SKILLED MIGRATION AND HEALTH OUTCOMES IN DEVELOPING COUNTRIES

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Abstract - Many studies have found that health outcomes decline when health professionals leave the country, but do such results remain consistent in gender- and income-disaggregated skilled migration? The present study revisits this topic but allows for associations of skilled migration with mortality and life expectancy to differ between male and female, and between low- and high-income countries. Using a panel of 133 developing countries as source and 20 OECD countries as destination from 1980 to 2010 allowing the coefficient on emigration across different education levels to differ, this study finds the negative effect of high-skilled emigration on health outcomes. Such effect is more pronounced for high-skilled female migration than those for male and for low-income countries than for middle-and high-income countries. Results also show that such adverse effect is larger for African countries than non-African ones. However, the low-skilled migration appears to be insignificant to affect health outcomes in developing countries. Thus, skilled migration is detrimental to longevity in developing countries but unskilled migration is not.

JEL classification - $F_{22,}$ I_{15}
Keywords - skilled migration, mortality, life expectancy, health outcomes

I. INTRODUCTION

International migration has been taking an accelerated pace in the recent years across the world. During the 1990's, the number of migrants increased on average by 2 million whereas this annual flow more than doubled to 4.6 million between 2000 and 2010. Emigration rates from low income to OECD countries are even higher for those individuals with a tertiary education. In fact, for African countries like Kenya, Ethiopia and Trinidad and Tobago, more highly educated individuals were living outside these countries than within them. The migration of skilled individuals has attracted the attention of policy makers and economists. The exodus of skilled professionals is believed to impact several sectors such as education, income, poverty, politics and economic development of both sending and receiving countries. The current study investigates the effect of such flights on health outcomes in sending countries.
Previous empirical studies have mainly concentrated on the effects of migration of health professionals such as nurses and doctors on health outcomes of the source country. However, as my knowledge goes, no research has examined on how aggregate and gender-disaggregated skilled migration affect health outcomes of the migrant sending countries. Emigration of skilled individuals may have positive or negative effects on health outcomes. The negative effects arise mainly from four sources according to Brock and Blake (2014). They stem from the loss of human capital, loss of government revenue, loss of societal positive spillover of knowledge, and loss of building of institutions. Investment in education and health of the developing country will translate into a loss when skilled people leave the country. The direct benefits go to the migrant recipient country that has not spent for educating those migrants. The intellectuals of any country are one of the most valuable assets for all-round development of the country including health sector. The departure of such scarce human resources may bring an irreparable loss in the country. Skilled migration leads to the direct and indirect losses to the health outcomes in the country. Direct loss incurs from the emigration of skilled health professionals including nurses and physicians. The already suffered healthcare systems from the shortage of health professionals further exacerbated from the departure of such individuals. Flight of health workers causes to run the health centers under skeleton workers. On the indirect effect, migration of skilled professionals may hurt the education sector depleting qualified educators in the county, which in turn adversely affect the health sectors. Educated people may generate knowledge spillovers by increasing what others can learn from them as in Niehaus (2012). So, an indirect adverse effect also arises from the loss of positive spillover due to the flight of skilled persons. Another indirect effect comes from reducing government revenue with the exodus of skilled people. Highly skilled citizens of a country contribute larger amount of revenue to the country than low-skilled ones. A decrease in government revenue with the departure of skilled people diminishes the health expenditure. Developing countries have also invested in the education and training of young health professionals. This translates into a loss of considerable resources when these people migrate, with the direct benefit accruing to the recipient states who have not forked out the cost of educating them (Dodani & LaPorte, 2005).
On the benefit side, probably the most significant single gain from migration may be remittance inflows into the country (Ratha, 2005). However, inflows of

