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Impact of Human Capital Development on Economic Growth of Pakistan: A Public Expenditure Approach

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Abstract: This study was undertaken to ascertain the relationship between human capital development and economic growth of Pakistan. Particularly, we were interested to find out the impacts of expenditures on education and health on the growth performance of the country. We attempted to estimate the direction and magnitude of the coefficients for both short run and long run. The co-integration and error correction techniques were applied on the time series data ranging from 1978 to 2008. The results of the study indicate that expenditures on health have positive and statistically significant effects on the economic growth rate in the short run. On the other hand, expenditures on education have significantly positive long run impacts. Moreover, primary school enrolment has positive while secondary school enrolment has negative impacts for both short and long runs. The magnitude of the long run coefficients is higher than the short-run coefficients. The results of the study suggest that there is a vast yet unfulfilled potential for Pakistan to move to higher trajectory of growth by investing in people in terms of education and health.

Key words: Human capital · Economic growth · Education expenditures · Health expenditures · Co-integration · Error correction

INTRODUCTION

Human capital of a nation is understood from the perspective of health, education and life expectancy of the population. Education and health are closely related components of the human capital that work together to make individuals more vigorous and productive. Expenditures on any one of these reinforce the other. Improving the quality of education and health is not only an end itself; it also positively affects the future growth prospects of a country.

Economists around the world keep on understanding various determinants of economic growth. The Harrod-Domar growth model was based on the accumulation of physical capital stock which in turn depends on saving rate [1]. With the emergence of 'new growth theory' in 1990s, the earlier emphasis on the accumulation of physical capital shifted to the human capital as an important variable that determine growth [2]. The aggregate production function now came to be represented as Y=F (K, L, H, A), where K is the capital, L is the labour force, H is the human capital and A is the technology. This production function differs from the neoclassical one in the sense that it incorporates both physical and human capital as two distinct factors of production [3]. This new growth theory was further extended to explain the determinants of technology itself. This came to be known as 'endogenous growth theory' wherein 'H' was represented by education and on job trainings [4].

A paradigm shift in the focus of applied research resulted with the evolution in the concept of economic growth theory. Researchers started investigating the relationship between human capital development and economic growth, for example, [5-10]. However, findings of various studies on this issue are not always similar. For

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example, [8 and 11] found positive impacts of health expenditures on the economic growth. In terms of education, [12] found positive impacts on economic growth in the case of Tanzania and Zambia. He, further, concluded that these benefits can be maximized if heavy investment in physical capital is made. However, [13] found negative impacts of public expenditure on education and health on the economic growth. Similarly, using cross national data [14] found that education contributed much less to economic growth than was expected. He gave three possible reasons for the cross country differences in the impacts of education on the economic growth. These are the differences in the institutional environment, differences in the rate of growth of demand for labour and failure of schools in imparting skills to the students. Similarly, [15] also explains that although education inculcates knowledge and skills which raise productivity, yet it can also perpetuate societal inequalities.

Above discussion highlight that the studies regarding the impacts of human capital on the economic growth present mixed findings. These variations in the results are due to the differences in socio-economic status of various countries. It is thus imperative to investigate this issue in each individual country specific context.

What has been the direction and magnitudes of these impacts in the case of Pakistan? We attempt to answer this question in the present study. By employing public expenditures approach, we attempt to investigate both short and long run impacts of education on the economic growth of Pakistan.

The state of public sector expenditures on education and health is not satisfactory in the case of Pakistan. The trend of investment in education in terms of GDP has been 2.24, 2.50, 2.47, 2.10 and 2.05 percent from 2005-06 to 2009-10, respectively [16]. In cross country comparison, Pakistan's investment in education is lower than Bangladesh (2.6%), India (3.3%) and Vietnam (5.3%) in the year 2009-10. The status of health in Pakistan is also not different from education. Public sector expenditures on health remained in the range of 0.5-0.8 % of GDP from 1970-2010, [16].

Even though the public sector expenditures on education and health are low, yet marginal returns on investment in both of these sectors may be higher [17]. We test this hypothesis in this research by quantitatively estimating the impacts of education and health expenditures on GDP growth of Pakistan.

