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Relationship between Health, Education and Labour Productivity in South Asia

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ABSTRACT

This study aims to assess the relationship between health, education, and labour productivity for five South Asian countries over 1991-2019 by applying the Ordinary Least Square (OLS), Fixed Effects (FE) model, Random Effects (RE) model, and the Generalized Method of Moments (GMM). The study confirms that health and education are increasing factors of labour productivity. The empirical results showed that health, measured by prevalence of undernourishment, education, and physical capital, is helpful in enhancing productivity of labour, while increasing the number of workers is inversely related to labour productivity. The study recommends that South Asian countries should focus on the improvement of health facilities and educational institutes to boost the efficiency of their labour force which can lead to economic growth.

Keywords: Undernourishment, Education, Labour Productivity, GMM.

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1. INTRODUCTION

Workers are a notable asset of any organisation, and a country cannot progress without workers' participation (Mostahsan and Mirzaee 2013). In any procedure of manufacturing, manpower plays a key role in boosting productivity. Human and physical capital are the two main capital resources of industrial development. The main reason of underdevelopment is often low level of productivity, while high productivity increases economic growth and commercial/social activities. In the industrial sector, improvement in labour productivity affects the quality of goods, reduces cost and impacts production capacity. In a comfortable environment, people work hard and efficiently perform their duties. Productivity is negatively affected when employees are insecure about their jobs. When individuals are interested in a particular task, they definitely achieve their goal (Downes 2001).

The most important asset of human life is health (Aguayo-Rico et al., 2005). A healthy worker has more capacity to work as compared to an unhealthy person. Good health enables skill development and capabilities that lead to income growth (Siddique et al., 2018). If health is not good, workers are trapped in physical and mental weaknesses and their lives are affected badly.

Health problems also create barriers in the way of economic progress. Ainsworth and Over (1994) examined the impact of poor health in African workers and found that AIDS was widespread in young employees and affecting local savings rate and productivity. Empirical literature also shows linkage between health and income and how income, consumption and wealth improve with better health (Smith 1999). Health, population, and democracy have been found to have a positive impact on economic growth and output (Biyase and Malesa 2019; Bloom et al., 2001; Siddique et al., 2018).

Education is another important indicator for the improvement of an economy. All the developed states in the world focus on quality of education. There is positive correlation between education and labour productivity (Ullah et al., 2019). Prosperous nations invest in education and build a framework for the success of their country. Investing in higher education not only increases labour productivity but also strengthens the economy (Afzal et al., 2011). Yet, the relationship between economic growth and education may not be significant all the time (Morote 2000), other economic as well as non-economic variables influence this association.

Korkmaz and Korkmaz (2017) discuss that due to globalisation, competition between countries has become intense. To gain advantage in business, each country makes technological improvements. By using modern technology, the cost of production reduces and productivity increases. An economy's output increases by enhancing factors of production.

Human capability and proficiency are immediately affected through disease or morbidity; therefore, health has direct influence on human social welfare and well-being. Health is essential to increase productivity. Workers' health can be improved by increasing the health budgets, which can also enhance the ability to fight diseases.

The present study looks at the relationship between human health, education, and labour productivity in South Asian countries for 1990-2019. A review of select prior studies is presented in Section Two. In Section Three, theoretical framework is described. Sections Four and Five provide a description of the variables, methods as well as the data used for estimation in the study. Sections Six and Seven include study findings and conclusion.

2. LITERATURE REVIEW

The purpose of this section is to provide an overview of prior studies on the relationship between health and productivity. Bhargava et al., (2001) examined how health effected economic growth of low-income countries from 1965-1919, using the Random Effects model. Study used Adult Survival Rates (ASR) as health indicator and tested its effect on GDP. The results showed positive effects of ASR on GDP. It recommended that the foremost focus of policymakers should be on health that affects economic performance. Bloom et al., (2001) also investigated health and economic growth for the time period 1960-1990, using panel data of ten countries. The study showed that work experience and health are also used for human capital. Outcomes showed that there was cross-country variation in work experience and differences in the rates of economic growth. It recommended that output could increase by 4% with 1% increase in life expectancy.

