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Health, Education and Economic Growth Nexus: Evidence from Middle Income Countries

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Abstract *Health and education are indispensable factors for economic growth. This study examines the role of health and education in economic growth for 76 middle income countries during 1991-2016, using fixed and random effect approaches. The empirical findings demonstrates that a progressive link among life expectancy and economic growth while inverse association exists between infant mortality and economic growth. The outcomes of FE and RE models stated that secondary and tertiary level education contribute to increase in economic growth. The results also shows capital's encouraging impact on growth, while the labor has negative influence to economic growth. The impact of life expectancy, infant mortality, enrollment in secondary and tertiary education on economic growth is stronger in upper middle income countries (UMIC) with comparison to lower middle income countries (LMIC). The study recommended that economies should focus on education and better health facilities towards betterment especially in lower income states.*

Key Words:
Economic Growth, Life Expectancy, Infant Mortality

Introduction

Economic growth is a result of efficient utilization of resources. It is a symbol of prosperity and economic development. Many indicators stimulate the growth of an economy among them human capital is the most important one. It is helpful to accelerate the output level, boosts labor's productivity, and enhance the efficiency of available resources.

Health is a basic element of human capital which not only uplifts the worker's capability but also improves output. Health is an indispensable for growth of an economy. A healthy body and mind are most important in performing daily life activities, and healthy person is able to enjoy the life without being dependent upon others. Health expenditures also improve food productivity and information about diseases. Improvement in health in industrial states raises economic growth up to

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40%, and an increased rate of mortality causes a low growth level in developing countries (Arora, 2001).

The rising mortality rate is a sign of poor health facilities, as a result national income declines and vice versa. Infant mortality rate is declined that was 99.7 (per 1000) in 1990 and 28.2 in 2016, and the GDP per capita was 399.48 US$ in 1990 and 1029.57 US$ in 2016 in Bangladesh. The child mortality is also reduced in Pakistan from 106.2 (out of 1000) in 1990 to 64.2 (per 1000) in 2016, and the GDP per capita was 741.80 US$ in 1990 and 1179.41 US$ in 2016. Figure 1 shows an inverse affiliation among growth and infant mortality in MIC over 1991-2016. (World Bank report, 2017)

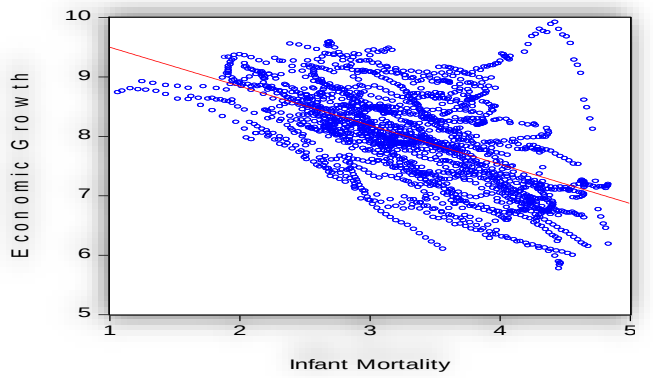

Figure 1: Relationship between Growth and Infant Mortality

Better life expectancy indicate the standard of living and improvement in per capita income. According to the report of World Bank, life expectancy is improved that was 69.29 years in 1990 and 76.25 years in 2016, and per capita GDP was 730.77 US$ in 1990 and 6894.46 US$ in 2016 in China. Existing empirical studies on health emphasis its positive and significant contribution to rising income. Figure 2 shows the progressive association among growth and life expectancy in MIC for 1991- 2016.

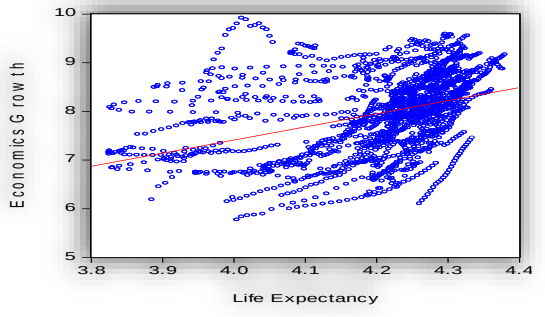

Figure 2: Relationship between Economic Growth and Life Expectancy

The empirical analysis of Swift (2011) confirmed a co-integration association among life expectancy and GDP in OECD countries for two hundred years. The empirics exposed that 1% improvement in life expectancy causes a six percent rise in GDP. High life expectancy rate is an indication of improved health facilities. According to Bloom & Canning (2005), health is an increasing element of economic growth. Weil, D. (2007) also finds health as a notable element of rising income.

