

## **DOES MIGRATION OF SKILLED WORKERS AFFECT HUMAN CAPITAL INVESTMENT IN SOURCE COUNTRIES?**

Mr. Abubakar Lawan Ngoma  
Department of Economics, Faculty of Economics and Management  
University Putra Malaysia, 43400 Serdang, Selangor  
Email:alhajingoma@yahoo.com  
Tel: +60162352453

Ass. Prof. Normaz Wana Ismail  
Department of Economics, Faculty of Economics and Management  
University Putra Malaysia, 43400 Serdang, Selangor  
Email:nwi@upm.edu.my  
Tel: + 603-8946 7711

### **ABSTRACT**

The debate over the effects of migration of skilled labour from developing to developed countries has parted into two major theoretical views. Traditionally migration of skilled labour was viewed to diminish the stock of human capital generated by source, developing countries. However, recent studies have held the view that prospect of migration for skilled workers, to where the return to skill is relatively higher than at home, induce would-be migrant workers to invest more in their education. In view of this, using panel dataset and random and fixed effect estimators, the effect of skilled labour migration on human capital investment was examined in a sample of 89 migrants-sending developing countries during the period 1975-2000. The result of the analysis revealed that the prospects of skilled labour migration exerts statistically significant effects on educational investments in migrants' source developing countries. However, in the long run it leads to a reduction in the stock of better educated workers.

Keywords: Skilled labour, Migration, Human Capital Formation

## INTRODUCTION

The debate over the effects of skilled worker migration on human capital formation of migrant-sending developing countries has parted into two major theoretical views. On the one hand, the traditional perspective views the skilled worker migration as detrimental for source countries, because it fuels brain drain<sup>i</sup> which strengthens international inequalities of trained professionals, thereby posing development impediments and social welfare loss of non-migrants left behind in migrant-sending developing countries, in spite of the possible positive feedback effects such as remittances, return migration with extra skills acquired abroad and establishment of scientific and business networks (Ngoma and Ismail, 2013b; Gibson et al, 2011; Mackenzie and Rapoport, 2010).

On the other hand, recent literature argues that higher prospects of skilled labour migration to higher-returns-to-skill countries induce would-be migrant workers to invest more in their own education. Consequently, since international migration involves restrictions owing to 'quality selective' immigration policies of the migrant destination countries, not all aspiring skilled migrant workers would eventually migrate. Therefore, the possibility of skilled labour migration can result in human capital creation as the *ex-post* (i.e., after emigration occurs) average level of human capital stock in migrants' source countries increases<sup>ii</sup>. In other words, the average level of human capital stock created in developing countries with skilled labour migration possibilities might be higher than that created in developing countries without such possibilities (Di Maria and Lazarova, 2012; Beine et al. 2001, 2008, 2011; Stark 2004).

Empirically a number of studies using cross sectional dataset have found evidence suggesting that an increase in the prospect of skilled labour migration, where returns to schooling are higher than at home, induce more human capital investment in migrant-sending developing countries. (Beine et al, 2001:2008; and Di Maria and Lozarova, 2012). But, given the cross sectional regressions used by these studies conditioned by available data for skilled labour migration, they are likely to suffer from misspecification biases, measurement errors and inability to fix unobserved heterogeneity across countries (Skuterud and Su, 2012). Unlike cross sectional dataset, panel dataset allows us to model heterogeneity across individual units and mitigates measurement errors (Baltagi 2005).

In addition, in measuring the effects of skilled labour migration possibilities on human capital formation most of these studies used stock of human capital level in migrant-sending countries which by definition includes not only the skilled residents in the migrants' country of origin but also skilled natives working abroad. This inclusion might over-state the incentive effect of possibility of skilled labour migration on human capital investment in migrant-sending developing countries and lead to a biased conclusion especially in the short run. Therefore, a good measure of would-be migrants' investment in education should consider not only human capital levels, but also tertiary school enrollments in migrant-sending countries. As the latter reacts to skilled labour migration prospects much faster than the stock of human capital being a priori condition for educational attainment.

Besides, most of these studies did not consider distinguishing between short-run and long-run effects of prospects of skilled labour migration on educational attainment in migrant-sending developing countries. As proposed in the literature, migration of skilled labor involves both human capital generating and diminishing effects which vary not only by the magnitude of migration rates but also with time, Beine et al. (2001). Therefore, to measure such effects both likely short-run and long-run impacts must be considered taking appropriate proxies into cognizance.

