Relationship among Poverty, Education Expenditure, and Education Status: Empirical Evidence from Pakistan

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Abstract—

Poverty and ignorance is a very dangerous combination. Education is generally seen as the foundation of society which brings economic wealth, social prosperity and political stability. This research helps to understand the long run relation between poverty, education expenditure and education status. The research has utilized the Johanson Cointegration Test, Vector Error Correction Model (VECM),Wald Test and Granger causality test to investigate the causal direction and long run relationship between poverty, education expenditure and education status in the country. With the help of Percentage of population below national poverty line, Adult Literacy rate over 15 years of age, Government expenditure on education as a percentage of total expenditures and Total School life Expectancy the authors concluded that there exists a strong causal bi-directional relationship running between poverty rate and education status in the region. The research did not find a significant long run relationship existing between poverty rate and education expenditure. The research concluded that, increasing budgetary allocation to funding education sector alone without reducing poverty level, would not be sufficient to improve the education status of the country. The researchers therefore suggest that policies should be made to promote adult literacy level, reduce the poverty rate in the region.

Index Terms—**Adult Literacy Rate, Education Status, Government Education Expenditure, VECM**

I. Introduction

Poverty is typically defined in relation to income poverty; however, according to a number of scholars, income poverty is not the complete measure of the complicated phenomenon of poverty.A study by United Nations Development Program (UNDP) revealed that human poverty not only stands for income poverty: it is the lack of access to opportunities and alternatives for living an endurable life. Lack of education is one such significant opportunity which reflects the poverty of education. Therefore, in a cyclical overview, educational poverty translates into an important measure of human poverty. ((Espen Dahl, 2009)

At the macro level, countries having a low level of education or uneducated majority of total population find it difficult, and at times, almost impossible to progress and considerably increase their GDP. This results in low and declining standards of living. At the micro level, uneducated households and individuals live mostly below the poverty line because they do not get high-paying jobs and have low levels of productivity. Sufficient investments in education are restricted due to economic poverty, thereby, causing the poverty to increase further. Investments in human capital are essential in order to break this vicious cycle. (Isham, 2002)*A*

Significance of Research Study

Poverty and ignorance is a very dangerous combination. It can trap people in inescapable circles and could lead to frustration and despair. It not only makes one vulnerable to disease and suffering but to all kinds of exploitations. Education is generally seen as the foundation of society which brings economic wealth, social prosperity and political stability.

This study will guide the way through which Pakistan might lead to make advancement in the education sector and may capture the best strategies in this regard. This study will highlight the ways by which the country can develop and promote their educational sector for the better performance, economic growth. This study has analyzed the long run relationship between poverty and education in the country. For conducting research the available literature is reviewed to find out the significant relationship between poverty and education.

In this study, by taking time series data from1961 to 2011 on poverty, education expenditure and education status in the Pakistan, the researchers have examined the causation between these three factors. The empirical methodology adopted for this purpose includes the Granger Causality test within an error-correction framework. This is the first study on these factors in the country. Data is extracted from secondary sources.

The study included four main variables of poverty and education. These are as follows: Percentage of Population below National Poverty (representing the poverty rate of the population), Government Expenditure on Education as a percentage of total government expenditures, Adult Literacy rate i.e. the percentage of population aged 15 years and over who can both read and write with understanding a short simple statement on his/her everyday life(representing the education status of the population). Generally, 'literacy' also encompasses 'numeracy', the ability to make simple arithmetic calculations. School life expectancy is the total number of years of schooling which a child of a certain age can expect to receive , assuming that the probability of his or her being enrolled in school at any particular age is equal to the current enrolment ratio for that age. Educational outcomes are measured by school life expectancy, the expected number of years of formal education. (Tether, 2005)

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B Research Objectives

This research study has following objectives:

1. To study the empirical link between Poverty and Education variables.
2. To study long run relationship between the variables.
3. To study short run relationship between variables.
4. To explore the possible existence of causality effects between the variables in Pakistan and Bangladesh.