New growth theories consider health and education as the basic trigger of economic growth (Bloom et al., 2004). Ogundari and Awokuse (2018) expressed that health is more important than education for growth.

Education is also playing a key role in economic growth. It changes the values, traditions, culture, and brings reforms in a society. The most vital is that it enhances the return of inputs. It is an important to helping people to participate in transform of an economy positively. The role of educated people is mandatory to stabilize a nation as they are more capable to do work efficiently. Mercan and Sezer (2014) explained a positive role of educational expenses to growth in Turkey. An encouraging effect of higher schooling on growth is also found by Mariana (2015) in Romania.

The higher education causes more returns and economic growth as compared to other levels (Afzal et al., 2011). An unproductive use of education is inversely related with growth (Abdullah, 2013). Education has negative impact on growth in some cases due to some factors like brain drain (Lenkei et al., 2018). The outcomes of education at different levels towards growth are vary from country to country.

The study's aims is to find (i) the impacts of enrollment in secondary and tertiary level education on economic growth, (ii) the role of life expectancy and infant mortality on growth for Middle Income Countries, and (iii) either the effect of health and education is stronger in UMI countries or in LMI countries. The paper is prepared as; Section 2 and 3 hold background and theoretical framework. Section 4 and 5 contain methodology and data respectively. The results and concluding remarks are precise in Section 6 and 7 respectively.

Literature Review

This section carries the review of previous studies on the nexus between health, education and economic growth. According to Mayer (2001), improvement in health facilities enhances productivity and income growth for age group of 1950-1990 in Latin America. GLS technique is applied using fertility rate, Govt. consumption, primary education and life expectancy. Carrion-i-Silvestre (2005) also exposed the association between healthcare expenditure (HCE) and GDP for OECD countries.

Similarly, Lago-Penas et al. (2013) found that HCE are feeding to GDP in 31 OECD countries over 1970-2009. It is also exposed that private share in health

expenditure are more sensitive to GDP as compared to total expenditures. Mladenovic et al. (2016) tried to explore the relationship between HCE and GDP for 28 European members over 1974-2015 by applying adaptive neuro-fuzzy technique. The empirics show that HCE has progressive role to growth rate predictions.

Bhargava et al. (2001) explained that adult survival rate is an increasing factor of growth in low income countries. Saida and Kais (2018) also found a causality from health expenditure to GDP per capita in Africa over 1990-2015. Narayan et al. (2010) examined co-integration among health and economic growth for five countries over 1974-2007. Results were in line with the previous studies proving health as an important ingredient of growth. Gong et al. (2012) also summarized that health improvements are the source of growth for China over 1978-2003.
The empirical report of Swift (2011) confirmed a co-integration association among life expectancy and GDP in 13 OECD countries for two hundred years. Results exposed that a 1% improvement in life expectancy rate causes a six percent rise in GDP. Mahumud et al. (2013) also inspected that life expectancy increases the real income of people in Bangladesh. The study expressed that life expectancy is greater in females than males in the previous one and half decades.

Arora (2001) described the nexus among health and growth in 10 industrial economies for one century, and showed that economic growth raises 30-40% by improvement in health. Public spending on health also improve food productivity and information about diseases. The findings also expressed that increasing rate of mortality causes a low growth rate in developing countries.

Health is not the mere accelerator of growth, reverse also holds true. In a study on a sample of 148 countries for 1970-2010, Linden and Ray (2017) found per capita GDP as a basic reason of life expectations. Goode et al. (2014) investigated that household income has a strong impact on children health in China. Lu et al. (2017) discovered that GDP per capita is negatively correlated with mortality rate in 38 Chinese provinces for 2002-2014.

Katrakilidis et al. (2016) found a one-sided causation from income to infant mortality in Greece for 1960-2012. The results showed that economic growth improve health quality. Hooters' and Posnett (1992) ensured that GDP is an important factor of health spending and found a positive link among them in a relatively large sample of OECD countries. Results suggested that OECD countries panel is not an identical group.

