The first equation tests the effect of FDI on human capital stock, measured as share of highly educated people in total population (source Barro Lee 2001). We use as key explanatory variable the total inward FDI stock per capita, while other covariates are the rate of high skilled migrants which measures the brain drain effect<sup>8</sup>, the public expenditure on tertiary education per capita and the interaction variable between FDI and emigration rates as above described.

The second equation assesses the complementarity or substitutability effect of FDI on migration. To test the direct effect of FDI on migration, we use the total FDI inward per capita, whereas their indirect effect is tested through the human capital variable. Among the other explanatory variables (see table 1) of the migration decision making process, we use GDP per capita of sending countries to capture the relative position of the countries in term of living standards and to capture the absolute poverty effect on the capacity to finance migration. We have also included the GDP per capita differential between sending and mean income G7 receiving countries as a proxy of wage differentials

Controlling for the wage differential we expect a positive sign for GDP per capita. Finally, we include population density in sending countries to capture the demographic pressure on their labour markets. We use five years average data for our regressors. We run the simultaneous equations model (SUREG) for the year 2000 with a sample including 91 developing countries (see the note in table 1 for the complete list).

Our results (table 2, column a) show a positive and significant correlation between migration and wage differentials, GDP per capita and the population pressure. More importantly, the human capital variable has a negative impact on the total migration rate while FDI are positively correlated. The direct positive effect of FDI on migration shows that complementarity effects prevail. The negative effect of the stock of educated people on migration (both skilled and unskilled) seems to confirm that the increase in human capital, as a scarce factor, is crucial for strengthening internal markets and labour demand.

Finally, the human capital equation shows how FDI positively act on human capital formation and therefore can produce an indirect negative effect on migration rates (substitutability effect). In fact, as in table 2 (column b), the coefficient measuring FDI's indirect effect on migration through human capital formation is negative (-0.013); however it is lower than the coefficient measuring the FDI direct effect (0.042). Therefore the total FDI effect on migration is positive.

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<sup>8</sup> For our purpose, we refer to the dataset by Docquier and Marfouk (2005) that provides new estimates of emigration rates by educational attainment for the 2000. The emigration rates measure the fraction of skilled agents born in a developing country and living in an OECD country related to the total number of people in the source country and with the same educational category. Skilled migrants are those with at least tertiary educational attainment.

These results are robust for different specifications (see table 2). Moreover, when we control for the variable measuring interaction between migration and FDI, we find a positive and significant effect. This implies that the brain drain effect may be mitigated by the FDI inflows as the positive sign of the interaction term shows. In fact, as in table 2 (column c), the coefficient measuring the brain drain effect on human capital formation is negative (-21.609); while that measuring the interaction effect is positive (16.178). This latter result appears to tell us that the negative impact of brain drain on the stock of educated people in developing countries is, at least partially, offset by the joint positive incentive effect determined by FDI and expected migration opportunity. Results (shown in table column d) confirm our previous outcomes even if we focus our attention on high skilled migration. In addition, we find that human capital accumulation negatively affects high skilled migration. This result contradicts the findings of the migration literature on brain drain.

Table 2. Cross Section Estimation Results).

|                | Hum(a)               | Mig(a)                | Hum(b)               | Mig(b)                | Hum(c)                | Mig(c)               | Hum(d)                | Mig(d)                |
|----------------|----------------------|-----------------------|----------------------|-----------------------|-----------------------|----------------------|-----------------------|-----------------------|
| Fdipc          | 0.671**<br>(0.297)   | 0.052***<br>(0.013)   | 1.247***<br>(0.365)  | 0.042***<br>(0.015)   | 1.106***<br>(0.355)   | 0.041***<br>(0.015)  | 0.748**<br>(0.351)    | 0.126***<br>(0.031)   |
| Expedupc       |                      |                       | 0.129***<br>(0.041)  |                       | 0.13105***<br>(0.039) |                      | 0.16527***<br>(0.042) |                       |
| Migfdi         |                      |                       |                      |                       | 16.177**<br>(7.773)   |                      |                       |                       |
| Mighigh        | -5.424***<br>(1.187) |                       | -5.507***<br>(1.497) |                       | -21.609***<br>(7.951) |                      |                       |                       |
| Gdp95pc        |                      | 0.001***<br>(0.001)   |                      | 0.001**<br>(0.001)    |                       | 0.001***<br>(0.001)  |                       | 0.001**<br>(0.001)    |
| Indiff         |                      | 1.004***<br>(0.344)   |                      | 1.240**<br>(0.516)    |                       | 1.288**<br>(0.518)   |                       | 2.497**<br>(1.083)    |
| popdens        |                      | 0.001**<br>(0.001)    |                      | 0.001<br>(0.00008)    |                       | 0.001<br>(0.001)     |                       | 0.00013<br>(0.00016)  |
| hum            |                      | -0.017***<br>(0.004)  |                      | -0.017**<br>(0.00501) |                       | -0.012**<br>(0.005)  |                       | -0.025**<br>(0.010)   |
| Constant       | 3.096***<br>(0.376)  | -10.195***<br>(3.509) | 0.495<br>(0.938)     | -12.581**<br>(5.253)  | 0.722<br>(0.908)      | -13.075**<br>(5.271) | -0.927<br>(0.886)     | -25.214**<br>(11.028) |
| Observations   | 91                   | 91                    | 57                   | 57                    | 57                    | 57                   | 57                    | 57                    |
| R <sup>2</sup> | 0.08                 | 0.33                  | 0.24                 | 0.19                  | 0.31                  | 0.19                 | 0.23                  | 0.33                  |

Standard Errors in parentheses; \*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.1$

Note: The variable migfdi is obtained multiplying mighigh to a dummy variable that takes value 1 if sending country dispaays a value of FDI per capita higher than 0.0268029.

### Concluding remarks

The aim of this paper is to find empirical evidence for the link between FDI inflows and emigration flows from developing countries and to investigate the channels this relationship works. The first channel is the direct effect on the labour demand for skilled and unskilled workers in the migrants' countries of origin and on domestic wages. This effect, which should reduce the incentive to migrate, is emphasized by the positive role played by FDI on human capital accumulation which is a condition for higher level equilibrium in the labour markets of most developing countries. We found empirical evidence of this



positive influence of FDI on human capital formation which can be explained in two ways. First, the complementarity between human and physical capital pushes multinational enterprises to finance education where they establish their productive activities. Additionally, the positive effect of FDI on demand for skilled labour increases the return of private investments in human capital. In conclusion, FDI can be seen as substitutes of migration through direct and indirect labour demand effect. The substitutability effect of FDI through the human capital channel depends on the fact that, according to our results which contradict the brain drain literature, a higher endowment of human capital reduces emigration flows. However, a strong complementarity effect between migration and FDI should be taken into account. This complementarity can be determined by the reduction of transaction and information costs for potential migrants. This may be due to the fact that FDI increase bilateral information and knowledge on employment and wage condition abroad as well as on values, practices and technical and organizational procedures in foreign enterprises. This information and transaction cost effect can be seen as the inverse of the network effect that recent literature highlighted to explain a possible positive effect of migration and the diaspora phenomena on FDI. This effect can be enhanced by an increase in human capital suitable for developed countries as a result of the learning by doing externalities produced by FDI. The empirical evidence show both complementarity and substitutability effects are at work, even if the complementarity effect prevails. However, evidence that human capital is a channel for the substitutability effect supports the idea that FDI policies could be addressed by spreading within the developing countries the benefits they create in term of human capital formation.

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