Mayer (2001) found that improvement in health increased growth in the long run for 18 Latin American countries from 1950-90, using Granger Causality Test. Huq et al., (2014) studied the influence of health on productivity in Bangladesh, using statistics by taking data from respondents for the age of 16-65 from a nationally representative Household Income Expenditures Survey 2005 by taking a sample of 48,969 individuals and 10,080 households. Data was collected on the basis of consumption, expenditures and income. The results showed that living standards as well as household wages improved when health conditions improved. The study recommended that national policies should be enforced to maintain economic growth and social stability for the welfare of people. Gong et al., (2012) scrutinised the linkage between health, capital accumulation and economic growth for China for 1979-2003, using Fixed Effects and Random Effects models. Findings showed that health level and health growth rate were positively linked with economic growth. Ljunge (2016) investigated the relationship between migrants, health and happiness in 30 European countries, using Two-Stage Least Squares (2SLS) model. Study indicated that causality existed from social conditions to health and well-being. Muslim immigrants faced more health penalties as compared to non-Muslim immigrants.

This showed that health was a more important indicator than demographic determinants. Policymakers should focus on health for better standard of living. Gupta and Mitra (2004) also examined the linkage between economic growth and health for 15 states of India for the period of 1970-1990. Results showed that health and economic growth had positive association. Study revealed that healthy people were more productive, and ultimately led to higher growth. Saha (2013) revealed that a one-way relationship existed between life expectancy and Total Factor Productivity (TFP) growth for the period of 1961-2008, using conventional growth accounting methods for India. Study showed that healthy persons were more efficient and productive, therefore, health was important for human development. Regression analysis showed that improvement in health condition affected TFP growth significantly and positively.

Cole and Neumayer (2006) showed that unhealthy people were less productive, and poor health was responsible for weaker development. Underdevelopment and poverty caused many factors that influenced productivity negatively, such as water borne diseases, lack of clean drinking water, sanitation, malnutrition, medical facilities, and preventive medicines. The findings revealed that poor health significantly led to decrease in TFP. Ecevit (2013) investigated the impact of life expectancy on growth for 21 OECD countries for the period 1970-2010. Findings showed that health played an important role in economic growth. Soriano and Garrido (2016) investigated the role of economic growth for solving undernourishment issues for 27 developing countries for the period 1991-2012. The findings showed that annual undernourishment rate improved due to faster annual growth rate.

The relationship between education, health and economic growth has also been studied. Boyle et al., (2006) examined the impact of economic growth, maternal education, and domestic wealth on child health for 42 developing countries for the period 1994-2003. Findings showed that significant variations existed across the country regarding child health. Child health as well as level of health was affected by maternal education. Hongyi and Huang (2009) investigated the relationship between health, education, and economic growth in the Chinese economy. The study used panel data by taking 28 provinces of China for the period 1978-2005. Both education and health were proven as determining factors of economic growth. The study recommended that policymakers should focus on education investment rather than health investment for the improvement of economic growth in China. Faridi et al., (2010) studied factors of employment in Pakistan for the period 2008-09. Results showed that education and worker status were significant indictors of employment.

Siddiqui and Rehman (2017) studied nine East and South Asian countries for the period 1972-2014, using the Empirical Bayesian (EB) model. Findings showed that in East Asian countries, fluctuations in economic growth occurred due to levels of primary as

well as secondary education. However, in South Asian countries, tertiary education and vocational education were found to be beneficial for economic growth. In both regions, government expenditures on education had a positive effect on growth. According to Afzal et al., (2012), education increased economic growth and decreased poverty by increasing productivity in Pakistan for 1971-72 to 2009-10, using ARDL model. The study recommended that pro-poor growth policies should be adopted in Pakistan. Babalola (2011) found the long-term linkage between economic growth and education during 1977-2008 in Nigeria. The outcomes also confirmed one-way causality that moved from economic growth to education. The connection between higher education and economic growth was scrutinised by Gyimah-Brempong et al., (2006) in Africa for 1960-2000. The study showed that in African countries, education had positive impact on per capita income growth rate. Ogunniyi (2018) confirmed long-term linkage between human capital and growth for the Nigerian economy during 1981-2014 using ARDL approach.

Overall, there is considerable empirical literature which attempts to study education and health as independent variables that impact labour productivity. Yet, more evidence is needed to understand the holistic relationship between health, education, and labour productivity, particularly important in the context of South Asia because it represents a vastly under-researched area.

3. THEORETICAL FRAMEWORK

According to Downes (2001), productivity means at what level of output can be produced with the help of inputs in well-organised way by a firm or economic entity. Inputs may be categorised into non-human as well as human resources, i.e., raw material, labour, capital, and resources. In the production process, the quality of input matters for higher yield and productivity. Productivity is a mix of efficiency and effectiveness, and human resource is a key element for improving productivity.