A bidirectional affiliation among HCE and GDP in 20 OECD countries for 1970-2009 is examined by Amiri and Ventelou (2012). Similarly, Chaabouni et al. (2016) exposed a health-growth causal correlation for a panel of 51 states over 1995-2013, and Piabuo and Tieguhong (2017) also found the same nexus for CEMAC (the Central African Economic and Monetary Community) countries.

Education is a main character of economic growth. The study of Benos and Zotou (2014) shown that mostly studies used education attainment and ignored the

quality of education, by considering 57 studies from previous literature. They have also guessed that qualitative measures are not used due to missing data. Mercan and Sezer (2014) explained a positive role of educational expenses to economic growth for Turkey during 1970-2012. Afzal et al. (2011) found twofold causality among education and growth in Pakistan for 1970-2008. The study expressed that an effect of higher education is stronger as compared to other education levels. A progressive role of higher education on growth is also found by Mariana (2015) in Romania for 1980-2013.

A study of Hongyi and Huang (2009) exposed that both health and education are accelerating factors of economic growth in China for 1978-2005. Ogundari and Awokuse (2018) expressed that health is more important than education for growth for a panel of 35 countries over 1980-2008. The findings of Bloom et al. (2004) pointed out that schooling and health are the main indicators of growth. They have also shown that a 1% improvement in life expectancy raises the output by 4 percent.

Frimpong and Adu (2014) inspected the significant character of schooling and health to raise growth in Africa over 1970-2010. The results also expressed that health has greater influence on growth as compared to education. The study of Lenkei et al. (2018) expressed the positive influence of primary and secondary education on economic growth in fourteen Asian economies for 1960-2013. The empirics exposed that tertiary education is negatively correlated with growth because of brain drain. Abdullah (2013) confirmed the accuracy of data on education for Malaysia and found a negative impact of education on growth due to unproductive use of education.

The results of secondary and tertiary education on economic growth are vary from country to country. Our purpose is to indicate the impact of life expectancy, infant mortality, secondary and tertiary education on economic growth in 76 MI countries.

Theoretical Framework and Model

A healthy body and mind are most important in performing activities of daily life, and healthy person is able to enjoy the life without being dependent upon others. A health production function describes information about health status of a nation. It explains the association between inputs and outputs in a particular time. An econometric model is formulated to find health and economic growth nexus. We follow the aggregate production function of Weil (2007) as,

$$Y = AK^{\alpha}(L\omega)^{\beta} \quad ----------\quad (1)$$

where, Y output, A represents labor productivity and technology, K is capital, and L is labor, ω is human capital per capita. Human capital of a worker carries better health and education which can be written as,

$$\omega = S^{\gamma} H^{\delta} \quad ---------- \quad (2)$$

where, S and H represent schooling and health respectively, γ is the share of schooling and δ is the share of health towards human capital. Taking natural logarithm of Eq.2

$$ln\omega = \gamma lnS + \delta lnH \quad ---------- \quad (3)$$

Taking natural logarithm of Eq.1, the aggregate production function is as

$$ln\, Y = ln\, A + \alpha\, ln\, K + \beta(lnL + ln\omega) \quad ---------- \quad (4)$$

By substituting Eq.3 into Eq.4

$$ln\, Y = ln\, A + \alpha\, ln\, K + \beta(lnL + \gamma lnS + \delta lnH) \quad ---------- \quad (5)$$

$$ln\, Y = ln\, A + \alpha lnK + \beta lnL + \beta\gamma lnS + \beta\delta lnH \quad ---------- \quad (6)$$

The empirical model for panel data analysis from derived equation can be expressed as,

$$y_{it} = \alpha_0 + \alpha_1 k_{it} + \alpha_2 l_{it} + \alpha_3 s_{it} + \alpha_4 h_{it} \quad ---------- \quad (7)$$

where, the terms *i* is used for MI countries and *t* is used for time period from 1991-2016, *y* is used for log of economic growth, *k* is natural logarithm of capital, *l* is labor, *s* is lo of education and *h* used for natural log of health. The term α_0 is intercept, α_1 is used for elasticity of capital with respect to growth, α_2 is used for elasticity of labor, α_3 for schooling, and α_4 is the elasticity of health. Health is measured by life expectancy (LE) and infant mortality (IM), and included secondary and tertiary education as proxy of schooling.

