Skilled Migration, Human Capital and Educated Unemployment

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Abstract

It is, theoretically, argued that the possibility of migration to where-the-returns to education is higher promotes human capital investment and educated unemployment in the migrants' source countries. However, empirical studies seeking to support this claim are uncommon in the received literature. This paper examines the effect of skilled migration on human capital formation and unemployment of educated workers in migrants' source developing countries. The paper uses System Generalised Method of Moments (SGMM) technique on panel dataset from 96 migrant-sending countries over the period of 1980 – 2000. The results reveal that skilled migration exerts positive effect on educational investment in migrants' source countries. The results further show that the possibility of skilled migration attenuates skilled unemployment in migrants' source countries. From the policy standpoint, the paper shows that policymakers in migrant-sending countries can use the potentials of international migration to boost their countries level of human capital and reduce skilled unemployment.

Keywords: Skilled Migration, Human Capital Formation, Educated Unemployment, Developing Countries

JEL Classification: F22, J24, J64

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1 Introduction

International migration, the movement of people across international boundaries, has economic implications in both migrants' origin and destination countries. The World Bank estimates showed that more than 247 million people live outside of their countries of birth in 2013. Among these migrants are millions of tertiary-educated people who left their country of origin to seek for better economic opportunities. It was reported that in 2011 about 28 percent of migrants living in the OECD countries are highly skilled.

The recent literature on brain drain argues that higher prospects of skilled migration to higher-returns-to-skill countries induce would-be migrants to invest more in their own education. Consequently, since international migration involves limits due to 'quality selective' immigration policies in the destination countries, not all aspiring skilled migrants would eventually migrate. Therefore, the possibility of skilled 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[1]. In other words, the average level of human capital stock created in developing countries with skilled migration possibilities might be higher than that created in developing countries without such possibilities (Stark and Dorn 2013; Di Maria and Lazarova, 2012; Beine et al., 2001, 2008, 2011; Stark 2004). Furthermore, Fan and Stark (2007a) and Stark and Fan (2011) demonstrated that the prospect of international migration might result not only in human capital creation, but also in 'educated unemployment[2]' when the increased supply of skilled labour meets constant demand due to sticky wages in migrant-sending developing countries. While some empirical research have been conducted on the issue of international migration of skilled workers, the issue of educated unemployment has yet to receive any formal empirical test in the received literature.

Contrary to the notion that skilled labour migration promotes brain drain

[1] 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.

[2] Educated unemployment refers to unemployment of individuals with university education that result from lower net earnings in home country and failure to secure jobs abroad.

(Shimada 2013; Ngoma and Ismail, 2013b; Gibson et al, 2011; Mackenzie and Rapoport, 2010), empirically a number of studies using cross-sectional dataset have found evidence suggesting that an increase in the prospect of skilled migration, where returns to schooling are higher than at home, induces more human capital investment in developing countries (Beine et al., 2001: 2008; and Di Maria and Lozarova, 2012). But, given the cross-sectional regressions used by these studies, they are likely to suffer from endogeneity, 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 dynamically model heterogeneity across countries, mitigates measurement errors and address problems of omitted variables and endogeneity using system generalised method of moments (SGMM) estimator (Arellano and Bond 1991; Arellano and Bover 1995; Blundell and Bond 1998; Baltagi 2005).

In view of these, this paper examines the effects of skilled migration on human capital formation and unemployment of educated workers in migrant-sending countries using SGMM estimator and data on skilled migration rates over the period of 1980–2000 with five-year frequency. This paper contributes to the existing literature by using a panel data approach instead of a cross-sectional one. We also extend the literature by empirically testing the recent development in the theoretical literature of skilled migration: that the possibilities of skilled migration lead to 'educated unemployment' in migrants' source developing countries as proposed by Fan and Stark (2007a).

Our results show that the probability of skilled migration to destinations where the return on education is relatively higher than at home induces human capital investment in migrants' origin countries. We also found that skilled migration attenuates skilled unemployment in the migrants' country of origin. The rest of the paper is organized as follows; section 2 presents literature review, section 3 describes empirical methods and data sources, section 4 explains results and section 5 concludes.

2 Literature Review

In their classic works, Stark et al. (1997) and Stark and Wang (2002)

highlight circumstances in which the possibility of employment 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.

