Print ISSN: 2288-4637 / Online ISSN 2288-4645
doi:10.13106/jafeb.2021.vol8.no4.0083

The Effect of Foreign Direct Investment on Public Health: Empirical Evidence from Bangladesh

Fahimul Kader SIDDIQUE[1], K. B. M. Rajibul HASAN[2], Shanjida CHOWDHURY[3], Mahfujur RAHMAN[4], Tahsin Sharmila RAISA[5], Nurul Mohammad ZAYED[6]

Received: November 30, 2020 Revised: February 20, 2021 Accepted: March 02, 2021

Abstract

Health is an outset of psychological, social, financial, and physical state. Several macroeconomic factors are entangled with health and mortality. Infant mortality and life expectancy are two keyguard on demographic research context on last few decades. On the other hand, foreign inflows play an unprecedent role for raising economic circulation and providing more opportunities to build a better society. The study aims to investigate the relationship between foreign direct investment (FDI), economic growth, and Bangladesh's health. This study employs time-series data from 1980 to 2018. Results show, with Auto-regressive Distribute Lag (ARDL) model, that there is significant cointegration among variables. Foreign investment and economic output relate significantly and positively to health. On the contrary, education is quasi-linked with a different sign-on different model. For model validation, pitfalls of time-series multicollinearity, heteroscedasiticy, and autocorrelation are not present. Also, CUSUM and CUSUMSQ tests are validating the model as stable and fit for future prediction. Medical assessment and education need more attention from the government as well as the private sector. FDI can play a catalyst role for improving the health sector, raising opportunity in educating and creating a better lifestyle. In order to optimize foreign investment, the government should implement necessary reforms and policies.

Keywords: FDI, Economic Growth, Public Health, ARDL, Bangladesh

JEL Classification Code: F21, F43, C23, O47

1. Introduction

Traditional rationale generally posits that human advancement relates to a direct capacity of economic development. Scholars (Pyatt, 1987; Escobar, 2000) and foreign bodies, along with the United Nations Development Program (UNDP), have discussed this assumption over the past few years. Stiglitz (2006) suggests that other basic development elements, such as training and safety, may be ignored because of the focus on GDP. Ali et al. (2017) emphasized that foreign direct investment (FDI) was considered as pivot of global economic integration (Nguyen, 2020).

Numerous researchers conduct a large body of analysis to ascertain the importance of FDI in the growth of an economy that concentrates on multifold variables such as trade openness, inflation rate, market size, health expenditure, spending on education, urbanization, quality of living, economic indicators, infrastructure indicators, and social indicators (Sikwila et al., 2017; Anyanwu, 2011;

[1]First Author. Lecturer, Department of Accounting and Information Systems, Begum Rokeya University, Rangpur, Bangladesh. Email: fksiddique@brur.ac.bd
[2]Senior Principal Officer, Risk Management Division, Agrani Bank Limited, Dhaka, Bangladesh. Email: rajibulhasan12@gmail.com
[3]Assistant Professor, Department of General Educational Development, Faculty of Science and Information Technology, Daffodil International University, Dhaka, Bangladesh. Email: shan_chydiu.ged@daffodilvarsity.edu.bd
[4]Independent Researcher, Comilla University, Kotbari, Comilla, Bangladesh. Email: mahfuj.cou01@gmail.com
[5]Lecturer, Department of Business Administration, Faculty of Business and Entrepreneurship, Daffodil International University, Dhaka, Bangladesh. Email: raisa.bba@diu.edu.bd
[6]Corresponding Author. Assistant Professor & Head, Department of Real Estate, Faculty of Business and Entrepreneurship, Daffodil International University, Dhaka, Bangladesh [Postal Address: Daffodil Tower 4/2 Sobhanbag, Mirpur Road Dhanmondi, Dhaka 1207, Bangladesh] Email: zayed.bba@daffodilvarsity.edu.bd

Donwa et al., 2015). A country failing to provide health security and better lifestyle to its people raises inequality among groups and provokes imbalance in income (Nguyen & Pham, 2020; Olilingo & Putra, 2020; Solanki et al., 2020; Tariq et al., 2020).

A few scholars have integrated the impact of FDI on important aspects of human life quality, such as health indicators. But the health effects of FDI get little attention. The majority of the literature is "data-free," based on theory, assumptions, or speculations. Hence, it is impossible to assess the upcoming impact of FDI on health entirely and make sophisticated recommendations. Therefore, a considerable gap exists in the knowledge base on FDI and its impact on people's health (Smith, 2004). This study analyzes the effect of foreign direct investment on improving the social development of the nation. The present study intends to examine the long-run relationship between health dimensions, namely, infant mortality, life expectancy, school enrollment at secondary and tertiary level, GDP, urbanization, number of physicians, and FDI in Bangladesh, which has been ignored by past studies.

2. Literature Review

It is difficult to characterize the concept of "welfare" in a way that catches every of its aspects with macroeconomic effects, social factors, and the natural climate. The connection between foreign direct investments and human development is mentioned in welfare and economic development.

