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Full Length Research Paper

Impact of Education on Poverty Reduction: A Co-integration Analysis for Pakistan

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ABSTRACT

Nations cannot be developed without investing in education. Education is a multidimensional process, on one side, it enhances the economic growth and on the other side, it reduces the poverty by increasing the productivity but poverty is out of control in the rural areas of the Pakistan, where people are in a state of deprivation with regards to incomes, clothing, housing, and health care and education facilities. The study analyzed the impact of Education on poverty reduction in Pakistan extracting 34 time series annually observations. The study employed Augmented Dickey-Fuller (ADF), causality and Johansen co integration methodology to test for the existence of a long run relationship between variables. The study concluded that Literacy rate and Gross Enrollment (Secondary) has negative and significant impact on poverty in long run but Life Expectancy has positive impact on poverty. The study recommended that Government should focus on the quantity and quality of education that, in turn, leads to more researches in the country.

Keywords: Poverty, Education, unit root, co-integration, Error Correction

INTRODUCTION

The thought that education and human capital are essential for economic growth and poverty, The term human capital was firstly used in 1960's and 70's, when Goode (1959), Schultz (1961) and Becker (1975) gave the different point of view regarding the concept and formation of human capital. However, human capital accumulation got importance by the emergence of endogenous growth theory given by Lucas (1988) and Romer (1989, 1990). Mankiw *et al*., (1992) firstly used human capital in production function. It is expected that higher level of human capital leads to higher rate of economic growth. There are many ingredient of human capital i.e. education, health, on job trainings, skills, aptitudes and migration to better job, but education serves as the most important ingredients of human capital (Goode, 1959; Schultz, 1961; Khilji 2005).

Nations cannot be properly developed without education. Raja (2000) argued that education is the first step in the path of development process. It is a two way process, on one side, it increases the economic growth and on the other side, it reduces the poverty and increases the productivity. It plays a very crucial role in building of human capabilities and enhances economic growth through skills and knowledge. Investors are more interested in that country, where there is more than enough stock of human capital. Education is the necessary part of human proficiency and power (Sen, 1999). Kim and Terada-Hagiwara (2010) elaborated the importance of well-educated labor force as it is considered necessary in the diffusion and adoption of new technology and new methods of production. It plays a crucial role in developing countries like Pakistan, as; they have shortages of physical and human capital. The quantity as well as the quality of education at each level with its linkages to demand for skills is very critical for economic growth (HDR, 2001; Adawo, 2011).

Educational institutions, investments in education, quality of education and equal access to education play the vital role in the alleviation of poverty and enhancing economic growth (Chaudhry and Rehman, 2009). Burneth *et al.,* (1995) said that investment in education increased GNP per capita, reduced poverty and supported the spreading out in knowledge. Education is also playing a significant role in the reducing income inequalities (Danacica *et al*., 2010). It also helps to lower the crime rate, terrorism and child labor through reducing

the poverty. People commit these crimes as they are not capable to fulfill the basic needs of life. (Kruger and Maleckova, 2003)

There has been ongoing debate on poverty for the last few decades. In particular, when we talk about globalization, economic growth, and living standards, we also talk about poverty. People living in poverty are unable to meet their basic needs, such as essential nourishment, basic health, and education. An expansion in earnings leads to a better nutrition plan, improved health, and better education. (Janjua and Kamal 2011) At the beginning of the twenty first century, over 1.2 billion people are living in extreme poverty, subsisting on less than 1$ a day. This proportion has fallen from 32 percent in 1987 to 25 percent in 1998 (World Bank 2000). Food and Agriculture Origination (FAO) confirms that the number of the people at world level reached 963 million, or approximately 15 percent of the estimated of the world population. This represents an increase of 142 million over the figure for 1990-92. (Sikander and Rizvi 2013)

Education and poverty are inversely related. The higher the level of education of the population, lesser will be the number of poor persons because education imparts knowledge and skills which is helpful in higher wages. The direct effect of education on poverty reduction is through increasing the earnings/income or wages. The indirect effect of education on poverty is important with respect to 'human poverty' because as education improves the income, the achievement of basic necessities becomes easier and raises the living standard which surely means the fall in human poverty. The education indirectly helps in the fulfillment of basic needs like water and sanitation, utilization of health facilities, shelter, and it also affects the women's behavior in fertility decisions and family planning. (Awan *et al.,* 2011)

LITERATURE REVIEW

Khan *et al.* (2008), tried to find the Impact of Education and Health on Poverty reduction in Pakistan. Survey data is used from Economic survey of Pakistan 2008 in this paper. Multivariate co integration methodology has also been used on this data. In his paper he found that Improvement in human resources and increase in investment by human capital contributes to poverty reduction. Findings of the study indicate that it has negatively related to each other.

