Skill Composition of Migrants and Economic Growth in Developing Economies

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Abstract

A significant number of both skilled and unskilled workers had been flowing from developing countries to developed economies searching for a better life. A lose of any type of labor, whether skilled or not, reduce the total available labor resource, and thus have adverse effect on growth of the economy. The migration of skilled labor could also have a positive feedback effect on the growth of home country. The net effect, therefore, will depends on whether the positive feedback effect outweighs the reduction of labor resource in the home country. This paper examines the impact of migration, based on education level of immigrants, on economic growth of the sending countries. Using unbalanced panel data of 114 countries for the period 1975 - 2000, the paper supports the hypothesis that the outflows of skilled labor have a positive feedback effect on developing countries. However, outflow of skilled workers would significantly hurt the growth of the very poor economies, which experienced high income inequality.

Key Words: immigration, skilled labor, economic growth

1. Introduction

International migration of skilled and professional workers, commonly known as brain drain, has long been an important topic for economists and government planners in many countries. Many governments, especially those that are losing these workers, have great concerns about the possible adverse effects of brain drain on economic growth, education, income distribution, and welfare. These concerns stem from the fact that brain drain is the outflow of one of most scarce resources in many source countries. Overtime, brain drain could adversely affect the formation of human capital, and it could hurt the growth of the sending countries (Bhagwati and Hamada, 1974). This negative impact of brain drain has also been stressed in the New Growth literature (Galor and Tsiddon, 1997).

Recently the range of theoretical as well as empirical papers has been challenged the traditional view of brain drain. Those recent studies revealed that skilled migration prospects foster human capital accumulation and economic growth (e.g. Stark et al., 1998 and Beine et al., 2001). The rationale behind is that if the return to education is higher abroad than at home, the possibility of migration increases the expected return to human capital, thereby enhancing domestic enrollment in education. More people, therefore, invest in human capital as a result of increased migration opportunities. Since only some of them actually emigrate, there may be an overall increase in the country's post-migration level of human capital. In addition to the incentive to acquire education, the flow of remittance, return migration after additional knowledge and skills have been acquired abroad and the creation of trade networks are the other channels whereby the migration may positively affect the sending economy (Beine et al., 2009).

Although a number of studies on migration and economic growth are more exclusively theoretical (e.g. Mountford, 1997, and Stark et al., 1998), very few empirical studies have been done testing the effect of migration on economic growth of the source country. Among them, for instance, Beine et al, (2001) examined the effect of migration prospects on economic growth in a cross-section of 37 developing countries and they provided some evidence of beneficiary brain drain (BBD). As a contribution to the literature, this paper examines the dynamic impacts of migration prospect on economic growth of the source country, using a disaggregated data of migration rate based on education level. In the last three decades, a significant number of both high skilled and low skilled workers migrate from developing countries to developed countries such as U.S., Canada, Europe and countries in the Middle East.

It is important to look at the asymmetric effect of high skilled and low skilled migration on the growth of sending economies. The previous argument or channel of brain grain, that migration would increase the education investment and thus improve the human capital formation and economic growth in the source country, would be questionable. The migration rate of high skilled and low skilled may have different impact on the education attainment and thus economic growth of the source country. Based on the average education attainment of emigrants, the paper identified the dynamic effect of migration on the source countries economic growth. The estimation result indicate that high skilled migrants (those who have completed post secondary education) have a significant adverse effect on developing countries that suffer from high income inequality. The flows of low skilled migrants, on the other hand, did not have any significant impact on growth of those sending economies.

2. Model Specification

To examine the impact of migration on economic growth, a typical growth model following Caselli, et al. (1996) and Mankiw, et al. (1992) is specified as follows:

$$gr_{i,t} = \delta_0 + \delta_1 \ln(Y_{i,t-5}) + \delta_2 hsmr_{i,t-5} + \delta_3 lsmr_{i,t-5} + X\beta + \eta_i + \varepsilon_t + u_{i,t}$$

Where $t=1,2,3,4,5$ and $i=1,2,...,N$, $gr_{i,t}$ represents economic growth of country *i* between the period *t* and *t-5*, η_i is a country specific effect, ε_t is a period specific, *Y* is real per capita GDP and Y_{t-5} is a measure of initial income. *lsmr* and *hsmr* are migration rate for low skilled and high skilled, respectively. *X* represents a vector containing other control stock and flow variables. The "stock" variables in the vector include education attainment at home country and measure of political stability, International Country Risk Guide (ICRG)[1]. The "flow variables", i.e. population growth (n), technological progress (g), rate of depreciation (δ), investment as percentage of GDP (I/RGDP), remittance as percentage of GDP (REMIT/RGDP) and measure of openness [OPEN =(Export + Import)/RGDP], are considered as an average over the 5 years preceding *t*. Due to data limitation it is a standard in the applied economic growth literature to estimate the annual rate of technological progress and rate of depreciation as of 0.05 (i.e. $n+g+\delta = n+0.05$), (Caselli et al., 1991, Mankiw et al., 1992).