One of the principal contentions of FDI is its beneficial outcome on economic development. That being stated, many experts trace proof of FDI-led growth theories implying that FDI adds to the development pace of the host country (Umoh et al., 2012). Some controversial results also indicate that FDI is unfriendly to financial growth (Li and Liu, 2005; Iqbal et al., 2010). These conflicting results indicate that the relation between FDI and economic development is likely to be affected by factors such as human capital and corruption (Acemoglu et al., 2005). It is widely accepted that economic growth promotes human development. If this study is right, then it will mean that FDI has a major impact on human progress through its economic development relationship (Gökmenoğlu et al., 2018). Usually, foreign firms provide higher salaries and a better working environment for their employee than domestic firms. Therefore, the health condition of the host countries can benefit from FDI. Moreover, higher average income may result in the indirect effects on health followed by FDI-induced growth factor in the economy. There is a strong significant relationship between FDI and the private market as FDI targets host countries' private sector. Therefore, it is important to consider the health of the workforce of this sector. There is a positive correlation between GDP per capita and FDI and, thus, social progress. FDI generates economic growth, increases income, and enables more resources to be allocated to education, healthcare, and infrastructure.

On the contrary, shelter and necessary infrastructure can attract FDI, providing an impetus for social and economic development. FDI can contribute to basic human needs such as access to basic medical care, nutrition, reduced infant mortality rate, increased life expectancy, and school enrollment in primary, secondary and tertiary levels, urbanization, and more physicians. FDI has both positive and negative effects on health in various countries. Burns et al. (2017) showed a positive effect of FDI on health, primarily boosting the supply of health-related goods and services.

A relationship between FDI and life expectancy has been discovered by Burns et al. (2017) looking at 85 countries between 1974 and 2012. The results show a strong relationship between FDI and adult mortality, but no association with either child or infant mortality using the OSL and fixed-effects models. Nagel et al. (2015) found the interconnection between foreign direct investment and public health among 179 countries and found a positive relationship between them. Their findings pointed to the beneficial outcome of FDI on health in low-wage economies and a negative effect on health and high-wage nations.

In Pakistan, using the VECM Granger causality test, Shahbaz et al. (2016) analyzed the impact of FDI on life expectancy as a proxy for health from 1972 to 2012. They have also used the structural break unit root test and the ARDL cointegration test to investigate the connection between the factors such as food supply, lack of education, urbanization, misery, health spending, and life expectancy. The results show that life expectancy has improved due to the increase of health spending; however, the lack of education decreases it and emphasizes the role of economic misery when preparing an economic policy to improve health status.

Azemar and Desbordes (2009) studied 70 developing countries from 1985 to 2004 to understand the interconnection between governance, FDI and health using fixed-effect model. They concluded that integrated health policy could have increased FDI inflows results in the economic growth of those developing countries. On the contrary, Herzer and Nunnenkamp (2012) investigated the relationship between health and FDI from 1970 to 2009, utilizing a sample set of 14 countries. They applied life expectancy as a proxy for health like other studies. The outcomes demonstrated critical, negative links between FDI and health.

Golkhandan (2017) investigated the long-term relationship between health indicators and FDI. He used the Continuously updated and Fully-Modified (Cup-FM) method for 25 developing countries' statistical data from 1995 to 2014. He found a positive relationship between FDI and health conditions if FDI is facilitated in host countries. Magombeyi and Odhiambo (2017) looked at the link between foreign direct investment and poverty in Tanzania from 1980 to 2014. The first step toward reducing poverty is reducing the infant mortality rate, raising life expectancy, and raising household consumption. FDI income can have a major positive impact in decreasing poverty because of reduction in child mortality rate. Although FDI has no direct connection to poverty alleviation, there is a causal relationship to life expectancy.

3. Research Method

This study explores some information on reducing infant mortality rate with economic growth or investment from Bangladesh's foreign sector from 1980 to 2018. It enables to exhibit this nexus through public health improvement and increases in outset investment. Also, life expectancy is considered as the dependent variable to formulate our model more effectively. Underlying this study, methods like Auto-regressive Distributed Lag model (ARDL) are used to exhibit a short-run or long-run relationship in successive achievement of infant mortality downfall or life expectancy owing to foreign investment, economic growth, educational attainment, and public health. Before performing ARDL, Augmented-Dickey Fuller (ADF) and Phillips-Perron (PP) unit root tests are carried out. Nonetheless, for uncovering structural break, a single structural break Zivot-Andrews test is applied.

3.1. Data and Variables

This study aims to exhibit an empirical relationship between health, foreign investment, and economic growth. Description of variables is given in Table 1. Data is collected from the Word Bank website.

Table 1: Variables with the Description of Study

Variables	Used for	Description
IMR	Health	Mortality rate, infant (per 1,000 live births)
LE	Health	Life expectancy at birth, total (years)
EG	Economic growth	GDP per capita (constant 2010 US$)
FDI	Foreign investment	Foreign direct investment, net inflows (% of GDP)
SEDU	Education	School enrollment, secondary (% gross)
TEDU	Education	School enrollment, tertiary (% gross)
UPG	Urbanization	Urban population growth (annual %)
PH	Number of Physician	Physicians (per 1,000 people)

This study amalgamates several factors to pursue a long-run relationship. Firstly, health is the root of all happiness; well-being is perceived as goodness in a physical, mental, social, and social context. This study aims to show the nexus between health and economic growth, foreign outlay, and education. Proxies like infant mortality and life expectancy are used for health status following other researchers (Magombeyi & Odhiambo (2017)). Secondly, FDI or foreign direct investment is now regarded as a catalyst for increasing human economic conditions, ensuring good education, and achieving good health. Several studies consider this crucial for economic growth (Saqib et al., 2013; Faruk, 2013). Thirdly, economic growth or GDP per capita is a reflection of a nation's economy. Studies also documented a causal nexus between economy and health for increasing their economic circulation (Ilori & Ajiboye, 2015; Siddique & Majeed, 2015). Other studies also exhibit a long-run relationship between health expenditure and economic growth (Erçelik, 2018). It is necessary for securing a better lifestyle, education, as well as higher education. Education is critical to human capital enrichment and the accomplishment of basic needs. IT also enhances not only labor productivity, but also positive thinking development; two proxies are used in this study. Finally, the last factor, urbanization, is crucial for ensuring better life expectancy (Shahbaz et al., 2016). These two proxies – urban population growth and the number of physicians per thousand people – are preferred for inspecting the overall impact of others (Gilligan & Skrepnek, 2014).