remittances may retard economic growth (Uprety, 2017; Bryan, 2004). Migrants can also aid their country in sharing medical technology that may be difficult to learn otherwise in isolated areas. Physicians and nurses from host countries can spend a sabbatical year back to their home countries, thereby sharing knowledge with those health workers left in the country. Other benefits include improved training, and long term professional networks. The adverse effects, however, are likely to predominate. Thus, the questions arise: Does migration of skilled individuals cause increase or decrease health outcomes such as life expectancy (LE) and adult mortality rate (AMR) in migrant sending countries? Can skilled migration explain cross-country differences in these levels of health outcomes? If an increase in skilled migration leads to an impact on these health outcomes, does gender-disaggregated skilled migration have differential impact on them? These questions are of primary importance, in particular in current debates on the costs and benefits of migration of people from developing to developed countries. For example, whether migration should or should not have a positive impact on health of those left behind, will have an obvious impact on the public support for or against formulating and implementing more universal immigration policies.

Thus, the main purpose of this study is to empirically examine and compare the impact of migration across education levels of men and women; low- and high-income countries; and African and non-African countries on LE and AMR. This article hopes that this research will be helpful in identifying factors that influence LE and AMR across countries and that the findings will help policymakers and researchers determine how to optimally deal the migration issues of their citizen.

Using a panel of 133 developing as source countries and 20 OECD as destination countries, and seven five-year windows from 1980 to 2010, this paper finds that LE and AMR are, indeed, adversely associated with subsequent migration to OECD countries but mainly for higher educated individuals. To put the findings in numerical form, an increase in highly skilled emigration by 257 persons may be expected to increase AMR by 1 person and to decrease LE by 0.34 months. The detrimental effects of high-skilled migration are more significant for female emigrants than those for male; for African emigrants than for non-African ones; and for low-income countries than for middle- and high-income countries. However, the low-skilled migration appears to be insignificant on health outcomes. Thus, skilled migration from developing countries leads to reduce longevity in the course countries.

A weakness with the data is the potential for emigration to be unreported although this is likely to be less of a problem with highly educated emigrants since they are less likely to emigrate into an OECD country illegally. However, there is likely to be unreported of the low-skilled emigrants since majority of them emigrate to OECD countries undocumented as in Gusmano (2012).

The paper is structured as follows. Section 2 outlays the data. Section 3 describes the empirical methodology. Section 4 presents the empirical results from panel regressions. Section 5 concludes by summarizing the results and then suggesting avenues for future research.

II. Data and Methodology

2.1. Data and Variables

This paper exploits two databases: Institute for Employment Research (IAB) and World Development Indicator (WDI) of World Bank. The per capita GDP growth, life expectancy at birth, adult mortality rate, urban population ratio, fertility rate, number of hospital beds and vaccination against measles are drawn from the World Bank's World Development Indicators (2016) dataset. Brain drain data is leaping every five years (1980, 1985, 1990 and so on). The explanatory variables are measured in logarithm and are averaged over five years to match the frequency with brain drain data. Such averaging also helps to control business cycle and to smooth the high frequency data aberrations. Data on migration at three skill levels (high, medium and low) of developing countries are obtained from IAB. The IAB brain-drain dataset contains data on the total number of foreign-born individuals aged 25 years and older, living in each of the 20 considered OECD destination countries, by year, gender, country of origin and educational level. Educational levels are distinguished in low, medium and high skilled. High-skilled migrants are those who completed at least 20 years of education. Migrants with 16 years of education are considered as medium-skilled. Migrants with high school education including lower-secondary, primary education and those who did not go to school are low-skilled.

The variables investigated in this study, along with their definitions and sources, are shown in Table 2. A list of the migrant source and destination countries is shown in Table 1. Variables that are the most significant effects on life expectancy and adult mortality rate in previous studies are selected for study. The determinants of these health outcomes are grouped into 3 main categories: demographic indicators, socioeconomic status, and health factors. The demographic indicators include total fertility rate (TFR) and urban population ratio (URB); the socioeconomic variables capture primary school enrollment (EDU) and GDP per capita growth (GROWTH); and the health factors contain vaccination against measles and number of hospital beds (HOSPITAL).