Methodology

Various methods and techniques are applied to inspect the association between human health and economic growth by incorporating education. The study uses the panel data analysis. There are many advantages of panel data: (i) competency of the parameters estimates is high due to high sample variability and the degree of freedom (ii) panel data helps to control the effect of missing and unobservable variables (iii) it helps to control individual heterogeneity that is it allowed to control unobservable variables (iv) it reduces chance of multi-colinearity and (v) it produces more accurate estimates as compared to cross-sectional and time series analysis. The basic techniques, panel OLS, Random Effect (RE) and Fixed Effect (FE) models are used for panel data analysis. We have used RE and FE models for MIC.

Hausman Test

The study applied the Hausman test for picking an appropriate technique between

RE and FE models. The hypothesis 'RE model is suitable' is tested against the alternative that is 'FE model is good'.

Pooled OLS Model

The key assumption of pooled OLS estimation technique is that intercepts and slope coefficients do not vary across cross-sectional units over time. Variations across countries over time are captured by error. Pooled OLS estimation technique is appropriate if $cov(u_{it,}X_{it}) = 0$. The pooled regression model can be written for Eq.7,

$$y_{it} = \alpha_0 + \alpha_1 k_{it} + \alpha_2 l_{it} + \alpha_3 s_{it} + \alpha_4 h_{it} + \mu_{it} \quad ---------- \quad (8)$$

The panel OLS takes common intercept and coefficients for all cross sections. This notion collapse the association among indicators. This is the reason to move towards RE and FE models.

Fixed Effect (FE) Model

FE model is used to determine the effect of coefficients that changes over time. This method assess the relationship between dependent and independent variables for each cross sectional unit, as every unit has some distinctive features which may have an impact on independent variable. FE model controls the impact of these time invariant features by allowing variability of characteristics in intercept. Now the proxy variables of education and health are added into Eq.7 and illustrated it according to the FE model,

$$y_{it} = \alpha_i + \alpha_1 k_{it} + \alpha_2 l_{it} + \alpha_3 sec_{it} + \alpha_4 le_{it} + \mu_{it} \quad ---------- \quad (9.1)$$

$$y_{it} = \beta_i + \beta_1 k_{it} + \beta_2 l_{it} + \beta_3 ter_{it} + \beta_4 le_{it} + \varepsilon_{it} \quad ---------- \quad (9.2)$$

$$y_{it} = \gamma_i + \gamma_1 k_{it} + \gamma_2 l_{it} + \gamma_3 sec_{it} + \gamma_4 im_{it} + \zeta_{it} \quad ---------- \quad (9.3)$$

$$y_{it} = \varphi_i + \varphi_1 k_{it} + \varphi_2 l_{it} + \varphi_3 ter_{it} + \varphi_4 im_{it} + \acute{\varepsilon}_{it} \quad ---------- \quad (9.4)$$

Here, the intercept of each cross section vary due to the exclusive characteristics of each country. The slope coefficients show elasticity of capital, education, labor and health with respect to economic growth.

Random Effect (RE) Approach

Random effects approach is appropriate if variation across entities have influence on dependent variable. It allows considering time invariant parameters. The key assumption of RE approach is that intercept of each cross-sectional unit is randomly drawn with constant average value of intercept. Thus Eq.7 with the proxy variables of education and health in form of RE model is,

$$y_{it} = \alpha_0 + \alpha_1 k_{it} + \alpha_2 l_{it} + \alpha_3 sec_{it} + \alpha_4 le_{it} + \acute{u}_i + \mu_{it} \quad ------ \quad (10.1)$$

$$y_{it} = \beta_0 + \beta_1 k_{it} + \beta_2 l_{it} + \beta_3 ter_{it} + \beta_4 le_{it} + \upsilon_i + \varepsilon_{it} \quad -------- \quad (10.2)$$

$$y_{it} = \gamma_0 + \gamma_1 k_{it} + \gamma_2 l_{it} + \gamma_3 sec_{it} + \gamma_4 im_{it} + \nu_i + \zeta_{it} \quad ------- \quad (10.3)$$

$$y_{it} = \varphi_0 + \varphi_1 k_{it} + \varphi_2 l_{it} + \varphi_3 ter_{it} + \varphi_4 im_{it} + \delta_i + \acute{\varepsilon}_{it} \quad ------- \quad (10.4)$$