II. Literature Review

Brown and Park (2001) examined the household and school survey data collected from poor countries in six Chinese provinces and analyzed poverty effects, intra-household decision making, enrollment decisions and test outcomes. Survey was conducted in June 1997. The data was collected from rural component of the National Sample Survey of Situation of Chinese Children and China Poverty Research Association. Cox proportional-hazard model was used. They incorporated direct measures of women's empowerment and credit limits and concluded that per capita expenditure increases learning while credit constrains decreases investment on education and girls who have weak academic power could not continue education after primary school and it was observed that school quality effects duration of primary school enrollment but it did not effect learning.(Brown & Park, 2001).

Sarwar et al (2011) found that poverty is the main hurdle to achieve economic development. According to Millennium Development Goals (MDGs) and Education for All (EFA) poverty could be eliminated with education. They had examined how different level of education, experience and gender of employed worker effects poverty in Pakistan. They took the data from Household Integrated Economic Survey (HIES) for 1998-99 and 2001-02 and run the regression model by taking poor people as dependent variable and took levels of education, experience and gender as independent variables. They concluded that levels of education and experience were negatively related with poverty. Gender inequality was also observed. They suggested that with higher level of education and male worker poverty could be minimized. (Masood Sarwar, 2011)

Mursa (2007) examined the positive relationship between degree of education and level of employment of working force. It was found that unemployment is due to less education, less aptitudes, knowledge and qualification. He stated that education has very significant economic value due to the complex productive process. He concluded that less qualified person faces unemployment because the companies demand a worker with high techniques and well education. Better education provides better opportunities, increases employment and decreases unemployment risk. (Mursa, 2007)

Ravallion (2001) evaluated urbanization of poverty in developing countries. He took time series data from India and cross sectional data of 39 countries and found that the poor people urbanize more rapidly as compared to nonpoor. The empirical model concluded that the poverty rate in urban areas increases slowly as compared to rural areas. He suggested that 61 % of the poor people live in rural areas while half population lives in urban areas in developing countries. (Ravallion, 2001)

Brooks et al (2006) analyzed education systems of 64 countries by using multivariate statistical techniques such as principal component analysis, factor analysis, and discriminant analysis. The main objective of the research was to classify countries into two populations, one where the educational system of the country is exceptional and the other where the educational system is fair. Data sources were secondary. The authors concluded that wealth is not the determinant of educational system. Education is the key to success in every field and it opens new doors of success. (Ashley Brooks)

Cooray (2009) investigated the effect of quality and quantity of education on economic growth. They used several proxy variables the to measure education by taking cross sectional data from low and middle income countries. The results suggested that the number of years of formal education when measured with enrollment ratios certainly influence economic growth but on the contrary the effect of government expenditure is indirect through its impact on the improvement in the quality of education. (Cooray, 2009)

Qureshi(2008) developed a model for population and primary education in Pakistan. This research was based on the assumptions that Pakistan has a clear socio-economic distinction of rural and urban areas and the funds allocated to each area are different. This study included area wise public and private sector investments in the field of primary education and forecasted a development path for education in Pakistan. The results concluded that due to high dropout rate it was very difficult for Pakistan to reach universal primary education by 2015. (Qureshi, 2008)

III Results and Discussion

Table 1Descriptive Statistics

	P	G	L	S
Mean	39.38537	7.081707	37.68049	4.919512
S.D	10.60388	1.972681	12.08241	1.333645

Descriptive statistics show that more than 39% of Pakistan's population lies below the national poverty line, average government expenditure on education as a percentage of total government expenditures is about 7% and average adult School life expectancy is about 5 years over the last four decades that is 1971-2011.

A non-stationery series has a unit root. This research employs Augmented Dickey Fuller (ADF) unit root test which is considered to be one of the most effective test of checking Stationarity in the variables. (Yin-Wong Cheung, 1995)

Ho: Variable has a unit root or it is not stationary.

All the variables got stationery at first difference with trend and intercept.