Stark and Fan (2011) further demonstrated that higher probability of skilled migration abroad, where wages and working conditions are better compared to home country, impinges on potential migrants minimum-wage limit in the home country's labour market. This causes voluntary "educated unemployment" as abortive foreign job-seekers in home country fail to work in their own country, but engage repeatedly in foreign job-search and involuntary "educated unemployment" due to sticky wages in the labour market of the country of origin.

From the empirical perspective a number of studies have examined the effect on human capital formation caused by the prospect of skilled migration in migrant-sending developing countries. Among the earliest contributions were the works of Beine et al. (2001; 2008) and Di Maria and Lazarova (2012) who found evidence that skilled migration was accompanied by higher education investments in migrant-source countries. Similarly, using a survey data from Cape Verde, Batista et al. (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. However, using cross-sectional data on school enrollments from 90 developing countries, Ngoma and Ismail (2013b) showed that skilled migration negates human capital investments in migrants' source countries in the short term. Similarly, in rural Mexico, Mckenzie and Rapoport (2010) discovered that international migration depresses schooling attendance and achievement. Furthermore, a study by Di Maria and Lazarova (2012) also revealed that depending on the technological complexity of the migrant-sending country, skilled migration prospects distort the structure of skills accumulated by individuals thereby hampering growth process in migrants' source developing countries.

3 Model Specification

The theoretical reinforcement that motivated this empirical study comes from the works by Stark and Fan (2011) and Fan and Stark (2007a), who hypothesize that increase in the prospect of skilled migration abroad, where returns to skills are higher than at home, induces more human capital investments in migrant-sending developing countries. Also, that prospect of skilled migration creates educated unemployment when the supply of skilled individuals exceeds demand due to sticky wages and also when skilled job-seekers repeatedly engage in foreign job-search instead of taking jobs in the home country.

This paper uses dynamic model and two-step System Generalised Method Moments (SGMM) estimator on panel data from 96 developing countries to measure the effect of skilled migration on human capital formation. It also use the same techniques to measure the effect of skilled migration on educated unemployment. These techniques can capture persistence in the dependent variables, resolve problem of omitted variables, measurement errors, endogeneity and country-specific heterogeneity. Moreover, Sargan test, which test validity of the instruments, and Arellano-Bond (AR1 and AR2) tests for serial correlation are used to examine the consistency of the SGMM estimator. The SGMM, unlike panel cointegration test, does not require large time series dimension to produce consistent parameter estimates. It is apt, as in our case, for sample data that is large in cross-sectional dimension but shorter in time series dimension. However, Perron (1991) confirmed that panel cointegration test has low power when the time series is short.

The human capital equation (Eqn. 1) is estimated using lagged human capital (denoted by lnh_{it-1}) and explanatory variables such as log of skilled migration rates (denoted by $lnsmr_{it}$), log of public expenditure in education at origin (denoted by $lnexp_{it}$), log of gross domestic product (GDP) (denoted by $lngdp_{it}$), log of population size in migrants' source countries (denoted by $lnpop_{it}$), and unobserved country-specific fixed effect (denoted by μ_i). ε_{it} is the error term, i is the number of cross-sections and t is the number of time series. The dynamic panel data model can be specified as follows:

$$lnh_{it} = \alpha lnh_{it-1} + \beta_1 lnsmr_{it} + \beta_2 lnexp_{it} + \beta_3 lngdp_{it} + \beta_4 lnpop_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

In Eqn. (1), human capital formation refers to general professional and technical skills acquired by individuals through investment in tertiary education in the migrants' source countries. Skilled migration rate 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). As proposed by Beine et al. (2001) and Fan and Stark (2007b), migration prospects induce investment in education in migrant-sending countries. Skilled migration rate is, then, expected to be positively related to human capital formation. Also skilled migration is usually based on individuals' skill level, which is partly determined by expenditure on education in the migrants' source countries as that determines migrants' skills prior to migration. Therefore, public expenditure in education is expected to be positively related with human capital formation.

However, investment in human capital is argued to be positively associated with higher level of income (Gray 2007). Hence, public expenditure on education is expected to be positively related to human capital formation in the migrant-sending country. Moreover, Rosenzweig (1988) argued that population growth is an important determinant of investment in human capital. Therefore, population size in the migrant country is expected to impact positively on human capital by raising level of enrollment in tertiary schools. The unobserved country-specific fixed effect in Eqn. (1) is assumed to capture among others cost of migration, which differ across migrant-sending countries due to existing laws and migration policies and regulations.