Or

$$y_{it} = \alpha_0 + \alpha_1 k_{it} + \alpha_2 l_{it} + \alpha_3 sec_{it} + \alpha_4 le_{it} + \omega_{it} \quad --------- \quad (11.1)$$

$$y_{it} = \beta_0 + \beta_1 k_{it} + \beta_2 l_{it} + \beta_3 ter_{it} + \beta_4 le_{it} + \psi_{it} \quad --------- \quad (11.2)$$

$$y_{it} = \gamma_0 + \gamma_1 k_{it} + \gamma_2 l_{it} + \gamma_3 sec_{it} + \gamma_4 im_{it} + \eta_{it} \quad --------- \quad (11.3)$$

$$y_{it} = \varphi_0 + \varphi_1 k_{it} + \varphi_2 l_{it} + \varphi_3 ter_{it} + \varphi_4 im_{it} + \acute{\omega}_{it} \quad --------- \quad (11.4)$$

where $\acute{u}_i$ is cross-sectional error component, u_{it} is time series and cross-sectional error and ω_{it} is an addition of $\acute{u}_i$ and u_{it}. In contrast to FE, RE does not create degree of freedom loss. This method is suitable when correlation between independent variable and random error term is zero. FE model is more suitable when independent variables are correlated with error term.

Data

This section contains the data, descriptive statistics and correlation among variables. Various variables are used to determine the relationship among indicators, and data is used over the period 1991-2016. The dependent variable include economic growth and measured by GDP per capita in literature (Siddique and Majeed, 2015).

The independent variables include infant mortality and life expectancy as health, and both are repetitively used in the literature (Linden and Ray, 2017; and Akram, et al. 2008). Schooling is measured by enrollment in secondary and tertiary education that is also used in economic literature (Akram, et al. 2008; and Ljunge, 2016). Capital is measured by Gross capital formation (% of GDP) which is utilized by Siddique et al. (2016), and labor force participation rate (above 15 age) is also independent variable (Siddique and Majeed, 2015). The data on all variables is taken from WDI (2018).

The study is concentrated on the panel of MIC (WDI 2018). We used three panels separately, the first is UMIC, the second is, LMIC, and third is MIC. UMI economies are those in which 2016 per person GNI was $3,956-$12,235. LMI countries are those in which 2016 GNI per capita was below $3,956.

Descriptive Statistics

This section carries the summary of descriptive statistics of used variables. Table

1 shows the maximum, minimum, standard deviation and mean values of data for MI countries. The maximum value (9.59) of economic growth belongs to Venezuela, RB and minimum value (6.06) belongs to Cambodia. The average economic growth is 8.00.

The maximum life expectancy (4.37) belongs to Costa Rica, minimum value (3.82) is for Swaziland, and mean values of life expectancy is 4.22. The maximum value of infant mortality (4.74) belongs to Nigeria, minimum value (1.06) is for Belarus, and mean values of infant mortality is 3.21. The bottom of Table 2 contains the descriptive stats for UMI countries and LMI countries separately.

Table 1. Descriptive Stats for MI Countries

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Economic Growth	994	8.0001	0.7447	6.0668	9.5923
Capital	994	3.1733	0.3602	-1.2031	4.8755
Labor	994	4.0674	0.1615	3.6468	4.4326
Life Expectancy	994	4.2257	0.0964	3.8265	4.3799
Infant Mortality	994	3.2123	0.6710	1.0647	4.7466
Secondary Education	994	4.2319	0.3796	2.5771	4.8367
Tertiary Education	994	3.0155	0.8223	0.6095	4.5584
Descriptive Stats for UMI Countries					
Economic Growth	539	8.4894	0.5366	6.6693	9.5923
Capital	539	3.1751	0.3813	-1.2031	4.8755
Labor	539	4.0663	0.1515	3.7110	4.3700
Life Expectancy	539	4.2607	0.0767	3.8885	4.3799
Infant Mortality	539	2.9093	0.5856	1.0647	4.6491
Secondary Education	539	4.3745	0.2308	3.1524	0.6095
Tertiary Education	539	3.2588	0.7097	4.8367	4.5584
Descriptive Stats for LMI Countries					
Economic Growth	455	7.4205	0.5009	6.0668	8.3596
Capital	455	3.1712	0.3339	1.3944	4.2181
Labor	455	4.0686	0.1727	3.6468	4.4326
Life Expectancy	455	4.1843	0.1009	3.8265	4.3271
Infant Mortality	455	3.5713	0.5833	2.0794	4.7466
Secondary Education	455	4.0630	0.4465	2.5771	4.6475
Tertiary Education	455	2.7274	0.8537	0.8672	4.4239