Following the typical empirical growth literature, such as Caselli et al. (1996), and Mankiw, et al. (1992), two applications of the generalized method of moments (GMM) are used: (1) Arellano-Bond estimator which is proposed by Arellano and Bond (1991) and it is also called "Difference GMM" and (2) "System GMM" proposed by Blundell and Bond (1998). These GMM type estimators address the issues of endogeneity and correlated individual effects that are highly possible in the typical growth equation. Furthermore, these GMM estimators optimally exploit all the linear moment restrictions implied by a dynamic panel data model (Caselli et al., 1996). A simple Fixed/Random effect model is also estimated as a baseline for comparison purpose.

It is clear that the GMM framework deals consistency and efficiency of the estimators. However the consistency critically based on the identifying assumptions such that lagged values of income and other explanatory variables are valid instruments in the growth regression. It is also based on the assumption that no second order correlation in the errors. To address this concern, the estimation results are complemented by two basic tests. First, the Arellano and Bond (1991) second autocorrelation test where the null is no autocorrelation in first difference errors. Second, the Sargan test for over identifying restrictions, under the null hypothesis that the instruments are valid. The Difference Sargan test is also reported for the system GMM estimators, where the null hypothesis is the lagged difference of the explanatory variables are uncorrelated with the residuals. These are additional restrictions imposed in the system GMM estimator.

3. Empirical Analysis

The empirical analysis is based on a data set compiled by Defort (2008) who generalized the Docquier and Marfouk's(2006) methodology and builds a similar data base covering the period 1975 – 2000. Defort (2008) collected the data on stock of immigrants in six major receiving OECD countries by education level (primary, secondary and tertiary) and country of birth at a five year frequency. This data set provide the number of migrants for all working-aged (25 and over) foreign-born individuals living in six major receiving OECD countries (i.e. U.S.A, U.K., Canada, Australia, France and German).

[1] The composite index aggregates subcomponents of the political risk: quality of bureaucracy, law and order, control of corruption, and Investment Protection.

It is estimated that the data represent approximately 77 percent of the world's migration population in the year 2000 (Docquier and Marfouck, 2006). The migration rate is computed for high skilled and low skilled independently. High skilled migration rate (*hsmr*) is defined as the ratio of the stock of natives, who have a tertiary education level (post high school), living in the OECD countries (emigrants) to the total high-skill natives born in the country (residents +emigrants). Similarly, the low skilled migration rate (*lsmr*) is the proportion of migrant workers who don't complete secondary education to the total low-skilled workers born in the country. Defoort (2008) data base also reports average education attainment (*SCHOOL*) of the labor force for sending developing countries. The ICRG measure of political stability data is obtained from Center for Global Development data base. Finally, the data for openness (*OPEN*) is calculated as the ratio of export plus import to real GDP. Table 1 presents the summary statistics of those variables used in the analysis.

The results of regression are highly depends on the type of specification and method of estimation. Therefore, it is desirable to check the robustness of the results to alternative specifications and methods of estimation. Table 2 reports the result from fixed effect model for a three different specifications. The Hausman test indicated the fixed effect is the preferred model against the corresponding random effect.[2] The first column presents the result for the base line specification (i.e. Solow type growth model). The second and the third column of Table 2reports the result after controlling for other important variables i.e. school enrolment (SCHOOL), quality of the government (ICRG) and immigration rate of high skilled (*hsmr*) and low skilled migrants (*lsmr*). The coefficient on lagged income has the expected negative sign, and is strongly significant in the three specifications, indicating a strong conditional convergence of growth. So are the coefficients on rate of investment and the rate of population growth consistent with the Solow growth model.

The main variable of interest, migration rate of high skilled is positive and significant, indicating that the flow of skilled labor improved the growth of sending economies. That could be due to the significant incentive effect i.e. it provided incentive for those who left at home to invest on education, the remittance coming from the immigrants, increase in human capital from return migration, and the possible creation of trade network. As of skilled labor, a huge number of low skilled natives did migrate from developing countries searching for better life. The summary statistics, Table 1, indicated that there are countries that sent more than 50% of their low skilled workers to OECD countries. However the estimation results reported under column 2 and 3 of table 2 indicates that the low skilled immigration did not have any significant effect on the growth of the developing countries. The interaction term between high skilled and measure of inequality (*hsmr*Gini*) is negative and significant. This indicates that in countries experiencing high income inequality, the flow of skilled labor adversely affect economic growth.