The unemployment equation (Eqn. 2) is estimated using log of lagged unemployment rate (denoted by $ln\mu n_{it-1}$), log of skilled migration rate (denoted by $lnsmr_{it}$), log of gross domestic product (GDP) (denoted by $lngdp_{it}$), log of foreign direct investment (denoted by $lnfdi_{it}$), log of population growth rate in migrants' source countries (denoted by $lnpop_{it}$), log of Inflation rate (donated by $lnifr_{it}$), unobserved country-specific fixed effect (denoted by μ_i), and ε_{it} is the usual error term. The dynamic panel data model is as described below:

$$ln\mu n_{it} = \alpha ln\mu n_{it-1} + \beta_1 lnsmr_{it} + \beta_2 lngdp_{it} + \beta_3 lnfdi_{it} + \beta_4 lnpop_{it} + \beta_5 lnifr_{it} + \mu_i + \varepsilon_{it} \quad (2)$$

In Eqn. (2) unemployment rate as percentage of labor force includes

people who are unemployed but actively searching for jobs and those who are unemployed but not looking for jobs expressed as a percentage of the labor force in migrant-sending developing countries. As theoretically argued by Fan and Stark (2007b), the possibility of skilled migration induces voluntary educated unemployment due to increase in would-be migrants' reservation wages and their decision to persistently seek for jobs abroad and involuntary educated unemployment due to sticky wages in migrants' source countries (Stark and Fan 2011). The unemployment rate is, hence, expected to be positively related to skilled migration possibilities.

Also, according to Okun's law there is an inverse relationship between output growth and unemployment. This means that increase in gross domestic product will be negatively related to skilled unemployment. Likewise, Grinols (1991) argued that in an economy with unemployment increased foreign capital can bring welfare gains. Therefore, foreign direct investment is likely to have negative impact on the level of educated unemployment in the migrant-sending country. Conversely rising population results in an increase in labour force which leads a substantial part of the population to unemployment. Therefore, population is expected to be positively related to educated unemployment in migrants' countries of origin.

Finally, based on the Phillips curve hypothesis, there is a trade-off between unemployment and inflation. Therefore, the coefficient of inflation rate is expected to be negative if the Phillips curve holds. This implies that an increase in inflation causes unemployment to decrease and vice versa. Conversely, if the Phillips curve does not hold, an increase in inflation leads to higher unemployment level, which result in stagflation.

3.1 Data Source

This paper utilized 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 used in Docquier and Marfouk (2006) data set on international migration by skills level. The data is only available for the period of 1975 – 2000 with a five year frequency. Data on human capital: average year of tertiary schooling is from Barro and Lee (2013) data base. Finally data on population size, population growth rate, gross domestic product (GDP) in current US dollars, foreign direct investment, inflation rate, and the unemployment rate were all collected

from World Development Indicators (WDI)[3]. Data on public expenditure on education as a percentage of GNI, is obtained from UNESCO institute for statistics online data base and United Nation database[4]. All the data are transformed into natural logarithm before the SGMM estimations are carried out in order to normalise their scale. Table 1 and Table 2, present descriptive statistics of all the series in the dataset that are used to estimate the effects of skilled migration on human capital formation and educated unemployment respectively. The series show considerable variations between and within the countries included in our sample.

Table 1. Summary of Descriptive Statistics (Observations 479)

Variables	Unit of measurement	Mean	Overall Std. Dev	Between Std. Dev	Within Std. Dev	Min	Max
Human Capital Level	%	5.3390	2.3452	2.2259	0.7793	0.615	11.178
Skilled migration rate	%	19.0979	21.2092	20.7718	4.6527	0	91
GDP	Current US$	3.75e+10	1.02e+11	8.69e+10	5.18e+10	4.9577	1.20e+12
Education expenditure	%	61.4059	9.9184	9.4495	3.1446	30.4732	79.0512
Population Size	Millions	3.75e+07	1.45e+08	1.44e+08	1.67e+07	92999	1.26e+09

Source: Authors' estimation

Table 2. Summary of Descriptive Statistics (Observations 322)