MATERIAL AND METHODS

Secondary data, ranging from 1978 to 2008, were gathered from various issues of Economic Survey, Federal Bureau of Statistics and State Bank of Pakistan. Following [18] below is the final form of the model used in this study.

$$LnGDP = \beta_0 + \beta_1 LnHE_{exp} + \beta_2 LnED_{exp} + \beta_3 LnPE + \beta_4 LnSE + \beta_5 LnTI + \beta_6 LnLB + U_t$$

In this equation gross domestic product (GDP) is used as the proxy for economic growth. Public expenditures on health and education are given by HE_{exp} and ED_{exp}, respectively. Primary and secondary school enrolments are represented by *PE* and *SE*, respectively. Total investment is denoted by *TI* and *LB* indicates labor force in the above equation. All these variables are taken in logarithmic form.

Empirical Consideration: Empirical considerations consist of following steps.

Unit Root Test: There are number of approaches to test the unit root hypothesis but the Dicky-Fuller test is most commonly used [19-20]. The same was applied in the present study to know the stationarity or non stationarity of time series data.

Co-Integration: Johansen's full information maximum likelihood (FIML) approach is used for testing the co-integration [21-22]. This method allows the estimation of all possible co-integrating vectors and how they work in the system. If the series is integrated of same order, Johansen's procedure can be used to test the presence of a co-integrating vector among GDP, public expenditures on health and education, primary and secondary enrolments, total investment and labor force.

There are different steps to test co-integration. In the first step, order of stationarity is determined. Variable must be stationary at same level. Second step involves choosing the optimal lag length. To determine the lag length VAR model is used. According to AIC criteria, we determined the lag length of one for the model used in this study. Next step deals with determining the number of co-integrating vectors. For this purpose, both trace statistic and eigenvalue statistic were used in this study.

Error Correction Model: Error correction model indicates the speed of adjustment towards the long run equilibrium after a short run shock. According to [23] co-integrated

variables must have an ECM representation. The major advantage of the ECM representation is that it avoids the problems of spurious correlation between dependent and explanatory variables.

RESULTS AND DISCUSSION

Unit Root Test Results: The results of second differenced ADF unit root test are given in table 1. The second differenced absolute values of test-statistics are well above the 95 percent value of their critical values. Therefore null hypothesis is rejected. This means that all variables are stationary after taking second difference.

Johansen's Co-Integration Results: The first step in the Johnsen's procedure is the selection of order of Vector Auto Regressive (VAR). Adjusted LR-test on the VAR with a maximum of three lags was carried out. The results are presented in Table 2. The adjusted LR test does not reject the order one because p-value is greater than 0.05. Therefore, the chosen order of VAR is one. Schwarz Bayesian Criterion also has maximum value at order one. The AIC has maximum at third order but finally Adjusted LR-Test supports the result at order 1.

After selection of VAR with order 1, the second step in the Johnsen's procedure was to test the presence and number of co-integrating vector among the series of each model. For this purpose Maximal Eigen Value and Trace tests were used and results are presented in table 3.

The results show, that the null is not rejected when r=1. Similarly, the trace statistic did not reject the null hypothesis for the first time when r=1. There is one co-integrating vector at 95 percent critical value because first statistical value of the trace test is greater than its 95 percent critical value. The trace test indicates that there is one co-integrating vector in the concerned series. Therefore, this is the appropriate model for further analysis.

If variables are co-integrated, then dynamic ECM framework is an ideal basis for estimation of growth response because it provides information about the speed of adjustment to long-run equilibrium and avoids the spurious regression problem between the variables [23].

The coefficients in growth model (Table 4) represent estimates of long run elasticities of GDP with respect to health expenditures, education expenditures, primary and secondary school enrolment. All these variables carry expected signs except LSE which has negative sign.

Table 1: Second-differenced ADF unit root test results

Variables	Trended Model	Non-Trended Model	Conclusion
LnGDP	5.02	4.47	Stationary
LnHE	5.55	2.99	Stationary
LnEE	-4.61	-4.38	Stationary
LnPE	-4.95	-4.94	Stationary
LnSE	-3.91	-3.87	Stationary
Critical Values at 5 percent	-3.58	-2.97	

Note: critical values (95 percent confidence level) are taken from Dickey and Fuller (1979)

Table 2: LR-test on VAR with maximum of three lags

List of variables included in the unrestricted VAR					
	LGDP	LHE	LEE	LPE	LSE
List of deterministic and/or exogenous variables					
		LI	LBF		
Order	AIC		SBC		Adjusted LR-test
3	157.25		100.63		----------
2	128.09		88.13		42.54(0.016)*
1	139.27		115.09		53.40(0.345)
0	35.68		29.09		154.44(0.000)
Critical values	-3.58		-2.97		