3.2. Model Specification

This study implemented an ARDL model to estimate the health situation through infant mortality and life expectancy with economic growth, foreign inflows, urbanization, and physician effect. The model is written in natural logarithm form as follows:

$$\text{LnIMR}_{it} = \alpha_i + \beta_1 \text{LnEG}_{it} + \beta_2 \text{LnFDI}_{it} + \beta_3 \text{LnSEDU}_{it} + \beta_4 \text{LnURB}_{it} + \beta_5 \text{LnPHY}_{it} + \varepsilon_{it} \quad (1)$$

$$\text{LnIMR}_{it} = \alpha_i + \beta_1 \text{LnEG}_{it} + \beta_2 \text{LnFDI}_{it} + \beta_3 \text{LnTEDU}_{it} + \beta_4 \text{LnURB}_{it} + \beta_5 \text{LnPHY}_{it} + \varepsilon_{it} \quad (2)$$

$$\text{LnLE}_{it} = \alpha_i + \gamma_1 \text{LnEG}_{it} + \gamma_2 \text{LnFDI}_{it} + \gamma_3 \text{LnSEDU}_{it} + \gamma_4 \text{LnURB}_{it} + \gamma_5 \text{LnPHY}_{it} + \varepsilon_{it} \quad (3)$$

$$\text{LnLE}_{it} = \alpha_i + \gamma_1 \text{LnEG}_{it} + \gamma_2 \text{LnFDI}_{it} + \gamma_3 \text{LnTEDU}_{it} + \gamma_4 \text{LnURB}_{it} + \gamma_5 \text{LnPHY}_{it} + \varepsilon_{it} \quad (4)$$

As the infant mortality rate decreases, life expectancy will increases. Also, infant mortality's diminishing trend is supposed to be associated with increasing economic growth, fostering foreign flows, educating more people, moving from rural to urban areas, and rising physician members. This counter-relationship is plausibly true for infant mortality, but not for life expectancy. As life expectancy increases, each variable are supposed to increase. Therefore, β's will be negative, but γ's will posit on equation (3) and (4). In the ARDL model (Pesaran & Shin, 1998; Pesaran et al., 2001; Narayan, 2004), long-run and short-run elasticities will be exhibited as follows:

$$\begin{aligned}\Delta \text{LnIMR}_t = {} & \alpha_0 + \textstyle\sum_{i=1}^{z} \beta_{1i}\Delta\text{LnIMR}_{t-i} + \sum_{i=1}^{z} \gamma_{2i}\Delta\text{LnEG}_{t-i} \\ & + \textstyle\sum_{i=1}^{z} \rho_{3i}\Delta\text{FDI}_{t-i} + \sum_{i=1}^{z} \omega_{4i}\Delta\text{LnSEDU}_{t-i} \\ & + \textstyle\sum_{i=1}^{z} \sigma_{5i}\Delta\text{LnURB}_{t-i} + \sum_{i=1}^{z} \tau_{6i}\Delta\text{LnPHY}_{t-i} \\ & + \vartheta_1\text{LnEG}_{t-1} + \vartheta_2\text{FDI}_{t-1} + \vartheta_3\text{LnSEDU}_{t-1} \\ & + \vartheta_4\text{LnURB}_{t-1} + \vartheta_5\text{LnPHY}_{t-1} + \varepsilon_t \end{aligned} \tag{5}$$

$$\begin{aligned}\Delta \text{LnIMR}_t = {} & \alpha_0 + \textstyle\sum_{i=1}^{z} \beta_{1i}\Delta\text{LnIMR}_{t-i} + \sum_{i=1}^{z} \gamma_{2i}\Delta\text{LnEG}_{t-i} \\ & + \textstyle\sum_{i=1}^{z} \rho_{3i}\Delta\text{FDI}_{t-i} + \sum_{i=1}^{z} \omega_{4i}\Delta\text{LnTEDU}_{t-i} \\ & + \textstyle\sum_{i=1}^{z} \sigma_{5i}\Delta\text{LnURB}_{t-i} + \sum_{i=1}^{z} \tau_{6i}\Delta\text{LnPHY}_{t-i} \\ & + \vartheta_1\text{LnEG}_{t-1} + \vartheta_2\text{FDI}_{t-1} + \vartheta_3\text{LnTEDU}_{t-1} \\ & + \vartheta_4\text{LnURB}_{t-1} + \vartheta_5\text{LnPHY}_{t-1} + \varepsilon_t \end{aligned} \tag{6}$$

$$\begin{aligned}\Delta \text{LnLE}_t = {} & \alpha_0 + \textstyle\sum_{i=1}^{z} \beta_{1i}\Delta\text{LnLE}_{t-i} + \sum_{i=1}^{z} \gamma_{2i}\Delta\text{LnEG}_{t-i} \\ & + \textstyle\sum_{i=1}^{z} \rho_{3i}\Delta\text{FDI}_{t-i} + \sum_{i=1}^{z} \omega_{4i}\Delta\text{LnSEDU}_{t-i} \\ & + \textstyle\sum_{i=1}^{z} \sigma_{5i}\Delta\text{LnURB}_{t-i} + \sum_{i=1}^{z} \tau_{6i}\Delta\text{LnPHY}_{t-i} \\ & + \eta_1\text{LnEG}_{t-1} + \eta_2\text{FDI}_{t-1} + \eta_3\text{LnSEDU}_{t-1} \\ & + \eta_4\text{LnURB}_{t-1} + \eta_5\text{LnPHY}_{t-1} + \varepsilon_t \end{aligned} \tag{7}$$