Table 2: Unit Root Test (% of Population below National Poverty Line)

Null Hypothesis: P has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.268213	0.0001
1% level	-2.624057	
5% level	-1.949319	
10% level	-1.611711	

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*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(P)
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
P(-1)	-0.019832	0.004647	-4.268213	0.0001

R-squared	-0.054918	Mean dependent var	-0.860000
Adjusted R-squared	-0.054918	S.D. dependent var	1.176871
S.E. of regression	1.208755	Akaike info criterion	3.241741
Sum squared resid	56.98243	Schwarz criterion	3.283963
Log likelihood	-63.83481	Hannan-Quinn criter.	3.257007
Durbin-Watson stat	2.083352		

The model for Poverty is:
$\Delta Pt=ß1+ß2t+\delta Pt-1+\sum \Delta Pt-i\ \alpha i+et$
The rule is to reject Ho if p value is less than 5% or the test statistic is greater than critical value. In case of percentage of population below national poverty line the absolute test statistic value 4.2 is greater than critical values and p value is 0.001% which is less than 5% so Ho is rejected and concluded that variable is stationary at first difference. (Weshah, 2003)
Table 3: Unit Root Test (Government Expenditure on Education as % of total Expenditures)

Null Hypothesis: D(G) has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.856127	0.0018
Test critical values:	1% level	-4.211868	
	5% level	-3.529758	
	10% level	-3.196411	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(G,2)
Method: Least Squares
Sample (adjusted): 1973 2011
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(G(-1))	-0.810835	0.166972	-4.856127	0.0000
C	0.168814	0.285591	0.591105	0.5581
@TREND(1971)	-0.003727	0.011948	-0.311953	0.7569

R-squared	0.396924	Mean dependent var	-0.026923
Adjusted R-squared	0.363419	S.D. dependent var	1.052494
S.E. of regression	0.839743	Akaike info criterion	2.562361
Sum squared resid	25.38603	Schwarz criterion	2.690327
Log likelihood	-46.96603	Hannan-Quinn criter.	2.608274
F-statistic	11.84697	Durbin-Watson stat	1.970540
Prob(F-statistic)	0.000111		

The model for Government Expenditure on Education is:
$\Delta Gt=ß1+ß2t+\delta Gt-1+\sum \Delta Gt-i\ \alpha i+et$
In case of percentage of Adult Literacy rate the absolute test statistic value is 4.85 which is greater than critical values and p value is 0.01% which is less than 5% so Ho is rejected and it is concluded that variable is stationary at first difference.
Table 4 Unit Root Test (Adult Literacy Rate above 15 years of age)

Null Hypothesis: D(L) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.768431	0.0001
Test critical values:	1% level	-4.211868	
	5% level	-3.529758	
	10% level	-3.196411	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(L,2)
Method: Least Squares
Date: 07/29/12 Time: 01:08
Sample (adjusted): 1973 2011
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(L(-1))	-0.972452	0.168582	-5.768431	0.0000
C	0.776937	0.347164	2.237957	0.0315
@TREND(1971)	0.004198	0.013899	0.302025	0.7644

R-squared	0.481872	Mean dependent var	-0.005128
Adjusted R-squared	0.453087	S.D. dependent var	1.309670
S.E. of regression	0.968548	Akaike info criterion	2.847766
Sum squared resid	33.77108	Schwarz criterion	2.975733
Log likelihood	-52.53145	Hannan-Quinn criter.	2.893680
F-statistic	16.74042	Durbin-Watson stat	1.910282
Prob(F-statistic)	0.000007		

The model for Adult Literacy Rate is:
$\Delta Lt=ß1+ß2t+\delta Lt-1+\sum \Delta Lt-i\ \alpha i+et$
In case of percentage of Adult Literacy rate the absolute test statistic value is 5.76 which is greater than critical values and p value is 0.001% which is less than 5% so reject Ho and concluded that variable is stationary at first difference.
Table 5 Unit Root Test (Total School Life Expectancy in Years)

Null Hypothesis: D(S) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.084501	0.0010
Test critical values:	1% level	-4.211868	
	5% level	-3.529758	
	10% level	-3.196411	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(S,2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(S(-1))	-0.974843	0.191728	-5.084501	0.0000
C	-0.089154	0.067449	-1.321789	0.1946
@TREND(1971)	0.010701	0.003217	3.326276	0.0020

R-squared	0.425731	Mean dependent var	0.023077
Adjusted R-squared	0.393827	S.D. dependent var	0.251795
S.E. of regression	0.196040	Akaike info criterion	-0.347188
Sum squared resid	1.383547	Schwarz criterion	-0.219222
Log likelihood	9.770167	Hannan-Quinn criter.	-0.301275
F-statistic	13.34419	Durbin-Watson stat	1.773362
Prob(F-statistic)	0.000046		

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The model for SLE is:
$\Delta St=ß1+ß2t+\delta St-1+\sum \Delta St-i\ \alpha i+et$
In case of percentage of Total School life expectancy the absolute test statistic value is 5.08 that is greater than critical values and p value is less than 5% so reject Ho and conclude thatvariable is stationary at first difference.