All variables are in natural logarithm form

Correlation among Variables

This section explains the correlation among the used variables for three panels over 1991-2016. The correlation for MI countries (full sample) is shown in Table 2.

Table 3 shows that correlation between variables for UMI countries, and Table 4 holds the correlation for LMI countries. The direction of relationship among variables are almost same for three panels. There is a positive correlation among life expectancy and economic growth. Capital, secondary and tertiary education are positively correlated labor and infant mortality is negatively correlated with growth.

Table 2. Correlation Matrix for MI Countries (Full Sample)

Variables	y	k	l	le	im	sec	ter
y	1.0000						
k	0.0702	1.0000					
l	-0.1547	-0.0698	1.0000				
le	0.4528	0.1068	-0.1951	1.000			
im	-0.6669	-0.0809	0.1549	-0.7508	1.0000		
sec	0.5105	0.0125	-0.0988	0.5934	-0.7020	1.0000	
ter	0.5197	0.0026	-0.1883	0.6431	-0.7471	0.7717	1.0000

Table 3. Correlation among variables in UMI Countries

Variables	y	k	l	le	im	sec	ter
y	1.0000						
k	0.1018	1.0000					
l	-1.1350	-0.0844	1.0000				
le	0.2037	0.0179	-0.0989	1.0000			
im	-0.4549	-0.0784	0.0624	-0.6280	1.0000		
sec	0.3121	-0.0559	-0.0596	0.3260	-0.5537	1.0000	
ter	0.4756	-0.0257	-0.1143	0.5529	-0.6952	0.6184	1.0000

Table 4. Correlation Matrix for LMI Countries

Variables	y	k	l	le	im	sec	ter
y	1.0000						
k	0.0853	1.0000					
l	-0.3050	-0.0537	1.0000				
le	0.3321	0.2175	-0.2977	1.0000			
im	-0.5990	-0.1060	0.2912	-0.7698	1.0000		
sec	0.3976	0.0598	-0.1348	0.6155	-0.7310	1.0000	
ter	0.4042	0.0310	-0.2678	0.6242	-0.7393	0.8316	1.0000

Empirical Results

The results of empirical analysis between health and economic growth for three panel datasets are discussed in this section.

Results of Hausman Test

Hausman test is applied to choose the best technique between RE and FE model. The main hypothesis (RE model is suitable) is tested against alternative (FE model is good) hypothesis. Results are displayed in Table 5.

The results for MI countries show that FE model is suitable for life expectancy with secondary education while RE is good for tertiary education equation. The FE model is appropriate for infant mortality with secondary and tertiary education. In case of UMI countries, the FE technique is reasonable. For the panel of LMI countries the FE approach is suitable for all cases except infant mortality with tertiary education.

Table 5. Hausman Test Result

MI Countries (Full Sample)				
Model (18)	**Education Proxy**	**Chi-sq.**	**Prob.**	**Status**
L**ife expectancy** used as health	Secondary Education (sec)	9.1466	0.0575	FE
	Tertiary Education (ter)	4.1440	0.3869	Random Effect (RE)
Infant mortality used as health	Sec	0.7890	0.9399	RE
	Ter	1.6007	0.8087	RE
UMI Countries				
L**ife expectancy** used as health	Sec	19.9466	0.0005	FE
	Ter	15.1218	0.0045	FE
Infant mortality used as health	Sec	13.5802	0.0088	FE
	Ter	15.0254	0.0046	FE
LMI Countries				
L**ife expectancy** used as health	Sec	21.4030	0.0003	FE
	Ter	21.4030	0.0003	FE
Infant mortality used as health	Sec	9.2400	0.0554	FE
	Ter	7.1433	0.1285	RE

Null hypothesis: Random effect model is appropriate

Full Sample Results

Table 6 shows the empirical results of 76 MI countries (full panel) over 1991-2016. The study used four equations to assessment the nexus between education, health and economic growth.