Variables	Unit of measurement	Mean	Overall Std. Dev	Between Std. Dev	Within Std. Dev	Min	Max
Educated unemployment	%	9.7680	7.6530	7.4800	3.3620	0.2	59.5
Skilled migration rate	%	0.1899	0.2291	0.2272	0.0298	0.0043	0.9104
GDP	Current US$	5.62e+10	1.25e+11	1.00e+11	6.60e+10	2009	1.20e+12
Foreign direct investment	%	1.45e+09	6.23e+09	3.29e09	5.24e+09	-4.55e+09	8.02e+10
Population growth rate	%	1.8566	1.0478	0.9726	0.5230	-2.8510	5.0010
Inflation rate	%	102.2681	801.5801	332.761	717.1914	-3.8462	11749.64

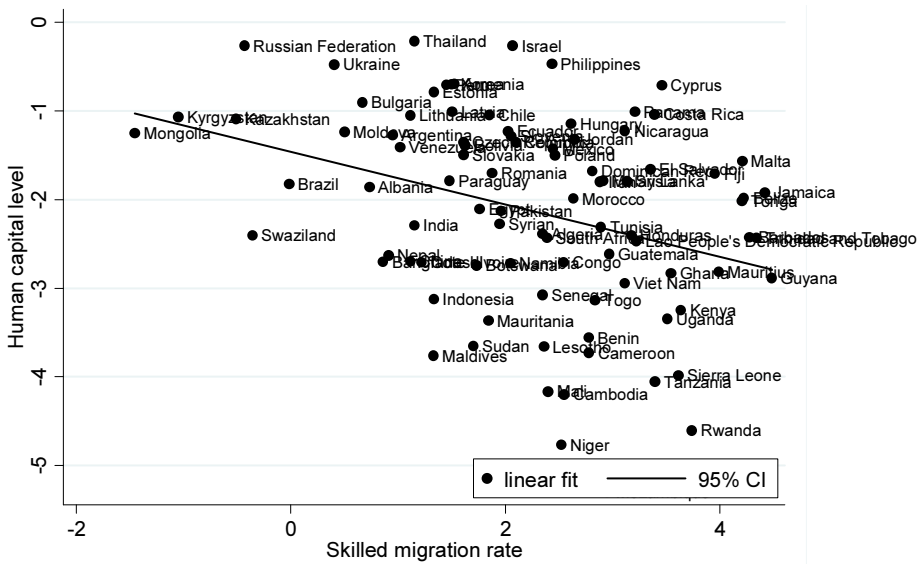
Source: Authors' estimation

[3] Like much empirical research, our study suffers from data limitations. We were unable to obtain data for skilled unemployment in developing countries.

[4] Retrieved August 7, 2010 (http://unstats.un.org/unsd/databases.htm accessed) Retrieved October 8, 2010 (http://data.worldbank.org/data-catalog/world-development-indicators)

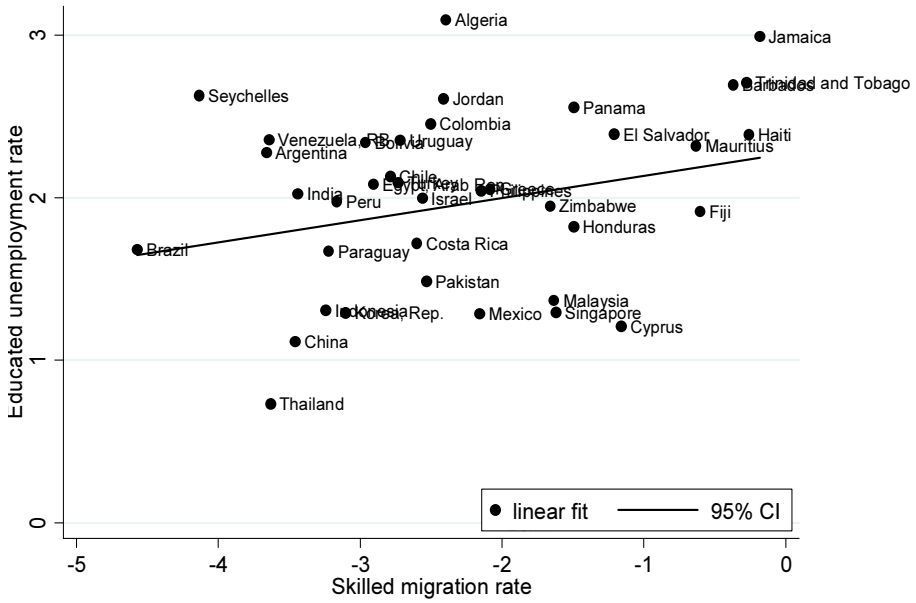
As a preliminary analysis of how skilled migration affects human capital formation and educated unemployment in migrants' source developing countries, we took the average of these series for each country included in our dataset and present their graphical plots. Figure 1, depicts human capital level against skilled migration rate in migrants' source developing countries. It can be seen that human capital level declines with an increase in skilled migration rate. This graphical analysis corroborates the hypothesis that skilled migration may deflate the level of human capital generated in migrant-sending developing countries. In Figure 2, a similar graphical plot of skilled migration rate and educated unemployment rate is presented. The figure shows that unemployment of educated individuals rises with an increase in the skilled migration rate in migrants' source developing countries[5]. This finding, interestingly lends support to the proposition that prospect of skilled migration abroad, where returns to schooling is relatively higher than at home, induces unemployment of skilled individuals. Although, these analyses are only graphical, they provide some sense of patterns common in the dataset.