The results explained so far from the base line specifications (Table 2) have several econometric problems. First, the variables on the right hand side of the growth equation are endognenous, because causality may run in both directions – from rate of investment to growth and vice versa – these regressors may be correlated with the error term. Second, time-invariant country characteristics (fixed effects), such as geography and demographics, may be correlated with the explanatory variables. The fixed effects are contained in the error term in the growth equation, which consists of the unobserved country-specific effects, η_i, and the observation-specific errors, ε_t. Third, the panel dataset has a short time dimension (T=6) and a larger country dimension (N=114). Such econometric problems can be solved by using the Arlano-Bond Differenc GMM (DGMM) and Arelano-Bover System GMM (SGMM) method of estimation (Roodman, 2006).

As reported column 1- 6 of Table 3, consistent with the baseline regression results, the lag of RGDP, rate of population growth and rate of investment are significant with expected sign. The high skilled migration rate is positive and barely significant (at 10% level of significance) in the last two specifications of both DGMM and SGMM estimation. The low skilled migration rate is still insignificant, in both DGMM and SGMM estimation as of the baseline (FE) model. However, the high skilled migration rate is negative and strongly significant in the countries with high income inequality. A 1% increase in the migration rate of skilled labor leads to the fall in growth of the home or sending country by about 0.8%. The reliability and consistency of the result is supported by a number of diagnostic tests.

[2] The null hypothesis for Hausman test is the unique errors (u_i) are not correlated with the regressors, and the alternative hypothesis is the errors are correlated with the regressors.

The p-value of the second autocoreelation test in all the three specifications of DGMM and SGMM estimations indicated no autocorrelation problem (i.e. P-value > 0.1). The Sargen test for DGMM and the Difference Sargen test also reject the over identification restrictions.

4. Conclusions

International migration of skilled and professional workers from the developing to developed economies has long been an important topic for researchers and policy makers. A significant number of both skilled and unskilled workers did left their home country searching for better life. Most of the previous (brain-drain and brain-gain) literatures, examined the impact of skilled migration on economic growth of the sending countries. A lose of any type of labor, whether skilled or not, definitely reduce the total available labor resource in the economy. The effect of outflow of labor, therefore, will depends on whether the positive feedback i.e. the incentive effect outweighs the adverse reduction of labor resource in the home country. As a contribution to this literature, the paper examines the impact of migration, based on education level of migrants, on economic growth of the sending countries. Using unbalanced panel data for 114 countries for the period 1975-2000, the flow of skilled labor have a positive feedback effect i.e. helps economic growth of the home country. However, migration of skilled workers from developing countries, which have high income inequality, would hurt the growth of those countries. It seems that the flow of low skilled labor from low income economies didn't have any significant effect on the economic growth of those economies.

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Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Real GDP per Capita (Y)	1562.54	1732.29	114.896	8854.39
Investment to Real GDP ratio (I/RGDP)	0.224	0.092	0.012	0.559
Population Growth (n)	2.316	1.131	-0.649	6.026
Remittance Real GDP ratio (REMIT/RGDP)	0.083	0.0888	0.0145	0.361
Education attainment (SCHOOL)	0.112	0.187	0.0009	1.665
Migration rate of low skilled (lsmr)	0.051	17.025	0.004	0.568
Migration rate of high skilled (hsmr)	0.198	22.40	0.004	0.776
Political instability (ICRG)	4.446	1.484	0.3333	8.666
Openness (OPEN)	0.323	0.481	0.085	0.324

Table 2: Fixed/Random Effect Estimation

Explanatory Variables	Fixed Effect (FE) Estimators		
	(1)	(2)	(3)
Constant	2.053***	1.560***	1.997***
	(0.000)	(0.000)	(0.001)
lag ln (RGDP)	-0.263***	-0.223***	-0.239***
	(0.0000)	(0.000)	(0.001)
ln (n+g+δ)	0.005	-0.923**	-0.895
	(0.971)	(0.0100)	(0.154)
ln (I/RGDP)	0.131***	0.136***	0.358***
	(0.000)	(0.000)	(0.000)
ln (SCHOOL)		0.197*	0.583***
		(0.076)	(0.001)
ln (ICRG)		0.009	0.033**
		(0.3900)	(0.021)
lag ln (hsmr.)		0.118***	0.0761**
		(0.000)	(0.028)
lag ln (lsmr.)		-0.027	0.128
		(0.2720)	(0.323)
lag ln (hsmr)*Gini			-0.0004***
			(0.003)
lag ln (lsmr)*Gini			-0.002
			(0.287)
Hausman Test	76.43	86.56	103.81
	(0.000)***	(0.000)***	(0.000)***
R^2	0.46	0.49	0.59

$gr_{i,t} = \delta_0 + \delta_1 \ln(Y_{i,t-5)} + \delta_2 hsmr_{i,t-5} + \delta_3 lsmr_{i,t-5} + X\beta + \eta_i + \varepsilon_t + u_{i,t}$,where the dependent variable, growth (gr)= ln ($Y_{i,t}$) – ln($Y_{i,t-5}$) where Y represent the real GDP per capita. h*smr* is the rate of high skilled labor, and *lsmr* represent the rate of low skilled migration. A significant Hausman test indicated the Fixed Effect (FE) is the preferred model.