By advancement of human resources, the foundation of firms, targeted productivity can be achieved. Boosting human efficiency, knowledge, skills, creativity, training, and productivity is possible with healthcare improvements. Education builds cognitive and non-cognitive abilities in people. Cognitive abilities or skills mean non-stop development of skills and knowledge. Non- cognitive abilities or skills mean the acceptance of mind-sector thoughts which are suitable for the development of society and for individuals.

Educational institutes particularly schools play a vital role in Human Resource Development. Economic growth means increasing the production of goods with the passage of time.

According to Ross and Wu (1995), education helps people fight against stress and depression and cope against disease. Educated people have knowledge how to release their stress and how to overcome their problems. Education expands knowledge to

interpret and solve issues on various levels and boost human potential. People having education and experience can achieve their goals and standard of living in a better way than others. Educated people often have healthy life behaviors and take all the measures that protect their lives.

To test the productivity or yield of a healthy labourer, productivity was considered an dependent variable, whereas health an independent variable and for this purpose prevalence of undernourishment was taken as the proxy of health (Cole and Neumayer 2006; Siddique et al., 2020). For education, enrollment in secondary school was used as a key variable (Shahid et al., 2019). This study also used labour and capital as independent variables. By adding the mentioned variables, the following equation was formed:

$$LP_{it} = \gamma_0 + \gamma_1 L_{it} + \gamma_2 K_{it} + \gamma_3 POU_{it} + \gamma_4 ED_{it} + \varepsilon_{it} \qquad (Eq\ 1)$$

Where, *i* was used for cross-sectional units and *t* showed time span of 1991-2019. The expression *LP* was applied in favour of labour productivity while *L*, *K* and *ED* indicate labour, capital and education, respectively. *POU* showed the prevalence of undernourishment. The term γ_0 is intercept, $\gamma_1, \gamma_2, \gamma_3$ and γ_4 indicate elasticity of labour, capital, undernourishment, and education with respect to productivity.

4. METHODOLOGY

In cross-country analysis, various methods are used for empirical analysis. This study checked the impact of health on worker productivity by using panel data techniques such as panel OLS, Fixed Effects and Random Effects (RE) models. The advantage of panel data is that it holds more degree of freedom due to more sample variability. The study also employed Generalized Method of Moments (GMM). In FE model, the intercept of all cross-sectional units differs because of special features of every country, whereas in the RE model, the intercept of every cross section was arbitrarily drawn (Siddique et al., 2018). GMM mostly corresponded to the first order conditions of dynamic optimisation problem, in this scenario, the GMM model was considered a natural estimation framework.

5. DATA

The purpose of this study was to examine the link between human health and labour productivity for South Asian countries during the period 1991-2019. The data was extracted from World Development Indicators (WDI).

In this study, Labour Productivity (LP) was taken as a dependent variable measured as the GDP per employee; Productivity - the sum of goods and services produced by a worker

during a specific period of time; LP - proportion of GDP transformed to 2017 constant international USD at Purchasing Power Parity (PPP) rates.

In this study, health was the main independent variable measured by Prevalence Of Undernourishment (POU). Undernourishment means the deficiency of energy or nutrients in an individual's diet. Poor people are mostly affected by undernutrition. Due to ill health, healthcare expenditures increase, productivity reduces and ultimately, economic growth decreases. Data was measured in numbers, for example, if the value was 7, it signified POU below 7%.

In the study, labour (L) was taken as an independent variable and taken for population above the age of 15 years from WDI. Due to skills and capacities, developed country workers are more productive than those in developing countries (Arabi and Abdalla 2013). Faridi et al., (2010) used primary data and a field survey method to study the effect of education and health on employment in Pakistan. Physical capital (K) plays an important role in the production process. In this study, capital was seen as an independent variable which meant buildings, machinery and equipment used for producing goods. By increasing investment in physical capital, productivity, and economic growth increases. Education plays a vital role increasing the productivity of labour and as a result economic growth increases (Mostahsan and Mirzaee 2013). Here, education (ED) was measured by secondary school enrollment similar to Siddiqui and Rehman (2017) for East Asian countries.