Figure 1. Skilled migration rate and human capital level (1980-2000)



[5] In Figure 2, only 49 countries are included in the graphical plot as we were unable to plot the graph using average data from the complete sample.

Figure 2. Skilled migration rate and educated unemployment rate (1980-2000)



Source: Authors' estimation

4 Empirical Results

Table 3, presents the results of the effect of skilled migration rate on human capital formation using two-step System Generalised Method of Moments (SGMM) estimator. Column 1 to column 4 show that the coefficient of lagged dependent variable is statistically significant at 1% level. This implies that past level of human capital is a strong predictor of its current level across all the model specifications. Also, the coefficient of skilled migration rate is positively significant in all the model specifications. This means that the possibility of skilled migration abroad, where the return to schooling is higher, influences educational investment in migrants' source developing countries. In column 1, all the independent variables are treated as exogenous. However, our results remain virtually consistent even after endogeneising skilled migration rate and education expenditure in column

2 and also endogeneising education expenditure and skilled migration in column 3 and column 4 respectively.

Other control variables used in the estimation are significant at conventional level across the model specifications. Increase in gross domestic product, expenditure on education and population size impact positively on human capital formation in the migrant-sending countries. The Arellano-Bond test for serial correlation shows that our model specifications do not suffer from first (AR1) and second (AR2) order serial-correlation. Similarly, the result of Sargan test shows that the instruments used are not over identified. Thus inferences can be made from our results. Our results are in line with Beine et al. (2011) who produced evidence of human capital investments generated by the impact of the skilled migration prospect from panel dataset while controlling for possible endogeneity.

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 migration may impinge positively on the long-run level of human capital stock and higher output growth.

Table 3. Results of System GMM Estimations. Dependent Variable: Human Capital Level

Model	Column1	Column2	Column3	Column4
h_{it-1}	0.7566***	0.7204***	0.7182***	0.7748***
	(37.83)	(51.48)	(42.69)	(49.43)
Skilled migration rate	0.0155**	0.0336***	0.0235***	0.0329***
	(2.10)	(6.17)	(4.34)	(5.43)
Education expenditure	-0.0029	0.6636***	0.0775***	-0.0118
	(-0.23)	(5.99)	(4.98)	(-1.49)
GDP	0.0399***	0.0638***	0.0597***	0.0553***
	(4.18)	(10.06)	(7.90)	(6.54)
Population size	0.0098***	-0.0039	-0.0018	0.0007
	(2.61)	(-1.54)	(-0.56)	(0.22)
Sargan test [*p*-value]	18.0274	43.3542	33.1464	31.5162
	[0.1565]	[0.2909]	[0.1579]	[0.2096]
AR(1) [*p*-value]	[0.2532]	[0.2427]	[0.2408]	[0.2510]
AR(2) [*p*-value]	[0.5767]	[0.6668]	[0.6910]	[0.6151]
Cross-sectional obs.	391	391	391	391
No. of instruments	18	44	31	31

Notes: values in parenthesis are z-statistics. ***, **, denotes significance at 1 and 5 % levels respectively.

Source: Authors' estimation

With regard to the impact of the skilled migration on educated unemployment in migrants' source countries, in Table 4 column 1 to 4, the coefficient of lagged skilled migration is statistically significant at 1% level. This shows evidence of persistence in educated unemployment in the migrant-sending countries. Contrary to theoretical prediction, the skilled migration rate is negatively significant at conventional level across all the model specifications. This shows that skilled unemployment responds negatively to increase in the probability of skilled migration in migrant-sending countries. In other words, unemployment of skilled individuals in developing countries falls when job-seekers obtain employment abroad. This finding confirms that unemployment of educated workers, which partly fuel international migration from developing countries (Ngoma and Ismail 2013a), declines with actual migration of skilled labour.