Afzal *et al.* (2010), tried to explore the relationship among Education, Poverty and Economic Growth in Pakistan: An Econometric Analysis. Time series data from 1971-2009 has been used in this study. ARDL and TYAGC technique also be used on this data. The findings of the study confirm that both the short-run and long-run effect of physical capital on economic growth have been found to be positive and significant. Education affects economic growth positively and significantly only in the long-run. The results of Toda-Yamamoto Augmented Granger Causality (TYAGC) Test confirm bi-directional causality between education and economic growth, and between poverty and education.

Janjua and Kamal (2011) tried to find the role of Education and Income in Poverty Alleviation: A Cross-Country Analysis. Panal data for 40 developing countries for the period 1999 to 2007 has been used in this paper. GLS technique also is applied on this data. The study concludes that income growth plays a moderately positive role in alleviating poverty. Second, education is the most significant contributor to poverty alleviation.

Letseka and Breier (2008) Tried to explore the impact of higher education dropout on poverty. In this paper his objective is to find the Student Pathway Study which examines the student dropout in South Africa. He used Three years undergraduate, four years or more undergraduate, postgraduate up to honors, masters, Doctoral as variables and his methodology is Semi-structured interviews, official reports, and annual reports. He found that higher education trends in South Africa indicate that 50% students enrolled in higher education institutions drop out in their first three years. This is despite the fact that some of these students will have passed their senior certificate with endorsement, merit and distinction. The dropout phenomenon therefore does not bode well with the efforts to break the vicious cycle of poverty.

Teffo (2008) tried to explore the relation between Education and Poverty Myth or Reality? In which his objective is to determine perceptions and expectations of majority in terms of what is considered minimally acceptable. He used Libratory education, self-empowerment as variables. He used descriptive analysis and he found that the effect of the grant differs across villages with varying local government quality, as well as the average level of educational attainment among adults will help us to understand key conditions for an efficient grant provision.

Bourne C (2005) tried to explore the relation between Poverty and its alleviation in the Caribbean. He found that Economic growth is one of the fundamental determinants affecting a country's capacity to generate employment and income, its capacity to provide greater access to resources, including the essential social services, and its ability to accumulate or save in good times to finance contra-cyclical expenditures in poor times, and its capacity to afford social insurance. Due to high economic growth there is high investment, sustained aggregate productivity, greater outlays on education and health.

Govinda R (2008) tried to find the relation between Non-formal Education and Poverty alleviation analysis of field experiences from Asia. The objective is to capture