High fertility rate may have a negative effect on life expectancy, as high-fertility families have to share the limited resources to a large number of children and each gets less of it. Children of such families also have a short period between births leading to decease breast-feeding and endanger the nutritional status of infants. Evolutionary theories of aging predict a trade-off between fertility and lifespan, where increased lifespan comes at the cost of reduced fertility ((Mondal & Shitan, 2013 and Kuningas, 2011). The expectation then is that total fertility rates negatively associated with life expectancy and positively with adult mortality rate. Urban population ratio is expected to be positively associated with life expectancy and that negatively with adult mortality rate. Urban residents get an easier access to hospitals and doctors than the rural residents. They also get better opportunities to education and other health related facilities than rural people. Thus, urban population ratio is then expected positively associated with life expectancy. For example, one reason is that the opportunity cost of going to a doctor or seeking medical treatment is relatively low in urban areas. These opportunity costs could differ between urban and rural areas, especially if one from a rural area needs to travel long distances to receive medical care or see a specialist (Sameem and Sylwester, 2017).

If there are too few hospitals beds to treat the general population, most individuals would likely not receive ordinary medical care (Deshpande, Kumar & Ramaswami, 2014). Thus, it is hypothesized that average life expectancy will increase as the number of hospital beds per 1000 people increases. There is an inverse relationship between hospital beds and adult mortality rate. The vaccination against measles provides lifelong immunity, in most cases to diphtheria and pertussis. Studies find a positive relationship between life expectancy and vaccinations (Husain, 2012).

Education is another influential factor in life expectancy and has direct and indirect effects on health outcomes. Higher education levels are associated with more timely receipt of healthcare and greater health awareness (Mondal & Shitan, 2013). People with more education are likely to be better aware of the need to obtain adequate prenatal care and can be encouraged to optimize the use of maternal health services, thereby avoiding childbirth-related complications such as low birth weight. Individuals with more education typically earn higher real wages, which means that average household income is higher, enabling people to increase the quality and quantity of the healthcare services they purchase. Moreover, people with more education tend to better understand information on proper nutrition, hygiene, healthcare services, and common illness prevention measures. Higher income also implies better access to housing, education, health services and other items which tend to lead to improved health, lower rates of mortality and higher life expectancy (Mondal & Shitan, 2013). It is not surprising; therefore, that GDP per capita growth has been a pretty good predictor of health outcomes. This variable is also used to control for business cycle.

All statistical analysis is done using STATA software (version 14.0; STATA Corporation, College Station, TX, USA).

2.2. Empirical Specification

To analyze the impact of skilled migration upon health outcomes across 133 developing countries, the empirical model relates the natural log of migration for the j^{th} skill level of migration in county i at time $t-1$ $(MIG^{j}{}_{it-1})$ to the natural log of life expectancy $(LIFE_{it})$ and adult mortality rate (AMR_{it}). The specifications include several country-year demographic control variables along with time-invariant country fixed effects $(\alpha_i \; and \; \mu_i)$, country-invariant time fixed effects $(\eta_t \; and \; \delta_t)$ and an error term $(\varepsilon_{it} \; and \; u_{it})$. Use of natural logs allows one to interpret coefficient estimates as elasticities. There are two specifications: one relates skilled migration to life expectancy and the other relates skilled migration to adult mortality rate. The regression specifications are then:

$$\begin{aligned} LIFE_{it} &= \beta_1 MIG^{j}{}_{it-1} + \beta_2 EDU_{it-1} + \beta_3 GROWTH_{it-1} + \beta_4 VACCIN_{it-1} \\ &\quad + \beta_5 HOSPITAL_{it-1} + \beta_6 TFR_{it-1} + \beta_7 URBAN_{it-1} + \alpha_i + \eta_t + \varepsilon_{it} \end{aligned} \quad (1)$$

$$\begin{aligned} AMR_{it} &= \gamma_1 MIG^{j}{}_{it-1} + \gamma_2 EDU_{it-1} + \gamma_3 GROWTH_{it-1} + \gamma_4 VACCIN_{it-1} \\ &\quad + \gamma_5 HOSPITAL_{it-1} + \gamma_6 TFR_{it-1} + \gamma_7 URBAN_{it-1} + \mu_i + \delta_t + u_{it} \end{aligned} \quad (2)$$