To find out long run relationship among poverty and the three independent variables Johansen Cointegration test was carried out which shows the long run relationship among variables.
Poverty rate is taken as dependent variable (p) and three independent variables are Government expenditure on education (g), Adult Literacy rate (L) and Total school life expectancy (s).
Table6 Johansen Cointegration Test:

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.590081	55.11493	40.17493	0.0008
At most 1	0.263400	20.33491	24.27596	0.1451
At most 2	0.192787	8.412198	12.32090	0.2065

The first column is the number of cointegrating relations under the null hypothesis, the second column is the ordered eigen values of the matrix, the third column is the test statistic, and the last two columns are the 5% critical values. The rule is to reject Ho if p value is less than 5%. Since p value is less than 5% and trace s statistic is greater than critical value so Ho is rejected;it means that there is cointegration among variables that shows presence of long run relationship between poverty rate and the three independent education variables.
Table 7 Long run cointegrating Equations of Johansen:

1 Cointegrating Equation(s): Log likelihood -141.6985

Normalized cointegrating coefficients (standard error in parentheses)

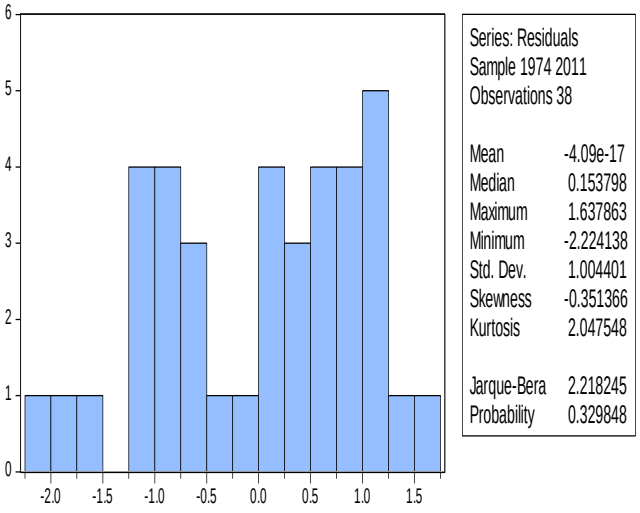
P	G	L	S
1.000000	4.099810	0.755783	-31.90814
	(3.80555)	(1.02481)	(8.87670)

P=4.09G+0.75L-31.9S
This shows that 1 % change in G leads to 4.09% change in P in the same direction, similarly 1% change in L leads to 0.75 % change in P in the same direction while 1% change in S leads to 31.9% change in P but in the opposite direction. The values in parentheses indicate standard error of the respective coefficients.
To find the long run relationshipamong poverty and theeducation variables VECM is applied.

Table 8 VECM
D(P) = C(1)*(P(-1) + 1.67888430488*G(-1) + .718201647968*L(-1) - 4.12022099085*S(-1) - 58.3581431559) + C(2)*D(P(-1)) + C(3)*D(P(2)) + C(4)*D(G(-1)) + C(5)*D(G(-2)) + C(6)*D(L(-1)) + C(7)*D(L(-2)) + C(8)*D(S(-1)) + C(9)*D(S(-2)) + C(10)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.013300	0.079159	-0.168013	0.8678
C(2)	-0.075998	0.191904	-0.396021	0.6951
C(3)	-0.114396	0.182511	-0.626792	0.5359
C(4)	-0.165801	0.252328	-0.657084	0.5165
C(5)	-0.265218	0.271111	-0.978263	0.3363
C(6)	-0.090711	0.217083	-0.417864	0.6792
C(7)	0.081687	0.205502	0.397501	0.6940
C(8)	0.985353	1.386300	0.710779	0.4831
C(9)	-1.553949	1.536765	-1.011182	0.3206
C(10)	-0.971278	0.532994	-1.822307	0.0791