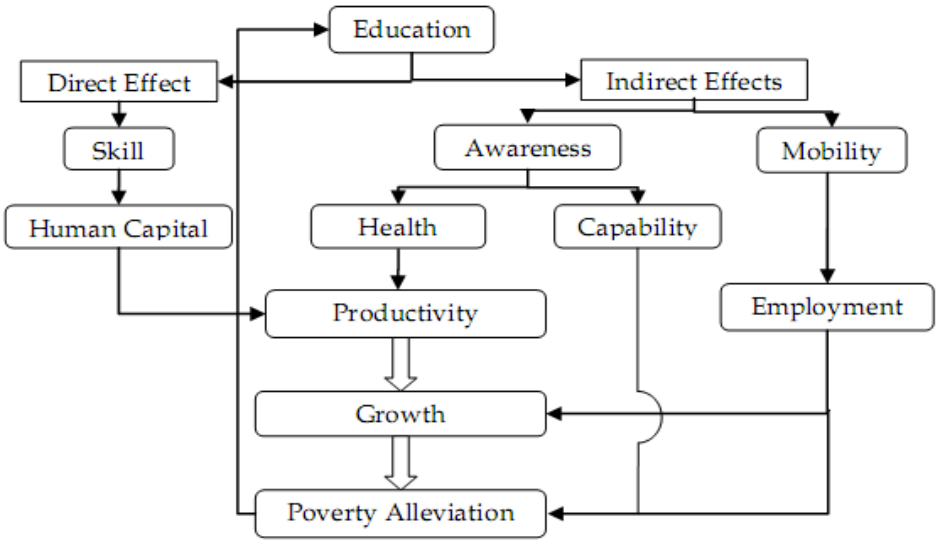

Figure 1. Theoretical channel from Education to Poverty Alleviation
In literature Janjua and Kamal 2008

the dynamics of the relationship between non-formal education programs which particularly focus on income generation activities and poverty alleviation. He found that The low level of literacy and life skills is a major factor contributing to the perpetuation of poverty in an intergenerational framework. The mere basic education through schooling may not fully meet the requirements of the poor, even if the primary education is completed.

Oxaal Z (1997) tried to find relationship between Education and Poverty: A Gender analysis. He found that Females in developing countries typically receive less education than do males. The opportunity costs of girls' schooling are most significant for poor households. The loss of girls' labor during school hours thus has an impact on women's ability to raise household income either through food production or wage labor.

Khan and William (2006) tried to explore the relationship between Poverty Alleviation through Access to Education: Can E-Learning Deliver? In this paper he used comparative analysis between e-learning and face to face learning. He found that e-learning is more beneficial than the face to face learning also it takes less cost and consumes less time. Also there are no geographical boundaries in e-learning education.

Literature concludes

Literature reviewed above enables us to understand the impacts of Education on Poverty Reduction. And according to different scholars who analyzed the empirics of different countries, it can be proved that Education causes to decrease in poverty. In Pakistan, past studies have been estimated by different techniques but in this study we will use Causality, ADF and VAR model we not only estimate long run relationship of these variables but also we will find short run adjustment of the coefficients for these variables.

Theoretical Framework

As the study is, supposed to measure the impact of Education on poverty. So, different studies explain that there is a significant relationship between Education and poverty. [Khan *et al.* (2008), Letseka and Breier (2008), Teffo (2008), Yamauchi C (2003), Govinda R (2008), Khan and William (2006)]. Channel is import to highlight the significance of the relationship of the variables. The way through which the Education affects the poverty, is explained as following:

Variables Justification

Impact of Education on Poverty by Direct and Indirect Method

Berg (2008) says: "Throughout the world it has been found that the probability of finding employment rises with higher levels of education, and that earnings are higher for people with higher levels of education." According to the study, "This connection between education and poverty works through three mechanisms. Firstly, more educated people earn more. Secondly, more (and especially better quality) education improves economic growth and thereby economic opportunities and incomes. Thirdly, education brings wider social benefits that improve economic development and especially the situation of the poor, such as lower fertility, improved health care of children and greater participation of women in the labor force." These findings support the view that

Table 1. Augmented Dickey-Fuller (ADF)

	At Level		At First Difference		At Second Difference	
Series in the Model	**With Intercept**	**With Trend and intercept**	**With Intercept**	**With Trend and intercept**	**With Intercept**	**With Trend and intercept**
LE	0.1447	0.0821	0.2041	0.6702	0.0009*	0.0007*
LR	0.5523	0.9493	0.7267	0.7400	0.0005*	0.0030*
GER	0.8908	0.5545	0.0052	0..238	0.0001*	0.0006*
POV	0.9552	0.5414	0.0752	0.9859	0.9899	1.0000

the benefits (direct and indirect) of education result in changes in people's behavior and this behavioral change inevitably has an impact on poverty alleviation. (Janjua and Kamal, 2008) Figure1 above.