Where,

$\alpha_i \; and \; \mu_i$ = 1, 2, 3, …,133 are the unknown intercepts for each country (133 country-specific intercepts). LIFE stands for life expectancy, and AMR denotes adult mortality rate. These are the dependent variables. The subscripts i = country and t = year. $\alpha i \; and \; \mu_i$ represent the unobserved time invariant country-specific effects. These varying intercepts essentially capture all effects which are specific to a particular country and do not vary over time. For instances, the sample countries includes emerging giant economies such as India, Indonesia, Turkey and China which are very different than other tiny economies such as Maldives, St. Lucia and Suriname. Similarly, there are landlocked countries and the countries with the access to the sea. Thus, $\alpha i \; and \; \mu_i$ capture such time invariant country specific effects as country size, access to sea, location and landlocked. Time fixed effects are captured by $\eta_t \; and \; \delta_t$ for variations across years that are consistent across countries such as changes in government policies at the national level. The reason for using fixed effect (FE) model is to control each of the 133 countries' own individual characteristics that may influence the predictor variables, skilled migration. Heterogeneities across sample countries are controlled by αi and μ_i. One has to control the unobserved variable Z_i that varies across states but not over time; otherwise they impact the predictor (migration) or outcome variables (life expectancy, for example). FE removes the effect of those time-invariant characteristics, so that the result can assess the net effect of the predictors on the outcome variables.

The reason of using lagged in the right hand side variables is to address causality concerns. There is an endogeneity issue from a potential causality of mortality/life expectancy to right hand side variables. For instance, mortality influences GDP per capita growth. Health should somehow matter for growth. First, individuals with higher life expectancy, for instance, are likely to save more, and savings in turn feed back into capital accumulation and therefore into GDP growth as in Zhang and Lee (2003). Second, individuals with higher life expectancy are likely to invest more in education, which in turn should be growth-enhancing. In an environment marked by low child mortality, parents are likely to choose a low level of fertility, which limits the growth in total population and supports per capita GDP growth. Finally, and more directly, healthier individuals are typically more productive, better at adapting to new technologies and more generally to changing situations. Ideally, the study could employ an instrument that would be correlated with the emigration but not otherwise be associated with mortality and life expectancy. Such an instrument would not only have to be available for the sample of 133 countries but also must vary over time since otherwise it would be associated with the country fixed effects. Since natural disaster such as earth quake, for instance, could impact both the desire to emigrate and mortality, finding an appropriate instrument has been difficult. Instead, the paper uses the lagged of explanatory variables to mitigate the endogeneity problem. For example, mortality of 1990 should not impact the migrant stock of 1985.

III. RESULTS

Tables 2 and 4 present regression results for the effects of migration across different education levels on life expectancy and adult mortality rate as dependent variables respectively. Column 1 collects the results for high-skilled migration, while column 2 shows the results for the medium-skilled, column 3 combines the two, column 4 depicts the results of low-skilled migration and lastly, column 5 presents total migration. The overall coefficients of high-skilled migration have adverse effects on health outcomes as are shown in column (1) in both the Tables. Tables 2 and 4 present the regression results of equations (1) and (2) respectively. The difference between these two specifications is only in dependent variable: Table 2 considers life expectancy as the dependent variable while Table 4 takes adult mortality rate as the dependent variable. All the right hand side variables are the same in both estimations.