$$\begin{aligned}\Delta \text{LnLE}_t = {} & \alpha_0 + \textstyle\sum_{i=1}^{z} \beta_{1i}\Delta\text{LnLE}_{t-i} + \sum_{i=1}^{z} \gamma_{2i}\Delta\text{LnEG}_{t-i} \\ & + \textstyle\sum_{i=1}^{z} \rho_{3i}\Delta\text{FDI}_{t-i} + \sum_{i=1}^{z} \omega_{4i}\Delta\text{LnTEDU}_{t-i} \\ & + \textstyle\sum_{i=1}^{z} \sigma_{5i}\Delta\text{LnURB}_{t-i} + \sum_{i=1}^{z} \tau_{6i}\Delta\text{LnPHY}_{t-i} \\ & + \eta_1\text{LnEG}_{t-1} + \eta_2\text{FDI}_{t-1} + \eta_3\text{LnTEDU}_{t-1} \\ & + \eta_4\text{LnURB}_{t-1} + \eta_5\text{LnPHY}_{t-1} + \varepsilon_t \end{aligned} \tag{8}$$

For these equations, is the intercept of the constant, is difference operator, Z is lag order, β, γ, ε, ρ, ω and σ are short-run coefficients and is the sign of error term. The null hypothesis of no long run-relationship for the first two models are $H_{0:}$ $\vartheta_1 = \vartheta_2 = \vartheta_3 = \vartheta_4 = \vartheta_5 = 0$ against H_1: $\vartheta_1 \neq \vartheta_2 \neq \vartheta_3 \neq \vartheta_4 \neq \vartheta_5 \neq 0$ and last two models $H_{o:}$ $\eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = 0$ against $H_{1:}$ $\eta_1 \neq \eta_2 \neq \eta_3 \neq \eta_4 \neq \eta_5 \neq 0$ Rejecting the null hypothesis under a certain level of significance, we can go further for short-run estimation. After accomplishing the ARDL model with F-statistic values proposed by Pesaran & Narayan bound limits, the error correction mechanism model (ECM) with single break dummy regressor on the equation is as follows:

$$\begin{aligned}\Delta \text{LnIMR}_t = {} & \delta_0 + \textstyle\sum_{i=1}^{Z} \delta_{1i}\Delta\text{LnIMR}_{t-i} + \sum_{i=1}^{Z} \delta_{2i}\Delta\text{LnEG}_{t-} \\ & + \textstyle\sum_{i=1}^{Z} \delta_{3i}\Delta\text{FDI}_{t-i} + \sum_{i=1}^{Z} \delta_{4i}\Delta\text{LnSEDU}_{t-i} \\ & + \textstyle\sum_{i=1}^{Z} \delta_{5i}\Delta\text{LnURB}_{t-i} + \sum_{i=1}^{Z} \delta_{6i}\Delta\text{LnPHY}_{t-i} \\ & + \theta\text{ECT}_{t-1} + \pi_1\text{D}_{1t} + \varepsilon_t \end{aligned} \tag{9}$$

$$\begin{aligned}\Delta \text{LnIMR}_t = {} & \delta_0 + \textstyle\sum_{i=1}^{Z} \delta_{1i}\Delta\text{LnIMR}_{t-i} + \sum_{i=1}^{Z} \delta_{2i}\Delta\text{LnEG}_{t-i} \\ & + \textstyle\sum_{i=1}^{Z} \delta_{3i}\Delta\text{FDI}_{t-i} + \sum_{i=1}^{Z} \delta_{4i}\Delta\text{LnTEDU}_{t-i} \\ & + \textstyle\sum_{i=1}^{Z} \delta_{5i}\Delta\text{LnURB}_{t-i} + \sum_{i=1}^{Z} \delta_{6i}\Delta\text{LnPHY}_{t-i} \\ & + \theta\text{ECT}_{t-1} + \pi_1\text{D}_{2t} + \varepsilon_t \end{aligned} \tag{10}$$

$$\begin{aligned}\Delta \text{LnLE}_t = {} & \delta_0 + \textstyle\sum_{i=1}^{Z} \delta_{1i}\Delta\text{LnLE}_{t-i} + \sum_{i=1}^{Z} \delta_{2i}\Delta\text{LnEG}_{t-i} \\ & + \textstyle\sum_{i=1}^{Z} \delta_{3i}\Delta\text{FDI}_{t-i} + \sum_{i=1}^{Z} \delta_{4i}\Delta\text{LnSEDU}_{t-i} \\ & + \textstyle\sum_{i=1}^{Z} \delta_{5i}\Delta\text{LnURB}_{t-i} + \sum_{i=1}^{Z} \delta_{6i}\Delta\text{LnPHY}_{t-i} \\ & + \theta\text{ECT}_{t-1} + \pi_1\text{D}_{3t} + \varepsilon_t \end{aligned} \tag{11}$$

$$\begin{aligned}\Delta \text{LnLE}_t = {} & \delta_0 + \textstyle\sum_{i=1}^{Z} \delta_{1i}\Delta\text{LnLE}_{t-i} + \sum_{i=1}^{Z} \delta_{2i}\Delta\text{LnEG}_{t-i} \\ & + \textstyle\sum_{i=1}^{Z} \delta_{3i}\Delta\text{FDI}_{t-i} + \sum_{i=1}^{Z} \delta_{4i}\Delta\text{LnTEDU}_{t-i} \\ & + \textstyle\sum_{i=1}^{Z} \delta_{5i}\Delta\text{LnURB}_{t-i} + \sum_{i=1}^{Z} \delta_{6i}\Delta\text{LnPHY}_{t-i} \\ & + \theta\text{ECT}_{t-1} + \pi_1\text{D}_{4t} + \varepsilon_t \end{aligned} \tag{12}$$