5.1. Correlation among Variables

The results demonstrated that a positive correlation exists between capital (K) and labour productivity (LP). The relationship between education and worker productivity was also positively associated. Labour and POU had negative signs which indicated that both had inverse correlation with LP. Table 1 describes the correlation among variables:

Table 1: Correlation Matrix

Variables	LP	L	K	POU	ED
LP	1.0000	-	-	-	-
L	-0.5601	1.0000	-	-	-
K	0.1848	-0.3464	1.0000	-	-
POU	-0.3652	-0.1608	0.2317	1.0000	-
ED	0.6385	-0.0442	0.2735	-0.5917	1.0000

Source: Authors' calculations.

6. RESULTS

This section indicates the results of panel OLS, FE model, RE model and GMM. The results are depicted in the Table 2.

The results of panel OLS revealed that undernourishment had an inverse relation with productivity. The coefficient of POU was -0.45 which indicated that a 1% change in POU caused -0.45% variation in worker productivity with 0.0031 probability which was statistically significant. Education played a vital role, as the coefficient showed that a 1% rise in education brought 0.4158% increase in productivity of workers. Capital insignificantly decreased productivity because it had the coefficient of -0.0208. Labour was negatively associated with productivity. According to the Law of Diminishing Marginal Productivity, productivity of additional unit of labour decreases by increasing the labour force. The same was found by Siddique et al., (2020).

The empirics of FE model showed that health was helpful for productivity because the coefficient of undernourishment was negative which indicated that a 1% rise in POU caused decrease in labour productivity by 0.0018%. Education improved labour productivity by 0.0943% and capital improved productivity by 0.4272% due to 1% increase in both education and capital. The negative coefficient of labour indicated that more workers are not beneficial for productivity.

The findings of RE model specified that health and education lead to enhancing labour productivity which meant that a 1% rise in POU led to 0.4533% decrease, whereas education led to 0.4158% increase in productivity. Labour had the coefficient of -2.8508 which was harmful for its productivity, while capital insignificantly improved labour productivity.

In the GMM model, the lag of worker productivity was used, and the coefficient was 0.9911 and statistically significant. The results revealed that a 1% increase in education brought 0.0215% change in worker productivity. The coefficient of undernourishment was -0.0145 which indicated that a 1% change in POU caused -0.0145% decrease in productivity of labour. Education and capital had positive effects on worker productivity. The coefficient of capital (0.0070) had positive and significant correlation.

The results were found to be statistically significant and consistent with the literature (see, for example, Ullah et al., 2019; Huq et al., 2014; Jamison et al., 2010; Gong et al., 2012; Siddique et al., 2018; Siddique et al., 2020; Mehmood et al., 2022).

Table 2: Empirical Results

Variables	Dependent Variable: Labour Productivity							
	Panel OLS		FE Model		RE Model		GMM Model	
	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
LP(-1)							0.9911	0.0000
L	-2.8508	0.0000	-1.5948	0.0000	-2.8508	0.0000	-0.0127	0.5451
K	-0.0208	0.5005	0.4272	0.0000	0.0208	0.4697	0.0070	0.0012
POU	-0.4533	0.0031	-0.0018	0.9426	-0.4533	0.0001	-0.0145	0.0831
ED	0.4158	0.0038	0.0943	0.0687	0.4158	0.0069	0.0215	0.0522
C	20.8267	0.0000	4.8916	0.0000	20.8267	0.0000	-0.0529	0.7292
R^2	0.7987		0.6997		0.7987		0.8199	
Obs.	70		69		70		69	

Source: Authors' calculations.

7. CONCLUSION

The main focus of this study was to find the relationship between health, education, and labour productivity association for South Asian countries. The literature review explored the linkage between heath and productivity, which had several shortcomings, e.g., limited timespan as well as the selection and preference of responding variables that influence productivity. The study used panel OLS, FE, RE, and GMM models. The relationship between undernourishment, education, labour force, and capital formation were considered, using the data of 28 years for the panel of five countries - Pakistan, India, Sri Lanka, Bangladesh, and Nepal.

The results of panel OLS revealed that prevalence of undernourishment had an inverse relationship with labour productivity. This suggests that any efforts to increase productivity and economic growth cannot be detached from and examined in isolation from health as an important social indicator. Education also plays a vital role in improving labour productivity. The coefficient of labour was negatively associated with productivity which means that increasing labour decreased its productivity. This is an important finding because it suggests that it is not the mere quantity of labour which is important, but the quality of labour which matters, which links well with education as an important social indicator in a country's economic growth. The results of FE, RE model, and GMM were the same and consistent with the empirics of OLS. The study recommends that South Asian countries should focus on the improvement of health facilities and educational institutions to boost the efficiency of their labour force which

can lead to economic growth.

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