In Table 2, all coefficients have the expected signs in terms of the direction of the relation between the independent and dependent variables. The explained variation, or coefficient of determination R^2, in all equations is 61% or more, and the high value of F tests, 38, decisively rejects the hypothesis of joint non-significance of the independent variables. The independent variables varied in both size (elasticity) and level of significance or p-value. Urban population ratio, GDP per capita growth, number of hospital beds, primary education enrollment and vaccination against measles significantly increase life expectancy at birth. The departure of skilled individuals from the country depresses the life expectancy. The effect of emigration of skilled people for life expectancy is greater as skill level increases because qualified medical personnel are able to address a larger proportion of conditions that put people at immediate risk of death. Thus, emigration of high-skilled people statistically significant on life expectancy at 1 % level, medium skilled is insignificant, and medium and high skilled combined is significant at 5 % level to reduce life expectancy.

Table 4 replaces the response variable life expectancy of Table 2 by adult mortality rate keeping all the explanatory variables same on the right side. Results are robust in that a positive association arises for high educated migrants with adult mortality rate but not for those of low education levels.

In addition to examining aggregate effect of emigration on health outcomes in a pooled regression, the study proceeds to investigate the effect of male and female emigration; low-income and middle- and high-income combined emigration; and African and non-African emigration on life expectancy and adult mortality rate for robustness check. Tables 3 and 5 present such results. These Tables focus solely to test whether gender and income disaggregated migration produce differentiated impacts on life expectancy and adult mortality rate. The results are essentially identical to those in male and female migration, but the coefficient estimates of female migration are generally more pronounced and significant than male migration. Almost as obvious is that, while both migration of skilled men and women increase mortality, migration of skilled women is more detrimental to the health outcomes. This is because high-skilled migrants consist of a significant number of healthcare workforce such as nurses, dentists, pharmacists and physicians. Nurses are increasingly part of the migratory stream. The migration of nurses from developing to developed countries is predominant (Li & Li, 2014). The number of men entering the nursing profession remains low. According to American Community Survey Highlight Report (2013), there were 3.5 million employed nurses in 2011; about 3.2 million of them were female and 0.33 million were male. Thus, skilled emigrants from developing countries arguably constitute a large number of female nurses. Nursing is the profession worst affected by the skilled emigration as in Chikanda (2006).

As in Kofman and Raghuram (2009), most of the developed countries including UK, USA, Canada and Australia are depending on imported female nurses from countries in the global South and other developing countries to cut costs to meet the shortages of nurses. These countries reduced investment doctors, nurses and teacher training since the late 1990s leading to significant shortages in the education, health and social work sectors. Over 90% of migrants in the nursing sector are women, and in many countries, this constitutes the largest single health profession

Skilled migrations from low-income countries are more detrimental than those from middle- and high-income countries. The effect of skilled migration on health outcomes is more pronounced for the poor countries than middle- and high-income countries. The brain drain effect on mortality is larger-the poorer is the source country. Why might this be the case? The skilled emigration from poorer countries consists more healthcare professional than that from the richer countries. Poor countries are already struggling the healthcare systems because of the acute shortage of healthcare professional individuals, departure of such persons leave the countries even more desperate state. Poor countries have more imperfect private labor markets, more lack of public funds, and more political instability and interferences, which lead to more emigration. Another major reason for declining health services in poor countries has been the structural adjustment programs imposed by international institutions and rich countries (Shah, 2006). According to Lapeyre (2004) such programs sharply reduce demands, deindustrialize and deformalize the economy reinforcing the problems and harming the poorest countries. The economic performance and social indicators of the poor countries fall behind over the decades rather than improving the situations because of these structural programs, which then contribute to the brain drain from poor countries.

Economists sometimes face unintended results from the policy formulation and implementation. While the purpose of the structural adjustment programs was to enhance efficiency of the poor countries in the global market, these policies manifested into increase poverty and the subsequent decline of the healthcare delivery in these countries (Brunelli, 2007).