Life expectancy has the coefficients 3.02 and 2.15 which shows a 1% increase in life expectancy rate causes 3.02% and 2.15% rise in economic growth. The result is consistence with Bloom et al. (2004). Infant mortality has adverse relationship with economic growth which shows that increasing rate of infant mortality decreases economic growth in MI countries. The coefficients of infant mortality are -0.61 and -0.57, which explain that a 1% increase in mortality rate declines growth rate by 0.61% and 0.57%, respectively. Lu et al. (2017) also discovered that GDP per capita is negatively correlated with mortality rate in China.

The results express that education is playing a vital role in increasing economic growth. The coefficients of secondary education are 0.39 and 0.14 which illustrate that a 1% rise in secondary education enrollment shows a 0.39% and 0.14% increase in economic growth. The enrollment in tertiary education is an indication of economic growth. The coefficients 0.29 and 0.13 express that a 1% percent rise in tertiary education is a sources of an intensification in economic growth by 0.29% and 0.13%, respectively. Afzal et al. (2011) found that the influence of higher level of education is stronger on growth as compared to other education levels. A progressive effect of higher education on growth is found by Mariana (2015).

Capital is an accelerating factor of economic growth which is consistent with economic literature (see, for instance, Siddique and Majeed, 2015). The coefficients of labor show an inverse association among labor and economic growth. Siddique and Majeed (2015) also found a negative sign of labor in economic growth model.

Table 6. Results for MI Countries (Full Sample)

Variables	Models			
	FE (9.1)	**RE (11.2)**	**RE (11.3)**	**RE (11.4)**
k	0.1496***	0.1584***	0.0968***	0.1152***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
l	-0.6843***	-0.3137**	-0.7326***	-0.2492**
	(0.0000)	(0.0194)	(0.0000)	(0.0218)
le	3.0202***	2.1578***		
	(0.0000)	(0.0000)		
im			-0.6146***	-0.5739***
			(0.0000)	(0.0000)
sec	0.3964***		0.1444***	
	(0.0000)		(0.0000)	
ter		0.2996***		0.1359***
		(0.0000)		(0.0000)
Constant	-4.0787***	-1.6758	12.0874***	10.1438***
	(0.0000)	(0.1999)	(0.0000)	(0.0000)

obs.	1347	1239	1348	1239
R^2	0.9422	0.5821	0.6645	0.7267
p-values in parentheses, ***p<0.01, **p<0.05, *p<0.1				

Sub-Sample Results

Hausman test confirmed that FE model is appropriate for the panel of UMI countries for all equations. Table 7 shows the empirical results of FE model for 42 UMI countries over 1991-2016. Life expectancy has a positive influence to economic growth. The coefficients are 3.53 and 2.23 which illustrate that a 1% increase in life expectancy rate causes an intensification in economic growth by 3.53% and 2.23%, respectively. Mahumud et al. (2013) also inspected that life expectancy increases the real income in Bangladesh.

The findings confirm that decreasing rate of infant mortality increases economic growth. The coefficients of infant mortality are -0.62 and -0.58 which explain that a 1% increase in infant mortality declines 0.62% and 0.58% in economic growth for UMI countries. The results are consistence with the findings of Lu et al. (2017).

The coefficients of secondary education (0.46 and 0.13) illustrate that a 1% rise in secondary education enrollment shows a 0.46% and 0.13% increase in economic growth. The coefficients of tertiary education are 0.35 and 0.14 which express that a 1% percent rise in tertiary education is a sources of 0.35% and 0.14% increase in economic growth respectively. The study of Lenkei et al. (2018) also expressed the positive influence of schooling on economic growth in Asia.

The results show that capital is an increasing determinant of economic growth. Furthermore, results indicate an inverse link between labor and income growth which is significant in two equations and insignificant in others. It is also observed in the literature (Omri, 2013).