Here, ECT or error correction term describes the statistically significant adjustment speed through short-run equilibrium between 0 to −1. For ARDL, some post estimations are needed to ensure parameters estimation (CUSUM & CUSUMSQ test for stability, normality through Jarque-Bera statistic, heteroscedasticity through Breusch-Pagan-Godfrey, and serial correlation by Breusch-Godfrey Serial Correlation LM Test.

4. Results

4.1. Descriptive Statistics

Basic statistics of the study variable are provided in Table 2. As heteroscedasticity is an excellent thread to econometric analysis, each variable is converted on a natural logarithm except foreign direct investment (FDI). Mean, median, maximum, and minimum values are connected to each other. Standard deviation (SD) explains about scattered or well-centered data. Almost all variables are closely observed with average. Except for urbanization (UPG), each exhibits normality under Jarque-Bera statistic. This overall basic descriptive is carried out for Bangladesh from 1980 to 2018.

Table 2: Descriptive Statistics of Variables

	LNIMR	LNLE	LNFDI	LNSEDU	LNTEDU	LUPG	LNPH	LNEG
Mean	4.1599	4.1485	0.4197	3.6159	1.9023	1.4467	–1.4224	6.3269
Median	4.2047	4.1726	0.2850	3.8339	1.7284	1.3560	–1.5089	6.2312
Maximum	4.8949	4.2811	1.3186	4.2862	3.0236	2.3745	–0.5597	7.0928
Minimum	3.2229	3.9684	–0.0299	2.8244	1.1301	1.1586	–2.1203	5.8846
SD.	0.5169	0.1015	0.4459	0.4627	0.5280	0.2465	0.4352	0.3596
Skewness	–0.2344	–0.3526	0.5418	–0.3408	0.6909	2.0084	0.3085	0.6278
Kurtosis	1.7941	1.7242	1.7740	1.6302	2.2732	7.7906	2.0240	2.1390
Jarque-Bera	2.7204	3.4531	4.3505	3.8042	3.9615	63.5117	2.1666	3.7668
Probability	0.2566	0.1779	0.1136	0.1493	0.1380	0.0000	0.3385	0.1521
Observations	39	39	39	39	39	39	39	39

Table 3: Unit Root Test of Study Variables

	ADF				PP			
	Level		1st Difference		Level		1st Difference	
	Intercept	Intercept with Trend	Intercept	Intercept with Trend	Intercept	Intercept with Trend	Intercept	Intercept with Trend
LNIMR	0.833	–3.568**	–4.056***	–1.797	6.7187	–8.2929***	–7.020***	–0.9184
LNLE	–6.954***	–0.935	–1.4696	–4.6754***	–2.8338*	0.8175	–0.3742	–1.7015
LNFDI	0.0340	–1.9561	–3.0747**	–2.9719	–0.9548	–3.2225*	–8.0817***	–8.0442***
LNEG	9.4265	1.2768	0.2273	–2.9628	9.4144	1.3274	–1.7955***	–7.5683***
LNSEDU	–1.465	–4.1445	–2.314	–3.2115	–0.5169	–1.748	–4.9256***	–4.9145***
LNTEDU	0.9151	–0.8507	–4.0888	–4.119***	0.5719	–1.1462	–4.2192***	–4.0944**
LNUPG	1.3441***	–0.6939***	–5.8551	–6.2052***	1.6237***	–0.6939***	–5.8551***	–6.3277***
LNPH	–4.2993	–6.5852	–11.3658	–10.411***	–4.9079	–5.5694	–4.4102***	–4.4472***

Notes: (*) Significant at the 10%; (**) Significant at the 5% and (***) Significant at the 1%. All values are under MacKinnon (1996) one-sided *p*-values.

This study uses ARDL (Autoregressive distributed lag) model promulgated by Pesaran, Shin, and Smith (2001). ARDL needs some strong assumptions to work. It is only applicable when variables are stationary at I (0) or I (1) or mixed series. Two traditional unit root tests (Augmented Dickey-Fuller, and Philips-Perron) are used in this study. Results are provided in Table 3. Except for infant mortality (IMR) and life expectancy (LE), all variables are stationary at first difference. Thus, we can ensure that our study variables are stationary. Unit roots without structural break undertake the effect of random shocks as temporary and do not impede on model estimation. A study disproves this statement (Nelson & Plosser, 1982). Also, Baum (2018) suggests analyzing econometric data within a structural break. Hence, we employ a single unit root break with endogenous as Zivot-Andrews test (Zivot and Andrews, 1992) in Table 4. The Z-A test provides a structural break with a circulating sequential *t*-statistic, as it is based on the minimum breakpoint *t*-value at the breakpoint. Though several breaks are found, we considered a single break as endogenous in 1990. As climate hazard and elementary education are mandatory in 1990; hence, a dummy is generated (1990 onwards 1 and others as 0) to fit our parsimonious model.