CONCLUSION AND POLICY RECOMMENDATION

Using a panel of 133 developing countries from 1980 to 2010, this study provides a nuanced story to the negative association between high-skilled migration and health outcomes in developing countries. The results show that high-skilled emigration reduces health outcomes and that the impact is more pronounced in the poor countries, suggesting that skilled emigration is more deleterious in the poorest countries. Women skilled emigration is found to have more harmful impact on health outcomes than that of men. The impact of skilled emigration is non-linear, though, suggesting that skilled emigration is likely to be more detrimental in the poorest countries.

These findings have several implications. The results suggest a new interpretation of the existing evidence on the role of skilled migration on health outcomes for developing countries. The differential brain drain effects on health outcomes in low- and high-income countries force policy makers of developed countries to rethink for the implementation of a single selective immigration policy to all countries. Further analyses are required to determine the threshold of income below which brain drain has different effects on mortality. Furthermore, this analysis adds one more facet to the old issues of brain drain literature: brain drain and health outcomes in the developing countries. If sound health sector is a prerequisite for economic growth and sustainable development, then it requires a call to adopt and implement an integrated policy that will retain skilled professionals, particularly female health professionals, in the country for the benefit of the main users of public health systems. Finally, if high-skilled immigration is crucial to the developed countries including the United States, it is even more crucial to the developing countries given that skilled human resource is a must for economic development. This requires a policy coordination of a fundamental problem in international migration to determine how to produce an acceptable degree of harmony between migrant sending and receiving countries.

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Panel A: Migrant Sending Countries			
Afghanistan	Dominican Rep	Libya	Serbia & Montenegro
Albania	Ecuador	Macedonia	Seychelles
Algeria	Egypt	Madagascar	Sierra Leone
Angola	El Salvador	Malawi	Solomon Islands
Argentina	Eritrea	Malaysia	Somalia
Armenia	Ethiopia	Maldives	South Africa
Azerbaijan	Fiji	Mali	Sri Lanka
Bangladesh	Gabon	Marshall Islands	St. Kitts & Nevis
Belarus	Georgia	Mauritania	St. Lucia
Belize	Ghana	Mauritius	St. Vincent & Grenadines
Benin	Grenada	Mexico	Sudan
Bhutan	Guatemala	Micronesia, Fed States	Suriname
Bolivia	Guinea	Moldova	Swaziland
Bosnia & Herzegovina	Guinea-Bissau	Mongolia	Syria
Botswana	Guyana	Morocco	Tajikistan
Brazil	Haiti	Mozambique	Tanzania
Bulgaria	Honduras	Namibia	Thailand
Burkina Faso	Hungary	Nepal	Timor Leste
Cambodia	India	Nicaragua	Togo
Cameroon	Indonesia	Niger	Tonga
Cape Verde	Iran	Nigeria	Trinidad & Tobago
Central African Rep	Iraq	Oman	Tunisia
Chad	Jamaica	Pakistan	Turkey
China	Jordan	Palau	Turkmenistan
Colombia	Kazakhstan	Panama	Uganda
Comoros	Kenya	Papua New Guinea	Ukraine
Congo, Dem. Rep.	Kiribati	Paraguay	Uruguay
Congo, Rep.	Korea	Philippines	Uzbekistan
Costa Rica	Kyrgyzstan	Romania	Vanuatu
Cote d'Ivoire	Laos	Rwanda	Venezuela

Cuba	Lebanon	Samoa	Vietnam
Djibouti	Lesotho	Sao Tome and Principe	Yemen
Dominica	Liberia	Senegal	Zambia
			Zimbabwe
Panel B: Migrant Receiving OECD Countries			
Australia	Finland	Luxembourg	Spain
Austria	France	Netherlands	Sweden
Canada	Germany	New Zealand	Switzerland
Chile	Greece	Norway	United Kingdom
Denmark	Ireland	Portugal	United States

Table 1: List of Migrant Sending and Migrant Receiving OECD Countries

Table 2 presents the variables in natural logs except for urban population ratio and GDP per capita growth. Skilled emigration data are taken from IAB: Institute of Employment Research and all other variables come from WDI: World Development Indicator.