Table 7. Results for UMI Countries

Variables	**Models**			
	FE (9.1)	**FE (9.2)**	**FE (9.3)**	**FE (9.4)**
k	0.1566***	0.1720***	0.0927***	0.1195***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
l	-0.7163***	-0.1264	-0.7657***	-0.2013
	(0.0000)	(0.4907)	(0.0000)	(0.1808)
le	3.5320***	2.2334***		
	(0.0000)	(0.0000)		
im			-0.6203***	-0.5861***
			(0.0000)	(0.0000)
sec	0.4604***		0.1355***	

	(0.0000)		(0.0019)	
ter		0.3551		0.1460
		(0.0000)		(0.0000)
Constant	-6.1135***	-2.2347*	12.5726***	10.1488***
	(0.0000)	(0.0947)	(0.0000)	(0.0000)
obs.	769	659	770	659
R^2	0.8564	0.8748	0.9024	0.9126
***p<0.01, **p<0.05, *p<0.1				

Table 8 displays the empirical results of RE and FE models in 34 LMI countries for 1991-2016. The Hausman test confirmed that FE model is appropriate for three equations and RE model is good for one equation.

The coefficients of life expectancy are 2.62 and 2.23 which show a 1% change in life expectancy causes 2.62% and 2.23% variation in economic growth. Child mortality is inversely correlated with economic growth, the empirics express that a one percent increase in mortality rate is a reason to decrease growth rate by 0.54-0.61% in LMI countries.

The findings also express that a 1% increase in secondary education enrollment causes 0.15-0.33% surge in economic growth. The enrollment in tertiary education has also positive impact on economic growth but it is weak in comparison to secondary enrollment in LMIC. The coefficients indicate a one percent change in tertiary enrollment origins a variation in economic growth by 0.12-0.23%. Capital is positively correlated with economic growth, while labor is negatively interrelated with growth.

Table 8. Results of FE and RE Models for LMI Countries

Variables	**Models**			
	FE (9.1)	**FE (9.2)**	**FE (9.3)**	**RE (11.4)**
k	0.1398***	0.1353***	0.1032***	0.1085***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
l	-0.7413***	-0.5292**	-0.6129***	-0.2801*
	(0.0019)	(0.0224)	(0.0004)	(0.0942)
le	2.6246***	2.2348***		
	(0.0000)	(0.0000)		
im			-0.6110***	-0.5461***
			(0.0000)	(0.0000)
sec	0.3386***		0.1535***	
	(0.0000)		(0.0019)	
ter		0.2363***		0.1282***
		(0.0000)		(0.0000)
Constant	-2.3480***	-0.8710	11.1577***	9.8388***

	(0.0991)	(0.5324)	(0.0000)	(0.0000)
Obs.	578	580	578	580
R^2	0.9106	0.9220	0.9534	0.7511

****p<0.01, **p<0.05, *p<0.1*

Conclusion

Economic growth is a result of efficient utilization of resources. It is a symbol of prosperity and economic development. Various indicators stimulate the growth of an economy among them human capital is the most important one. It is helpful to accelerate the output level, boosts labor's productivity, and enhance the efficiency of available resources. The RE and FE methods are applied to find the results for 76 MI countries, 42 UMI countries and 34 LMI countries over 1991-2016. The study used four equations to estimate the nexus between health, education and economic growth.

Life expectancy is an increasing factor of economic growth in MIC (full panel). Child mortality has negative impact on economic growth which indicates that a decreasing rate of mortality increases economic growth. The results show that health is an indispensable for economic growth of an economy. The results are expressed that enrollment in secondary and tertiary education playing a progressive role in increasing economic growth. Capital is positively correlated with economic growth while the labor has negative effect on economic growth.

The findings of UMI and LMI countries expose that life expectancy and capital have positively correlated with economic growth, while labor and infant mortality are negatively correlated with economic growth. The findings also express that secondary and tertiary enrollment have positive effect on economic growth.

The study concluded that the impact of life expectancy, infant mortality, enrollment in secondary and tertiary education on economic growth is stronger in UMI countries as compared to LMI countries. Better health facilities and improved educational institutes in UMI countries are contributing more towards economic growth and development. The study recommended that economies should focus on education and better health facilities to improve economic growth especially in lower income countries.

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