In view of these, this paper aims to examine the effects of probability of skilled labour migration on human capital formation in migrant-sending developing countries. By fully utilizing available data on skilled labour migration rates over the period 1975-2000 with five-year frequency, this paper contributes to the existing literature by using a panel data approach instead of cross-sectional. Contrary to previous studies, we used both tertiary school enrollment and stock of human capital level in migrants' source countries as proxies for human capital investment and distinguished between short-term and long-term effects using appropriate proxies.

Our results show that the probability of skilled labour migration to destinations where the return on education is relatively higher than at home induces human capital investment in migrants' origin countries in the short run. However, in the long run it leads to a reduction in the stock of better educated professionals. The rest of the paper is organized as follows; section 2 presents literature review, section 3 describes the empirical method and data sources, section 4 explains results and section 5 concludes.

## 1. LITERATURE REVIEW

In their groundbreaking work Grubel and Scott (1966) present a systematic review which highlights conditions under which skilled labour migration might be beneficial. In the words of Grubel and Scott's "Emigration should be welcomed whenever two conditions are met. These are, first, that the emigrant improves his own income and, second, that the migrant's departure does not reduce the income of those remaining behind". Taking these steps further, Stark et al. (1998) and Stark and Wang, (2002) highlight circumstances in which the possibility of employment incentive abroad, influence the level of human capital created by optimizing prospective migrants than when such possibility is absent. They argued that from a welfare point of view, when productivity is nurtured by knowledge and skills acquired by workers and the average level of human capital available in an economy closed to migration, individuals will under-invest in their educational attainments. Moreover, migration possibilities can ameliorate this outcome and enhance welfare by raising the average level of human capital gain by both successful and abortive future migrants in the economy.

Comparing two economies one closed to migration, but the other opened, Stark (2004) further argued that the prospect of migration abroad prompt individuals to acquire a socially desirable level of skills in economies that are opened to migration due not only to opportunities that confront workers but also prospective higher returns to education overseas. Also, when skilled labour migration involves uncertainty in the future Beine et al. (2001) showed that migration prospect to developed countries where the returns to schooling are higher than at home induces individuals' in developing countries to invest in their education which raise post-migration average level of human capital in the economy. This possible effect" was further confirmed by Hemmi (2004) in the presence of the fixed cost of migration. However, he argued that the existence of opportunity to migrate might cause conflicting effects on the long run growth rate and transitional growth rate in developing countries.

Considering the 'economies of scale' in advanced education it was also established that skilled labour migration raises the education and income levels of the destination countries at the expense of the source countries. In addition, skilled labour migration will hurt mostly other skilled workers who do not migrate, more than it affects the remaining unskilled workers. This is because skilled workers benefit relatively more from the scale externality associated with a large premigration stock of skills, Miyagiwa (1991). Moreover, when labour productivity and wages depends on the average level of human capital, skilled labour migration lowers the average level of human capital and productivity performance in the source countries, Celline (2007).

From the empirical perspective a number of studies have attempted to examine the likely existence of increased human capital formation caused by prospect of skilled migration in migrant-sending developing countries. Among the earliest contributions was the work of Beine et al. (2001) who found evidence that skilled labour migration was accompanied by higher educational investments in migrant-source countries. Nonetheless, they used gross migration rates as a proxy for the skilled labour migration rate, which render the result less reliable. To improve the robustness of their result in another study Beine et al (2008) employed cross-sectional dataset on skilled labour migration rates compiled by Docquier and Marfouk (2006). Their new findings further confirmed the positive impact of skilled labour migration on human capital creation in migrant-sending developing countries. But when they (Beine et. al, 2008) used counterfactual simulations to evaluate the *ex post* level of educational attainments in the absence of migration opportunities, the result turned out a large number of countries that were negatively affected by skilled migration.

A study by Di Maria and Lazarova (2012) revealed that depending on the technological complexity of the migrant-sending country, skilled labour migration prospects distort the structure of skills accumulated by individuals thereby hampering growth process in migrants' source developing countries. Similarly, using cross-sectional data on school enrollments from 90 developing countries, Ngoma and Ismail (2013b) found that skilled labour migration negates human capital investments in migrants' source countries in the short term. At the micro level, using a survey data from Cape Verde, Lacuesta and Vincente (2012) found that a 10 percent rise in migration possibilities induces a probability of secondary school completion by almost 4 percent for individuals under sixteen years of age. Conversely, in rural Mexico, McKenzie and Rapoport, (2010) discovered that international migration depresses schooling attendance and achievement.