Variable	Min	Max	Mean	Med	Sd.	N
High skilled emigrants	0.693	14.457	9.363	9.587	2.177	929
Med skilled emigrants	0.000	14.795	8.982	9.293	2.319	927
Low skilled emigrants	0.693	15.487	9.426	9.633	2.257	929
Male high-skilled emigrants	0.693	13.852	8.770	9.020	2.146	928
Male med-skilled emigrants	0.000	14.213	8.297	8.587	2.335	925
Male low-skilled emigrants	0.000	14.885	8.635	8.852	2.294	927
Female high-skilled emigrants	0.000	13.795	8.501	8.722	2.266	927
Female med-skilled emigrants	0.000	13.978	8.222	8.581	2.366	926
Female low-skilled emigrants	0.000	14.694	8.779	8.959	2.248	929
Total emigrants	1.386	16.053	10.470	10.675	2.201	929
Urban population ratio	4.718	94.407	42.524	40.728	20.038	929
GDP per capita growth	-25.811	50.727	1.707	1.847	4.255	846
Remittance per capita	-5.193	7.812	3.447	3.688	2.305	708
Adult mortality rate	4.914	7.310	6.124	6.093	0.420	908
Hospital Beds	-2.303	2.610	0.733	0.742	0.977	635
Life expectancy at birth	3.357	4.389	4.120	4.171	0.164	917
Total fertility rate	0.122	2.181	1.350	1.429	0.477	920
Enrolment in primary edu.	2.853	5.276	4.535	4.628	0.324	846
Immunization, Measles	0.000	4.595	4.123	4.331	0.629	851

Table 2. Summary Statistics

	High Skill	Med Skill	High & Med Skill	Low Skill	Total
MIG_{t-1}	-0.02***	-0.008	-0.016**	0.001	-0.008
	(-3.11)	(-1.49)	(-2.46)	(0.15)	(-1.29)
$GROWTH_{t-1}$	0.002***	0.002***	0.002***	0.001**	0.002**
	(3.13)	(2.63)	(2.92)	(2.38)	(2.57)

$URBAN_{t-1}$	0.002*	0.002*	0.002*	0.002*	0.002*
	(1.94)	(1.83)	(1.85)	(1.81)	(1.73)
EDU_{t-1}	0.14***	0.138***	0.139***	0.135***	0.136***
	(7.44)	(7.23)	(7.35)	(7.02)	(7.18)
TFR_{t-1}	-0.013	-0.007	-0.01	-0.007	-0.008
	(-0.63)	(-0.32)	(-0.46)	(-0.33)	(-0.37)
$HOSP_{t-1}$	0.016**	0.015**	0.016**	0.015**	0.016**
	(2.48)	(2.35)	(2.44)	(2.32)	(2.47)
$VACCINE_{t-1}$	0.022***	0.022***	0.022***	0.021***	0.022***
	(3.40)	(3.33)	(3.39)	(3.15)	(3.36)
CONS	3.555***	3.446***	3.524***	3.388***	3.472***
	(34.84)	(36.02)	(34.20)	(35.00)	(32.20)
OBS	425	425	425	425	425
F	38.71	37.14	37.95	36.68	37.02
R^2	0.616	0.607	0.612	0.604	0.606

t statistics are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels. Estimations conducted by a country-and time-fixed effect methodology.