For estimating the ARDL model, the null hypothesis of long-run coefficients needs to be rejected through *F*-statistic values. If *F*-statistic surpasses the lower and upper bound

Table 4: Zivot Andrews Structural Break Test of Variables

	Trend	Intercept with Trend		Trend	Intercept with Trend
LNIMR	–3.593 (2004)	–3.702 (2002)	D(LNIMR)	–2.788 (1994)	–2.698 (1990)
LNLE	–4.895** (1995)	–5.141 (1990)	D(LNLE)	–5.956*** (1990)	–5.141*** (1991)
LNFDI	–3.585 (1992)	–4.499 (2004)	D(LNFDI)	–7.303*** (2006)	–7.798 *** (2003)
LNEG	–1.190 (2000)	–1.130 (1999)	D(LNEG)	–7.696 *** (2003)	–8.488*** (2005)
LNSEDU	–2.164 (1997)	–3.991 (1991)	D(LNSEDU)	–4.901** (2007)	–5.473*** (1990)
LNTEDU	–5.114 (2003)	–5.126 (2002)	D(LNTEDU)	–5.705 *** (1987)	–6.880 (1990)
LNUPG	–5.318*** (2012)	–6.031*** (2001)	D(LNUPG)	–7.016*** (1987)	–7.745*** (1987)
LNPH	–3.342 (2001)	–3.741 (1996)	D(LNPH)	–6.619*** (1987)	–6.795*** (1998)

Notes: (*) Significant at the 10%; (**) Significant at the 5% and (***) Significant at the 1%.

Table 5: ARDL *F*-Statistic with Lower & Upper Bound Values

Postulated model	*F*-statistic	Lower bound	Upper bound	Decision
Eq. (7), model 1	9.52	3.93	5.23	Cointegration exist
Eq. (8), model 2	7.42	3.50	4.63	Cointegration exist
Eq. (9), model 3	12.73	3.93	5.23	Cointegration exist
Eq. (10), model 4	31.23	3.93	5.23	Cointegration exist

Each Cointegration takes as 5 Lags.

under a certain level of significance, then the null hypothesis of no cointegration is rejected. Results are provided on Table 5. Each equation rejects null hypothesis at 1% level of significance and evidence proves that our postulated model is suitable for the cointegration relationship. Lag selection criteria are undertaken by Akaike's Information Criteria (AIC) as 3.

For the short-run and long-run elasticities, our estimates are given in Table 6. A dummy is implemented in the three models, as its effect is significant in the short run. After the Z-A test, some variables found a break in 1990. So, this structural and endogenous break is considered in this study. For the first two models, the effect of study variables is given under the infant mortality rate (IMR). In long-run elasticities, under a particular condition, infant mortality (LnIMR) will statistically increase 1 unit if economic growth (LnEG) will decrease 0.332, neglecting others' effect, foreign investment will statistically decrease 0.335 unit. So, the impact of economic development (LnEG) and foreign investment (LnFDI) are statistically significant with negative sign, and urbanization (LnUPG) with positive sign with infant mortality and life expectancy. There is a significant effect of a physician with dependent variables. When secondary education is in the model, the coefficient is statistically negative, otherwise positive. In the long run, statistical evidence does not suggest a relationship between secondary education and infant mortality rate and life expectancy.

In short-run estimates, the error correction term is significant at 1% for each model. This describes an adjustment toward a long-run equilibrium relationship for all models if there is a shock in the short run. More specifically, deviation from the long-term equilibrium is corrected by about 16 percent each year of the first model. In short-run coefficients, secondary education elasticities are negative, but statistically significant with the model (1). For the four models, the effect of foreign investment, economic growth, and physician's involvement statistically promote infant mortality decline and life expectancy increase. On model (1) and (3), urbanization is statistically negatively associated with infant mortality and life expectancy. In this study, the ARDL model with the trend is employed in the unit root; variables are stationary on-trend. In addition, the trend coefficient is short-run elastically significant in the study model.

Table 6: Short Run & Long Run Estimates of Parsimonious ARDL Model

	Dependent variables			
	LnIMR		LnLE	
	Model 1	Model 2	Model 3	Model 4
Lag structure	(1, 0, 3, 3, 2, 1)	(2, 1, 3, 0, 0, 1)	(1, 0, 2, 0, 2, 0)	(2, 2, 2, 2, 2, 2)
Long run estimates				
LnEG	–0.3332***	–0.2591**	–0.2114***	–0.4612***
LnFDI	–0.0352***	–0.0469**	–0.0196	–0.0073
LnSEDU	–0.0247	–	–0.0155	
LnTEDU	–	0.0018	–	0.0447**
LnUPG	–0.0675	0.1359**	–0.1392**	0.0216
LnPHY	0.1364	0.2131**	0.0620**	0.3103**
Short run estimates				
Constant	1.2126***	0.6511***	0.60***	0.2537***
D(LNIMR(–1))		–0.2997*	–	–
D(LNILE(–1))	–			0.9798***
D(LNEG)		0.0224		0.0009
D(LNEG(–1))				0.0064**
D(LNFDI)	–0.0008	–0.0005	–0.0006	0.0003**
D(LNFDI(–1))	0.0057***	0.0048***	0.0009**	0.0005***
D(LNFDI(–2))	0.0026***	0.0032***		
D(LNSEDU)	–0.0148***	–		
D(LNSEDU(–1))	–0.0027	–		
D(LNSEDU(–2))	–0.0153***	–		
D(LNTEDU)	–		–	0.0007*
D(LNTEDU(–1))	–		–	0.0009**
D(LUPG)	–0.0018		–0.0138***	0.0010***
D(LUPG(–1))	0.0076***		0.0020**	–0.0006*
D(LNPH)	0.0120***	0.0124**		0.0037***
D(LNPH(–1))				–0.0031***
DUM	–	–0.0022**	0.0005	–0.0007***
TREND	–0.0073***	–0.0053***	0.0017***	0.0003***
ECT(–1)	–0.1664***	–0.1014***	–0.1105***	–0.0352***
Diagnostic test	**Statistic (df)**			
Normality	0.7026	0.3193	1.561	0.7453
Heteroscedasticity	1.34 (16, 19)	2.847 (14, 21)	1.38 (12, 24)	3.859 (19, 17)
Serial correlation	1.023 (2, 17)	0.0267 (2, 19)	5.023 (2, 22)	0.346 (2, 15)
Test	**Decision**			
CUSUM	Stable	Stable	Stable	Stable
CUSUMSQ	Stable	Stable	Stable	Stable