## 2. MODEL SPECIFICATION

The theoretical reinforcement that motivated this study was drawn from the works by Beine et al., (2001) Stark and Fan, (2004) who hypothesises that increase in the prospect of skilled labour migration abroad, where returns to skills are higher than at home induce more human capital investments, which lead to increase in the average level of human capital generated in migrant-sending developing countries.

This paper uses cross-sectional time-series data from 89 developing countries to measure the effect of skilled migration prospects on human capital formation. This method is chosen due to lack of harmonized time series data on skilled labour migration rates.

The human capital equation (Eqn. 1) is estimated using explanatory variables such as skilled migration rates (denoted by  $lnm_{it}$ ), skilled labour migration rates squared (denoted by  $lnm_{it}^2$ ) and a set of control variables, which include; workers' remittances, population size in migrants' source countries, gross domestic product (GDP), and public expenditure in education at origin denoted by  $(lnx_{it})$  and  $\varepsilon_{it}$  is the usual error term. The econometric model can be specified as follows:

$$lnH_{it} = \alpha + \beta_1 lnm_{it} + \beta_2 lnm_{it}^2 + \beta_3 lnx_{it} + \varepsilon_{it} \quad (1)$$

In Eqn. (1), human capital formation ( $lnH_{it}$ ) refers to general professional and technical skills acquired by individuals through investment in tertiary education in the migrants' source countries. Skilled labour migration rate ( $lnm_{it}$ ) refers to the proportion of the stock of the highly skilled citizens (i.e., emigrants) residing in the OECD countries to all highly skilled natives born in the country (i.e., natives + emigrants) Beine et al., (2011).

Skilled labour migration rate is expected to be positively related to human capital investment as proposed in the theoretical literature that migration prospects induce investment in education in migrant-sending countries. We also introduce a quadratic term of the variable to test for possible non-linearity and the long - run relationship between human capital accumulation and skilled labour migration rates as predicted by the theoretical framework, in Beine et al. (2001). The advantage of this method is that the possible high correlation which makes individual coefficients less reliable can be eliminated through differencing the skilled migration rate from its quadratic form. Moreover, the quadratic form allows us to measure both short-term and long-term effects. Also the linear form can be excluded to examine any partial effect, Mirer, (1995).

Remittances refer to workers' remittances and compensation of employees received by the source countries which comprises of current transfers by migrants as well as wages and salaries earned by nonresident workers. Workers' remittances are classified as current account private transfers made by workers who are residents of the destination countries to recipients in their origin countries. Compensation of employees is the income of migrants who have lived in the destination countries for less than a year. Migrant transfers are defined as the net worth of migrants (who are expected to remain in the destination countries for more than one year) that is transferred from one country to another at the time of migration. In developing countries, workers' remittance constitutes one of the major sources of external funding and could contribute to human capital formation through the alleviation of financial credit. Therefore, this variable is incorporated into the human capital equation.

The number of individuals or inhabitants in a country (population size) is expected to impact positively on the level of enrollment in tertiary school, thereby increasing the amount of skills people generated in that country. Also effective skilled migration is usually based on individuals' skill which is partly determined by expenditure on education in the migrants' source countries as that determined migrant workers' skills prior to migration. However, the level of economic activity as well as income level might also positively impact on investment in human capital. Hence, both population size, public expenditure on education and gross domestic product (GDP) are included as controls in Eqn. (1).

### 3.1 DATA SOURCE

This paper utilizes data from many different sources. The data on international migration by educational attainments (skilled migration rates) is from Defoort (2008) who employed the same techniques as earlier used in the Docquier and Marfouk (2006) data set on international migration by skill level. Data from six main immigrants receiving countries in

the OECD (Australia, Canada, France, Germany, United Kingdom and United State) were used by the authors. According to the estimation the data represent approximately 77 percent of the world migrants' population. To our knowledge this has been the only available comprehensive panel dataset on international migration by skill level. The data is only available for the period of 1975 – 2000 with a five year frequency. Data on human capital is from Barro and Lee (2013) database (human capital level) and United Nation data base (tertiary school enrollment). Finally, data on remittances, population, gross domestic product per head (GDP, and population growth rate were all collected from World Development Indicators (WDI). All the data are transformed in to the natural logarithm to normalize their scale.