Table 3: Impact of Skilled Emigration on Life Expectancy

	High Skill	Med Skill	High & Med Skill	Low Skill	Total
Male	-0.021***	-0.007	-0.018***	0.003	-0.008
	(-2.84)	(-1.33)	(-2.67)	(0.58)	(-1.19)
Female	-0.025***	-0.008	-0.021**	-0.013	-.009*
	(-3.02)	(-1.61)	(-2.38)	(-0.17)	(-1.65)
Low-income	-0.034***	-0.021**	-0.031***	-0.006	-0.02*
	(-2.71)	(-2.17)	(-2.63)	(-0.57)	(-1.62)
Middle-income	-0.011**	0.001	-0.006	0.007*	0.001
	(-2.21)	(0.05)	(-1.26)	(1.72)	(0.001)
Africa	-0.055**	0.022	-0.04*	-0.014	-0.03
	(-2.14)	(1.42)	(-1.80)	(-0.78)	(-1.30)
Non-Africa	-0.004	-0.002	-0.04	0.008**	0.001
	(-0.91)	(-0.55)	(-0.92)	(2.33)	(0.27)

t statistics in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels. Estimations conducted by a country-and time-fixed effect methodology.

Table 4: Coefficient estimates upon 'Skill Migration' for gender and country subsamples.
(Dependent Variable: Life Expectancy at Birth)

	High Skill	Med Skill	High & Med Skill	Low Skill	Total
MIG_{t-1}	0.087***	0.017	0.058***	0.004	0.042**
	(4.56)	(1.06)	(3.04)	(0.24)	(2.14)
$GROWTH_{t-1}$	-0.006***	-0.005***	-0.006***	-0.004***	-0.005***
	(-3.80)	(-2.79)	(-3.31)	(-2.64)	(-2.97)
$URBAN_{t-1}$	-0.002*	-0.004	-0.004*	-0.004	-0.003
	(-1.84)	(-1.65)	(-1.69)	(-1.61)	(-1.51)
EDU_{t-1}	-0.108**	-0.095*	-0.103*	-0.091	-0.097*
	(-2.04)	(-1.73)	(-1.90)	(-1.65)	(-1.77)
TFR_{t-1}	0.265***	0.239***	0.249***	0.240***	0.243***
	(4.41)	(3.87)	(4.07)	(3.88)	(3.95)
$HOSP_{t-1}$	-0.09***	-0.087***	-0.089***	-0.088***	-0.091***
	(-4.98)	(-4.68)	(-4.83)	(-4.67)	(-4.90)
$VACCINE_{t-1}$	-0.054***	-0.052***	-0.054***	-0.052***	-0.056***
	(-3.03)	(-2.81)	(-2.95)	(-2.73)	(-3.00)
CONS	5.850***	6.413***	6.059***	6.495***	6.147***
	(20.28)	(23.23)	(20.53)	(23.31)	(19.90)
OBS	423	423	423	423	423
F	34.12	30.41	31.94	30.21	31.06
R^2	0.588	0.560	0.572	0.558	0.565

t statistics in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels. Estimations conducted by a country-and time-fixed effect methodology.

Table 5: Impact of Skill Emigration on Adult Mortality Rate

	High Skill	Med Skill	High & Med Skill	Low Skill	Total
Male	0.081***	0.013	0.061***	-0.005	0.039*
	(3.83)	(0.85)	(3.18)	(-0.34)	(1.93)
Female	0.086***	0.021	0.066***	0.013	0.045***
	(5.38)	(1.5)	(3.73)	(0.83)	(2.64)
Low-income	0.073**	0.018	0.057*	-0.01	0.042
	(2.25)	(0.80)	(1.71)	(-0.40)	(1.08)
Middle-income	0.065***	0.015	0.049**	0.006	0.04
	(3.63)	(0.65)	(2.24)	(0.28)	(1.57)
Africa	0.117**	0.011	0.059	0.009	0.064
	(2.13)	(0.34)	(1.20)	(0.25)	(1.29)
Non-Africa	0.038**	0.023	0.033*	-0.001	0.022
	(2.01)	(1.43)	(1.81)	(-0.11)	(1.20)

t statistics in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels. Estimations conducted by a country-and time-fixed effect methodology.

Table 6: Coefficient estimates upon 'Skill Migration' for gender and country subsamples. (Dependent Variable: Adult Mortality Rate)