AIC = Akaike information criterion

SBC = Schwarz Bayesian criterion

*values in parenthesis are p-values

Table 3: Co-integration LR Test Based on Maximal Eigenvalue and Trace Test

List of variables included in the unrestricted VAR				
LGDP	LHE	LEE	LPE	LSE
List of deterministic and/or exogenous variables				
LI	LBF			

Null	Alternative	Statistic	95%CriticalValue	90%CriticalValue
Maximal Eigen value Test				
r = 0	r = 1	52.943	34.4000	31.7300
r<= 1	r = 2	22.661	28.2700	25.8000
r<= 2	r = 3	11.616	22.0400	19.8600
r<= 3	r = 4	6.419	15.8700	13.8100
r<= 4	r = 5	4.722	9.1600	7.5300
Trace Test				
r = 0	r>= 1	98.355	75.9800	71.8100
r<= 1	r>= 2	45.420	53.4800	49.9500
r<= 2	r>= 3	22.758	34.8700	31.9300
r<= 3	r>= 4	11.142	20.1800	17.8800
r<= 4	r = 5	4.722	9.1600	7.5300

Table 4: Johansen's Normalized Estimates for Growth Model

List of variables included in the unrestricted VAR					
LGDP	LHE	LEE	LPE	LSE	
List of deterministic and/or exogenous variable					
LI	LBF				
GDP =	7.543+ 0.198 LHE + 0.128 LEE+ 0.865 LPE+ -0.369LSE+7.543				
	(6.881)*	(0.424)	(2.389)	(5.436)	(2.184)

* t-ratios are in parenthesis.

Table 5: The Error Correction Model Estimates for GDP growth

Variables	Short-Run	Long-Run
Constant	-0.0016(0.258)*	7.543(6.881)
DLHE	0.0414(4.028)	0.198(0.424)
DLEE	0.0459(1.642)	0.128(2.389)
DLPE	0.1810(1.825)	0.865(5.436)
DLSE	-0.1605(1.619)	-0.369(2.184)
LI	-0.0424(3.505)	
LBF	0.1031(3.374)	
ECM1	-0.555(6.755)	
Diagnostic Tests		
R^2	0.73	
DW-statistics	1.97	
LM-test-*x*2 (1)	0.0911[.924]**	
RESET test-*x*2 (1)	13.545[.000]	
Jarque-Bera		
Normality-x÷2 (2)	2.651[0.266]	

*Values in parenthesis are t-ratios.

**Values in square brackets are p-values.

Table 5 reports the results of estimated coefficients for both short run and long run. The coefficient of real expenditure on health is consistent with a priori expectation implying a positive relationship between government expenditure on health and economic growth in long run. These results indicate that one percent increase in health expenditures increases GDP growth by 0.198 percent in the long run. In the short-run, value of the coefficient is 0.041. However this is not statistically significant. The values of the coefficient suggest that the magnitude of the impact on GDP is not too large in the case of Pakistan. This could be because of the fact the health sector remains neglected in this country over several years. The results of present study are in line with [7 and 24].

Real expenditures on education are found to have positive relation with economic growth. The estimated long-run elasticity of education expenditures is 0.12. In the short run, the elasticity is further low as 0.045. These results are consistent with the findings of [18 and 25].

The short run and long run elasticities of primary school enrolment found to be 0.180 and 0.865, respectively. These results are similar to [26]. The elasticity of secondary school enrolment was found to be -0.160 in short run and -0.369 in long run, which implies negative relation between secondary school enrolment and economic growth. The study of [27] also concludes that primary education contributes more than the secondary education.

Our results indicate that public sector expenditures on both education and health contribute positively to economic growth of Pakistan. Although, the magnitude of the coefficient is not very high in both education and health expenditures, yet positive and statistically significant results mean that the country can reap benefits by investing in human capital. It is also worth mentioning that the coefficients of long run elasticities are higher as compared to the short-run. This is understandable because returns from investment in human capital are not immediate. The results of this study also support the findings of [12] who maintain that investment in education can give maximum benefits only when combined with heavy physical investment.

CONCLUSION

The main objective of this paper was to investigate the relationship between government expenditure on education and health and economic growth of Pakistan. To attain that objective, co-integration and error correction techniques were used. The results of this study confirm that investment in health and education contributes significantly and positively in the GDP growth of Pakistan. As the results are statistically significant mainly in the long run, we propose that long term investments in these sectors should be made to acquire maximum benefits in the future. It is also suggested that both quality and quantity of health services and education should be improved so that their effect on the overall economic performance of the nation could be magnified.

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