### 3. EMPIRICAL RESULT

Table 1, column 3-6 present the results of the effects of skilled labour migration prospects on human capital formation using fixed effect panel data estimation. Column 3-6 shows that the coefficient of skilled labour migration rate is positively significant in all the models. This implies that possibility of skilled labour migration abroad, where the return to schooling is higher, influences educational investment in migrants' source developing countries in the short run. In columns 4-5 we include time dummies to test for time effects. The result shows that there are time effects. However, one of the time dummies is insignificant hence it was dropped and the result is presented in column 5.

As earlier noted the authors incorporated skilled labour migration rate squared to capture any possible non-linearity or long-run effects. Surprisingly the result (columns 3-5) shows a negative significant impact, describing an inverted U-shaped relationship between skilled labour migration rate and human capital formation. This suggests that in the short-run educational attainment response positively to the international migration possibility. However, such response tends to be negative in the long run as skilled migration selectively erodes the stock of human capital generated in migrants' source developing countries. In other words, the *ex-ante* (i.e., Before emigration occurs) increase in human capital stock caused by possibility of skilled migration seems to be dominated by the 'emigration effect' hence the net increase in human capital stock *ex-post* falls below the outflow of human capital from migrant-sending developing countries.

**Table 1: Skilled Migration Rate and Human Capital accumulation**

	(1)	(2)	(3)	(4)	(5)
Constant	-10.293*** (-14.33)	-13.552*** (-12.50)	-28.824*** (-16.50)	-20.738*** (-8.54)	-17.483*** (-5.68)
Skilled mig	-0.302 (-0.85)	0.146 (0.68)	0.349** (2.51)	0.349*** (2.71)	0.354*** (2.88)
Skilled mig SQR	0.156 (0.93)	-0.087 (-0.85)	-0.194*** (-2.83)	-0.187*** (-2.98)	-0.187*** (-3.09)
Remittance	0.096*** (3.76)	0.081*** (3.49)	0.017 (0.72)	0.015 (0.65)	0.007 (0.30)
Population	-0.488*** (-11.14)	-0.183*** (-2.24)	1.229*** (7.45)	0.782*** (3.88)	0.642*** (2.86)
Growth	0.605*** (12.27)	0.553*** (9.92)	0.297*** (4.62)	0.256*** (3.68)	0.219*** (3.14)
B-P LM test	432.76*** [0.000]				

Hausman test 130.80\*\*\*  
 [0.000]

Observations N=52, T=6 N=52, T=6 N=52, T=6 N=52, T=6 N=52, T=6

Values in parenthesis and bracket are t statistics and P-values respectively; \*\*\*significant at 1%; \*\*significant at 5%; \*significant at 10%. Column (1) is OLS result. Column (2) is random effect result. Columns 3-4 are fixed effect results. In columns 4-5 time effect is included and they are jointly significant

In table 2, column 3, tertiary school enrollment was used as a proxy for human capital investment instead of the stock of human capital to test the robustness of the short-run effects of skilled labour migration. The amount of enrollment in tertiary education is the best point of analysis to examine the incentive effects of skilled labour migration on educational investment in migrants' source developing countries. Since enrollment in tertiary education may react to international migration prospects much faster than the stock of human capital, Di Maria and Lazarova (2012). As shown by column 3 from each model, the enrollment in tertiary school level is positively related to probability of skilled labour migration. This further confirms the short-term incentive effects of skilled labour migration in inducing educational investment<sup>iii</sup>. Our results are in line with Beine, Defoort, and Docquier (2011) who produce evidence of human capital investments generated by the impact of skilled labour migration prospect from panel dataset while controlling for possible endogeneity. However, contrary to their analysis, our findings revealed that in the long-run skilled labour migration adversely affect human capital formation in migrants' source developing countries.

These findings suggest that in the short-run the possibility of skilled labour migration expands the opportunities that confront individuals in developing countries and induce them to invest more in their own education. However, in the long run, given the quality selective immigration policies in most developed countries, only highly educated and brilliant workers would eventually migrate, leaving the average ones in migrants' source developing countries. Such 'selective' skilled labour migration adversely affects not only the quality but the long-run average level of human capital stock generated, leading to brain drain in these migrants' source countries. Interpreting this result from the endogenous growth perspective that link long-run growth of a country's output with the average level of a country's human capital stock, such as Lucas (1988) and Galor and Stark (1994), it suggests that relaxing policies on skilled labour migration may impinge negatively on the long-run level of human capital stock, thus resulting in brain drain and lower output growth.