In column 1, the estimation was carried out while assuming the skilled migration rate and inflation are endogenous due to possible reversed causality. In column 2, we applied year fixed effects to control for unobserved effects that change over time. This is essential due to changes in migration policies in both home country and abroad. However, the result shows that time effects are insignificant. In column 3, we included a quadratic form of the skilled migration rate to test for any nonlinear effects as possibility of migration intensified in the migrant countries of origin. The quadratic form of the skilled migration rate was endogeneised in column 4, to control for any correlation. Overall, our results remained consistent using different model specifications. The coefficients of gross domestic product, which measures the level of economic activity as well as income is negatively significant at 1% level. This shows that improved level of income and economic activities negate unemployment in the migrant countries of origin. Also, population growth increases unemployment. As expected, the coefficient of inflation rate is negative and statistically significant at conventional level. This suggests that an increase in the rate of inflation reduces unemployment in the migrant-sending countries. Our results are robust and consistent as confirmed by the probability values from Sargan test, which support the overall validity of the instruments used in the estimations. Similarly, probability values of second-order serial correlation test (AR2) shows that the error terms are not serially correlated in all the estimations.

Table 4. Result of System GMM Estimations. Dependent Variable: Educated Unemployment

Model	Column1	Column2	Column3	Column4
un_{it-1}	0.4477*** (9.22)	0.3498*** (7.25)	0.3831*** (6.97)	0.4520*** (13.74)
Skilled migration rate	-0.1394*** (-2.55)	-0.1847*** (-3.01)	-0.6369** (-2.30)	-0.4539*** (-3.70)
GDP	-0.0243*** (-3.05)	-0.0193** (-2.21)	-0.0213** (-2.30)	-0.0193*** (-3.15)
Foreign direct investment	-0.0124 (-0.60)	0.0101 (0.38)	-0.0223 (-1.02)	-0.0199 (-1.14)
Population growth rate	0.1126*** (3.70)	0.1001*** (2.84)	0.1061*** (3.11)	0.0993*** (4.29)
Inflation rate	-0.0583** (-2.48)	-0.0879*** (-3.14)	-0.0664*** (-2.60)	-0.0852*** (-6.47)
Year fixed effect		-0.0487 (-1.41)		
Skilled migration rate squared			-0.0830* (-1.88)	-0.0564*** (-3.10)
Sargan test [*p*-value]	34.9116 [0.3313]	35.2175 [0.3184]	33.1160 [0.4125]	37.6043 [0.5786]
AR(1) [*p*-value]	[0.0150]	[0.0251]	[0.0194]	[0.0210]
AR(2) [*p*-value]	[0.2451]	[0.1936]	[0.2438]	[0.2786]
Cross-sectional obs.	227	227	227	227
No. of instruments	38	39	39	47

Notes: values in parenthesis are z-statistics. ***, **, denotes significance at 1 and 5 % levels respectively.
Source: Authors' estimation

5 Conclusion

In this paper, we examine the effects of skilled migration rate on human capital formation and educated unemployment in migrant-sending developing countries using dynamic models and two-step SGMM estimation technique on panel dataset over the period of 1980 – 2000 with a five year frequency. First, we find that higher probability of skilled migration increases incentives to invest in human capital formation in the migrant-sending developing countries. Second, contrary to the notion that a higher prospect of skilled migration stimulates educated unemployment, our result shows that unemployment of educated workers, in migrant-sending countries, actually declines with migration possibilities, which allows the

unemployed to seek employment abroad. Our findings, lend no support to the concerns expressed by policy-makers in developing countries that skilled migration deflates human capital accumulated in migrant-source developing countries. From the policy standpoint, the paper shows that policymakers in migrant-sending countries can use the potentials of international migration to boost their human capital level and reduce unemployment of skilled workers. However, skilled migration abroad occurs due to inconsistency between accumulated human capital and opportunity to get a rewarding job in migrants' countries of origin. This implies that appropriately established policies that enhance welfare of workers would be required to restrain the outflow of skilled workers in these countries when the skilled migration abroad rises.

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