5. Conclusion and Policy Implications

This study investigates the effect of FDI on the health and income of Bangladesh from 1980 to 2018. We attempt to analyze time series with two health-related variables, infant mortality and life expectancy as the dependent variable. Infant mortality rate and life expectancy are log-transformed, as they were right-skewed (Wooldridge, 2002). Population health is a robust predictor of growth in per capita income (Bhargava et al., 2001). For robustness, we added physicians per thousand patients. Also, urbanization is crucial for stabilizing our effect on health issues. Traditional and structural break unit tests are performed to check stationarity. We use the single break as a dummy for the Auto-regressive distributed lag model (ARDL). Diagnostic tests and CUSUM and CUSUMSQ tests are stable and reliable with our postulated model. Autocorrelation, heteroscedasticity, and specification error do not occur in this econometric model. F-statistic on bound test agrees to have a long-run relationship of our four econometric models. We added a break and trend effect for models 3 and 4, respectively. Both delays significantly after the shock of the break point. In 1990, the government implemented several laws to make elementary level education mandatory. For this condition, we consider a breakthrough Zivot-Andrews single structural break test.

In the long run, both income and foreign investment impede infant mortality and life expectancy with 1% significance. Due to a lack of policy and supervision, FDI promotes health hazard. Health can enhance cognitive function and higher school attendance, allowing children to become better educated, higher-earning adults (Bloom, 2005). Although NGOs and other community levels are working on the ground level, infant mortality still occurs, and life expectancy lessens. We ensure much success in the last two decades as targeted by SDG. After the breakpoint, the effect of variables decreases. This signifies that structural break retards onward of our model. We consider educational attainment as a proxy of human capital (Antràs et al., 2015; Daude & Stein, 2007; Barro & Lee, 2013). So, educational attainment is progressing, and it will ensure a better economy and a healthier family. Physician's impact is undercover and unseen by government and other private institutions. This can stimulate health security and lessen infant mortality. In addition, the interest of investors toward health sectors is neglected, influencing the negative effect on health hazard in the long run. Donors need to pay more attraction toward health securities, and government needs to concentrate on it more actively. More policies on hygiene and life insurance policies are to be implemented to propel Bangladesh's economy into a better future.

References

Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). Institutions as a fundamental cause of long-run growth. *Handbook of Economic Growth*, *1*, 385–472.

Ali, M., & Malik, I. R. (2017). Impact of foreign direct investment on economic growth of Pakistan. *Gyancity Journal of Electronics and Computer Science, 4*(2), 1–12.

Antras, P., & Foley, C. F. (2015). Poultry in motion: a study of international trade finance practices. *Journal of Political Economy*, *123*(4), 853–901.

Anyanwu, J. C. (2011). International remittances and income inequality in Africa. *Review of Economic and Business Studies*, *4*(1), 117–148.

Azemar, C., & Desbordes, R. (2009). Public governance, health and foreign direct investment in Sub-Saharan Africa. *Journal of African Economies*, *18*(4), 667–709.

Barro, R. J., & Lee, J. W. (2013). A new data set of educational attainment in the world, 1950–2010. *Journal of Development Economics*, *104*, 184–198.

Bhargava, A., Jamison, D. T., Lau, L. J., & Murray, C. J. (2001). Modeling the effects of health on economic growth. *Journal of Health Economics*, *20*(3), 423–440.

Bloom, B. S. (2005). Effects of continuing medical education on improving physician clinical care and patient health: a review of systematic reviews. *International Journal of Technology Assessment In Health Care*, *21*(3), 380.

Burns, D. K., Jones, A. P., Goryakin, Y., & Suhrcke, M. (2017). Is foreign direct investment good for health in low and middle income countries? An instrumental variable approach. *Social Science & Medicine*, *181*, 74–82.

Daude, C., & Stein, E. (2007). The quality of institutions and foreign direct investment. *Economics & Politics*, *19*(3), 317–344.

Donwa, P. A., Mgbame, C. O., & Julius, O. M. (2015). Corruption in the oil and gas industry: Implication for economic growth. *Nigerian Chapter of Arabian Journal of Business and Management Review*, *62*(2468), 1–16.

Erçelik, G. (2018). The relationship between health expenditure and economic growth in Turkey from 1980 to 2015. *Journal of Politics*, *1*(1), 1–8.

Escobar, A. (2000). Beyond the search for a paradigm? Post-development and beyond. *Development*, *43*(4), 11–14.