These findings can also be supported based on empirical statistics, for example, India has been a major exporter of medical doctors for the past few decades. The number of Indian doctors in the United State exceeded 50,000, the largest group of physicians after the native-born American doctors. Moreover, over 30% of medical doctors in National Health Services (NHS) in the United Kingdom are believed to be Indians. The long-term effect of this skilled labour migration now is there is one Indian doctor in the United State for every 1,325, Americans, whereas, there is only one Indian doctor in India for over 2,400 Indians (Adkoli 2006). Similarly, in the Philippines, it was observed that the outflow of highly skilled Filipino workers surpassed their net increased by almost 46 percent during the period 1992 to 1998 (Alburo and Abella, 2002). This means that the rise in the number highly skilled human capital stocks in Philippines through those years had been less than the number of registered skilled professionals who left the country as migrant workers.

**Table 2: Skilled Migration Rate and Tertiary School Enrollment**

	Model 1			Model 2		
	(1)	(2)	(3)	(1)	(2)	(3)
Constant	-12.570*** (-14.58)	-11.294*** (-9.17)	0.191 (0.08)	-11.349*** (-11.93)	-10.010*** (-7.73)	1.156 (0.44)
Skilled mig	-0.158*** (-3.13)	-0.103 (-1.37)	0.347** (2.44)	-0.178*** (-3.53)	-0.122 (-1.65)	(0.332)** (2.35)
Public exp Educ.	-0.212 (-1.59)	-0.103 (-0.68)	0.389** (2.31)	-0.239* (-1.79)	-0.139 (-0.91)	0.339** (2.10)
Growth	1.054*** (31.17)	0.987*** (19.57)	0.407*** (3.48)	0.988*** (24.23)	0.916*** (16.48)	0.352*** (2.77)
Remittance				0.089*** (2.87)	0.096*** (2.83)	0.090* (1.95)
B-P LM test	122.38*** [0.000]			122.65*** [0.000]		
Hausman test	43.33*** [0.000]			43.27*** [0.000]		
R-squared	0.84	0.84	0.45	0.84	0.84	0.46
Observations	N=89, T=3	N=89, T=3	N=89, T=3	N=89, T=3	N=89, T=3	N=89, T=3

Values in parenthesis and bracket are t statistics and P-values respectively; \*\*\*significant at 1%; \*\*significant at 5% \*significant at 10% Column (1) is OLS result. Column (2) is random effect result Columns 3 is fixed effect result.

#### 4. CONCLUSION

In this paper, we examine the effects of possibility of skilled labour migration on human capital formation in migrants' source developing countries using a panel dataset over the period of 1975 – 2000 with a five year frequency. We find that, in the short-run, higher probability of skilled labour migration increases incentives to invest in human capital formation in the migrants' source developing countries. However, in the long run, skilled labour migration leads to decline in the stock of human capital generated in migrants' source developing countries.

Our findings, on the one hand, lend support to the growing concerns expressed by policy-makers in migrant-source developing countries over the loss of their trained workers to developed countries through international migration. Skilled labour migration, if not carefully managed, might lead to brain drain in the long run, which can cripple delivery of vital services such as education and health care and impaired development in migrants' source developing countries. On the other hand, our findings also upheld the view that, the prospect of skilled labour migration can increase the incentives to acquire education, at least in the short run, and expand employment opportunities for growing unemployed skilled individuals in developing countries. Therefore, policy-makers in migrant-source developing countries can use the potentials of international migration to raise the employment effects in their development process while monitoring the challenges of skilled labour migration by identifying and controlling sectors that can be prone to brain drain.