In Equation 1 there are 10 coefficients; C (1) shows an error correction term which is one period lag residual of cointegrated equation and its negative sign shows that it not significant because p value is greater than 5% that means that there is no long run causality from education variables to poverty.
C (10) shows the constant or intercept.
To check the model efficiency histogram normality test is used. The null hypothesis is as follows:
H_o: Residual is normal distributed
$H_{1:}$ Residual is not normal distributed
Table 4.3.14 Histogram Normality Test



Here decision criteria to check the model efficiency is that if the corresponding P value of Jarque-Bera is less than 5%, than null hypothesis is rejected, which is that residual is normal distributed. It implies that there is some problem in the model. In this test corresponding P value of Jarque-Bera is more than 5%, so the null hypothesis is accepted that residual is normal distributed. Its mean that model is good.
Granger causality test shows causality between the variables.
Table 9 Granger Causality Test:

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
G does not Granger Cause P	39	0.05202	0.9494
P does not Granger Cause G		2.48422	0.0984
L does not Granger Cause P	39	1.51086	0.2352
P does not Granger Cause L		0.33469	0.7179
S does not Granger Cause P	39	1.23950	0.3023
P does not Granger Cause S		0.63490	0.5362
L does not Granger Cause G	39	1.66550	0.2042
G does not Granger Cause L		0.67413	0.5163
S does not Granger Cause G	39	4.88703	0.0136
G does not Granger Cause S		0.25620	0.7755
S does not Granger Cause L	39	0.89317	0.4187
L does not Granger Cause S		0.49836	0.6119

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If p value is less than 5% then Ho is rejected but in this case the p value is greater than 5% at lag value 2, so do not reject Ho, it means that there is no casualty among the variables. At 2 lag, only school life expectancy granger causes Government expenditure because its p value is less than 5%.
The p value is greater than 5% at lag value 4, so Ho is not rejected it means that there is no casualty among the variables. At lag 4, only school life expectancy granger causes Government expenditure because its p value is less than 5%.
Adult literacy rate granger causes Government expenditure on education as the p value is less than 5% at lag value 6, so Ho was rejected at lag 6.

IV Conclusion

This article analyzes and evaluates the poverty and education status in Pakistan. The discussion concentrates on the results of descriptive analysis, unit root test, Johanson Cointegration Test, VECM, Wald test and Granger causality test carried out on the data of each country for the time period 1971-2011. The variables involved in the research are: percentage of population below national poverty line for measuring the poverty rate and three education variables, Adult Literacy rate over 15 years of age, Government expenditure on education as a percentage of total government expenditures and Total School Life Expectancy were included to measure education status of each country.
Descriptive analysis shows that the country has made significant progress in the Poverty reduction during the 1980s and 1990s.The National Poverty Line shows that poverty declined during 1971-2011. It was found out that there is no long run relationship between poverty and the education variables in case of Pakistan. This means that education variables do not affect poverty in the long run. The results of Wald test show that there is no short run relationship between the poverty rate and the education variables.
Lastly, causality was checked by applying Granger causality test. In Pakistan it was found that School life expectancy variable granger causes Government expenditure on education at lag 2 and 4 and Adult literacy rate Granger causes Government expenditure on education at lag 6.
The study has established that there is a presence of a strong causal uni-directional relationship running from SLE to poverty in Pakistan. Increasing budgetary share to funding education sector alone (without targeting poverty reduction and improving the level of adult literacy) is not sufficient enough to improve the economic and education status of the population. Better education can be seen as a factor that contributes to poverty reduction via some “trickle-down” mechanism. Adult literacy rate was statistically significant in the model. Adult literacy rate was observed to have a bi-directional causality between adult literacy rate and poverty in the country.
Education is critical for poverty reduction and improvement in the standard of living. How to get things better is the issue of much discussion, and even then it may just be an indispensable, but inadequate, means of getting rid of poverty. Supplementary funds are important, but it is also essential to guarantee that they are used most effectively and efficiently. Along with quality education, many other things are essentially required like strong enthusiasm, stable economic and political circumstances and of course, some good luck!

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