Faruk, M. O. (2013). The effect of FDI to accelerate the economic growth of Bangladesh and some problems & prospects of FDI. *Asian Business Review*, *2*(2), 95–101.

Gilligan, A. M., & Skrepnek, G. H. (2015). Determinants of life expectancy in the Eastern Mediterranean Region. *Health Policy and Planning*, *30*(5), 624–637.

Gökmenoğlu, K. K., Apinran, M. O., & Taşpınar, N. (2018). Impact of foreign direct investment on human development index in Nigeria. *Business and Economics Research Journal*, *9*(1), 1–14.

Golkhandan, A. (2017). The impact of foreign direct investment on health in developing countries. *Health Research*, *2*(4), 235–243.

Herzer, D., & Nunnenkamp, P. (2012). The effect of foreign aid on income inequality: Evidence from panel cointegration. *Structural Change and Economic Dynamics*, *23*(3), 245–255.

Ilori, I. A., & Ajiboye, M. O. (2015). The impact of health expenditure on the growth of the Nigerian economy: The ARDL approach. *International Journal of Economics, Commerce and Management: United Kingdom*, *3*(12).

Iqbal, M. S., Shaikh, F. M., & Shar, A. H. (2010). Causality relationship between foreign direct investment, trade and economic growth in Pakistan. *Asian Social Science*, *6*(9), 82.

Li, X., & Liu, X. (2005). Foreign direct investment and economic growth: an increasingly endogenous relationship. *World Development*, *33*(3), 393–407.

Magombeyi, M. T., & Odhiambo, N. M. (2017). Foreign direct investment and poverty reduction. *Comparative Economic Research*, *20*(2), 73–89.

Nagel, K., Herzer, D., & Nunnenkamp, P. (2015). How does FDI affect health?. *International Economic Journal*, *29*(4), 655–679.

Narayan, P. (2004). Reformulating critical values for the bounds F-statistics approach to cointegration: an application to the tourism demand model for Fiji. *Australia: Monash University*. *2*(4).

Nelson, C. R., & Plosser, C. R. (1982). Trends and random walks in macroeconmic time series: some evidence and implications. *Journal of Monetary Economics*, *10*(2), 139–162.

Nguyen, H. H. (2020). Impact of foreign direct investment and international trade on economic growth: Empirical study in Vietnam. *Journal of Asian Finance, Economics and Business, 7*(3), 323–331. https://doi.org/10.13106/jafeb.2020.vol7.no3.323

Nguyen, L. P., & Pham, V. H. T. (2020). Trade of ICT products, government, and economic growth: Evidence from East Asia-Pacific region. *Journal of Asian Finance, Economics and Business*, *7*(8), 175–183. https://doi.org/10.13106/jafeb.2020.vol7.no8.175

Olilingo, F. Z., & Putra, A. H. P. K. (2020). How Indonesia Economics Works: Correlation Analysis of Macroeconomics in 2010–2019. *Journal of Asian Finance, Economics and Business*, *7*(8), 117–130. https://doi.org/10.13106/jafeb.2020.vol7.no8.117

Pesaran, H. H., & Shin, Y. (1998). Generalized impulse response analysis in linear multivariate models. *Economics Letters*, *58*(1), 17–29.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326.

Pyatt, G. (1987). Measuring welfare, poverty and inequality. *The Economic Journal*, *97*(386), 459–467.

Saqib, N., Masnoon, M., & Rafique, N. (2013). Impact of foreign direct investment on economic growth of Pakistan. *Advances in Management & Applied Economics*, *3*(1), 35–45.

Shahbaz, M., Shahzad, S. J. H., Ahmad, N., & Alam, S. (2016). Financial development and environmental quality: The way forward. *Energy Policy*, *98*, 353–364.

Siddique, H. M. A., & Majeed, M. T. (2015). Energy consumption, economic growth, trade and financial development nexus in South Asia. *Pakistan Journal of Commerce and Social Sciences*, *9*(2), 658–682.

Sikwila, M. N., Karedza, G., & Sikwila, Y. L. (2017). Foreign Direct Investment Inflows into Zimbabwe. *Mediterranean Journal of Social Sciences*, *8*(5 S1), 43.

Smith, J. A. (2004). Reflecting on the development of interpretative phenomenological analysis and its contribution to qualitative research in psychology. *Qualitative Research in Psychology*, *1*(1), 39–54.

Stiglitz, J. E., & Charlton, A. (2006). Aid for trade. *International Journal of Development Issues*, *5*(2), 1–41.

Solanki, S., Inumula, K. M., & Chitnis, A. (2020). Sectoral Contribution to Economic Development in India: A Time-Series Co-Integration Analysis. *Journal of Asian Finance, Economics and Business*, *7*(9), 191–200. https://doi.org/10.13106/jafeb.2020.vol7.no9.191

Tariq, R., Khan, M. A., & Rahman, A. (2020). How does financial development impact economic growth in Pakistan?: New evidence from threshold model. *Journal of Asian Finance, Economics and Business*, *7*(8), 161–173. https://doi.org/10.13106/jafeb.2020.vol7.no8.161

Umoh, O. J., Jacob, A. O., & Chuku, C. A. (2012). Foreign direct investment and economic growth in Nigeria: An analysis of the endogenous effects. *Current Research Journal of Economic Theory*, *4*(3), 53–66.

Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. Cambridge, MA: MIT Press.

Zivot, E., & Andrews, D. (1992). Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis. *Journal of Business and Economic Statistics, 10*(3), 251–270.