P-values are in parentheses, * (P-value<0.10), **(P-value<0.05), ***(P-value<0.01).

Table 3: Difference GMM and System GMM estimators

Explanatory Variables	Difference GMM (DGMM)			System GMM (SYMM)		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	2.900***	2.982***	1.264***	1.246***	1.762***	0.702***
	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.047)
lag ln (RGDP)	-0.391***	-0.431***	-0.135***	-0.140***	-0.257***	-0.059***
	(0.000)	(0.000)	(0.017)	(0.001)	(0.000)	(0.157)
ln (n+g+ δ)	0.162	-0.658*	-1.196***	0.277	-0.832**	-1.380***
	(0.370)	(0.089)	(0.004)	(0.150)	(0.035)	(0.000)
ln (I/RGDP)	0.133***	0.136***	0.443***	0.185***	0.129***	0.453***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.002)	(0.000)
ln (SCHOOL)		0.548***	0.797***		0.663***	0.830***
		(0.000)	0.0000		(0.000)	(0.000)
ln (ICRG)		0.007	0.021**		0.016	0.031***
		(0.556)	(0.022)		(0.193)	(0.004)
lag ln (hsmr.)		0.050**	0.076*		0.062*	0.076*
		(0.049)	(0.072)		(0.064)	(0.056)
lag ln (lsmr.)		-0.033	-0.208		0.038	-0.231
		(0.498)	(0.125)		(0.352)	(0.411)
lag ln (hsmr)*Gini			-0.071***			-0.083**
			(0.022)			(0.045)
lag ln (lsmr)*Gini			0.001			0.001
			(0.538)			(0.519)
Second Autocorrelation test	0.29	0.67	0.62	0.59	0.69	0.39
Sargen test	0.25	0.31	0.15	0.18	0.24	0.11
Difference Sargen test				0.67	0.31	0.40

$gr_{i,t} = \delta_0 + \delta_1 \ln(Y_{i,t-5}) + \delta_2 hsmr_{i,t-5} + \delta_3 lsmr_{i,t-5} + X\beta + \eta_i + \varepsilon_t + u_{i,t}$, where the dependent variable, growth, gr = ln ($Y_{i,t}$) – ln($Y_{i,t-5}$) where Y represent the real GDP per capita. h*smr* is the rate of high skilled labor, and *lsmr* represent the rate of low skilled migration. The null hypothesis for Sargan test is the overidentification restrictions are valid. The null for second autocorrelation test is no autocorrelation in first difference errors.

P-values are in parentheses, * (P-value<0.10), **(P-value<0.05), ***(P-value<0.01).

List of the countries

Afghanistan	Dominica	Madagascar	Seychelles
Albania	Dominican Republic	Malawi	Sierra Leone
Algeria	Ecuador	Malaysia	Solomon Islands
Angola	Egypt, Arab Rep.	Maldives	Somalia
Argentina	El Salvador	Mali	South Africa
Bangladesh	Ethiopia	Marshall Islands	Sri Lanka
Belize	Fiji	Mauritania	Sudan
Benin	Gabon	Mauritius	Suriname
Bhutan	Gambia, The	Mexico	Swaziland
Bolivia	Ghana	Micronesia, Fed. Sts.	Syrian Arab Republic
Botswana	Grenada	Mongolia	Thailand
Brazil	Guatemala	Morocco	Tanzania
Bulgaria	Guinea	Mozambique	Togo
Burkina Faso	Guinea-Bissau	Namibia	Tonga
Burundi	Guyana	Nepal	Tunisia
Cambodia	Haiti	Nicaragua	Turkey
Cameroon	Honduras	Niger	Uganda
Cape Verde	India	Nigeria	Uruguay
Central African Republic	Indonesia	Pakistan	Vanuatu
Chad	Iran, Islamic Rep.	Palau	Venezuela, RB
Chile	Iraq	Panama	Vietnam
China	Jamaica	Papua New Guinea	Yemen, Rep.
Colombia	Jordan	Paraguay	Zambia
Comoros	Kenya	Peru	Zimbabwe
Congo, Dem. Rep.	Kiribati	Philippines	
Congo, Rep.	Lao PDR	Romania	
Costa Rica	Lebanon	Rwanda	
Côte d'Ivoire	Lesotho	Samoa	
Cuba	Liberia	São Tomé and Principe	
Djibouti	Libya	Senegal	