## REFERENCES

- Alburo, F. A., & Abella, D. I. (2002). *Skilled labour migration from developing countries: Study on the Philippines*. Geneva: International Labour Organisation.
- Adkoli, B. V. (2006). Migration of Health Workers: Perspectives from Bangladesh, India, Nepal, Pakistan and Sri Lanka. In *Regional Health Forum* (Vol. 10, No. 1, pp. 49-58).
- Baltagi, B. H. (2005). *Econometric Analysis of Panel Data*. 3rd Edition: John Wiley & Sons. Ltd.
- Barro, R. J., & Lee, J. W. (2013). A new data set of educational attainment in the world, 1950–2010. *Journal of development economics*, 104, 184-198.
- Bhagwati, J., & Hamada, K. (1974). The brain drain, international integration of markets for professionals and unemployment: a theoretical analysis. *Journal of Development Economics*, 1(1), 19-42.
- Beine, M., Docquier, F., & Rapoport, H. (2007). Measuring international skilled migration: a new database controlling for age of entry. *The World Bank Economic Review*, 21(2), 249-254.
- Beine, M., Docquier, F., & Oden-Defoort, C. (2011). A panel data analysis of the brain gain. *World Development*, 39(4), 523-532.
- Beine, M., Docquier, F., & Rapoport, H. (2001). Brain drain and economic growth: theory and evidence. *Journal of development economics*, 64(1), 275-289.
- Beine, M., Docquier, F., & Rapoport, H. (2008). Brain drain and human capital formation in developing countries: Winners and losers\*. *The Economic Journal*, 118(528), 631-652.
- Cellini, R. (2007). Migration and welfare: a very simple model. *Journal of International Development*, 19(7), 885-894.
- Di Maria, C., & Lazarova, E. A. (2012). Migration, human capital formation, and growth: An empirical investigation. *World Development*, 40(5), 938-955.
- Docquier F, Marfouk A, (2006). *Measuring the international mobility of skilled workers (1990-2000)*. University of Lille 2(France): Release 1.0 CADRE
- Galor O, Stark O, (1994). *Migration, human capital formation, and long-run output in Siebert, H. (ed.), Migration: A Challenge for Europe*, Tübingen: Mohr.
- Gibson, J., McKenzie, D., & Stillman, S. (2011). The impacts of international migration on remaining household members: omnibus results from a migration lottery program. *Review of Economics and Statistics*, 93(4), 1297-1318.
- Grubel, H. B., & Scott, A. D. (1966). The international flow of human capital. *The American Economic Review*, 268-274.
- Hemmi, N. (2005). Brain drain and economic growth: theory and evidence: a comment. *Journal of Development Economics*, 77(1), 251-256.
- Lucas RE, (1988). On the mechanics of economic development. *Journal of Monetary Economics* 22(3):2-42
- Lundahl, M. (1985). Brain drain, illegal migration and capital exports from less developed economies: A neoclassical approach. *Economics Letters*, 17(3), 277-280.
- McKenzie, D., & Rapoport, H. (2010). Self-selection patterns in Mexico-US migration: the role of migration networks. *The Review of Economics and Statistics*, 92(4), 811-821.
- Migration and Remittance Factbook (2011). Publisher: World Bank Publications.
- Mirer TW, (1995). *Economic statistics and econometrics*. New Jersey: Prentice-Hall, Inc.
- Miyagiwa, K. (1991). Scale economies in education and the brain drain problem. *International Economic Review*, 743-759.
- Mountford, A. (1997). Can a brain drain be good for growth in the source economy? *Journal of development economics*, 53(2), 287-303.
- Ngoma, A. L., & Ismail, N. W. (2013b). The Impact of Brain Drain on Human Capital in Developing Countries. *South African Journal of Economics*, 81(2), 211-224.
- Özden, Ç. (2006, February). Brain drain in Latin America. In *Expert Group Meeting on International Migration and Development in Latin America and the Caribbean, United Nations Secretariat, Mexico City* (Vol. 30).
- Skuterud, M., & Su, M. (2012). The influence of measurement error and unobserved heterogeneity in estimating immigrant returns to foreign and host-country sources of human capital. *Empirical Economics*, 43(3), 1109-1141.
- Stark, O. (2004). Rethinking the brain drain. *World Development*, 32(1), 15-22.
- Stark, O., & Wang, Y. (2002). Inducing human capital formation: migration as a substitute for subsidies. *Journal of Public Economics*, 86(1), 29-46.

Stark, O., Helmenstein, C., & Prskawetz, A. (1997). A brain gain with a brain drain. *Economics letters*, 55(2), 227-234.  
Vidal, J. P. (1998). The effect of emigration on human capital formation. *Journal of Population Economics*, 11(4), 589-600.

Retrieved August 7, 2009

(<http://unstats.un.org/unsd/databases.htm> accessed)

Retrieved October 8, 2009

(<http://data.worldbank.org/data-catalog/world-development-indicators>)

---

<sup>i</sup> For an earlier systematic review on theoretical analysis of brain drain see Bhagwati and Hamada, 1974.

<sup>ii</sup> The hypothesis that higher probability of skilled migration increase the incentives to acquire education and through that the proportion of skilled population in the migrants' source country is under the assumptions that not all skilled individuals will actually migrate and that access to education and training is feasible.

<sup>iii</sup> The robustness of the result was initially tested using our original specification, which captures both short and long-run effects of skilled labor migration prospect on human capital formation. However, the result turned out to be sensitive to the inclusion of the quadratic form of skilled labor migration. Hence, the long-run coefficient was dropped.