MATERIAL AND MODELING

Model

Variables are selected on the base of selected studies given in literature review and time series data from 1972 to 2006 is obtained from Economic survey of Pakistan, World Development indicator, Food and Agriculture Organization and Handbook of Statistics State Bank of Pakistan. For regression analysis we develop a model in which we took poverty as dependent variable and all other mentioned variables as independent

The functional form of proposed Model is:

Poverty = f (Life Expectancy, Literacy Rate, Gross Enrollment Secondary)

The model is:

$$\text{Poverty} = \alpha + \beta 1\text{Life Expectancy} + \beta 2\text{Literacy Rate} + \beta 3\text{Gross Enrollment} + \mu$$

RESULTS AND METHODOLOGY

Unit Root Test

When we deal with a time series the first and foremost step is to check whether the underlying time series is stationary or not. If we want to apply the appropriate technique on the underlying time series then we must be aware of the order of integration of underlying time series. Stationarity is also important in the context that if we apply OLS to a non-stationary time series it may result in spurious regression. To check the unit root in the data Augmented Dickey-Fuller (ADF) Test is used. ADF is an extended form of Dickey-Fuller test. In DF test we assume that error terms are uncorrelated or white noise but if error terms are correlated then ADF is best because it also allows for Serial Correlation to be checked. ADF test has the following regression equation

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-1} + \varepsilon_t$$

Where ε_t is white noise error, $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$ where Δ represents first difference, q represents number of lagged difference, These lags are included to make error term in equation (5.3) white noise.$\beta_1$is intercept and t represents time trend.

ADF has a null hypothesis same as DF

$H_0 = \delta = 0$; There is Unit root

$H_1 = \delta < 0$; There is no unit root

ADF uses same critical values as DF. If $\Delta Y_{t-1} = 0$ then ADF = DF. So there is no difference between ADF and DF in that case.

In Eviews we can run ADF in three different specifications

i. ADF with Intercept
ii. ADF with trend and intercept
iii. ADF without trend and Intercept (none)

An appropriate ADF test specification should be applied according to the nature of the data. We first check all variables at level and if non stationary at level then we move to first difference. In EViews one can take up to two differences (Gujarati).

The results are given below, they are computed by applying ADF test statistic on data I(0). The test confirms that all variables have a unit root problem and they are non-stationary at level but stationary at their second difference, therefore, the order of integration of all variables are I(II). Log of literacy rate , log of gross enrollment rate and life expectancy rate are significant and stationary at second difference but log of poverty is not stationary at second difference it may be stationary at difference of second difference (table 1).

Co-integration

If we regress two non-stationary time series' on each other it may result in a spurious regression. If underlying time aeries is non-stationary then OLS is not a good option for estimations. OLS is an appropriate method if all the variables are I (0) i.e. stationary at level otherwise one should check for the possible co-integration relationship between the underlying non-stationary

series. 'OLS is for short run relationship while co-integration suggests a long run relationship between the series'.

"If the linear combination of two time series having unit root is stationary then we can say that the two time series are co-integrated."Gujarati (2004).

Let there are two variables x and y and both are I (1). Now if we regress y on x as

$Y_t = \beta_1 + \beta_2 X_t + \varepsilon_t$

Now if we write this as

$\varepsilon_t = Y_t - \beta_1 - \beta_2 X_t$

Now if check unit root of ε_t and if it turns out to be I (0) then we can say that their linear combination is stationary and both the variables are co integrated.

"A test for co-integration can be regarded as a pre-test to avoid spurious regression" (Granger).

There are several methods to check co-integration relationship between the variables like *Engel-Granger (EG) or Augmented Engel-Granger (AEG)* test can be used if all variables are I (1). It is a two-step procedure. In first step simply regress the variables using OLS like (5.4) and check the unit root of residuals using DF or ADF. For this values calculated by Engel and Granger are used instead of DF and ADF tabulated values. Engel-Granger is not appropriate for testing more than one co integration relationship.

If all the variables become stationary at their first difference i.e. I (1) then Johansen Co-integration test can also be used But if some variables are stationary at their level i.e. I (0) and some at first difference i.e. I (1) then Johansen is also not an appropriate method. In such cases where variables are both I (0) and I (1) Autoregressive Distributed Lag model is an appropriate technique.

For Present study Johansen co integration method is selected. Johansen maximum likelihood test allows testing for more than one co integration relations. Johansen test allows estimation of all the possible long run relations (Haleem *et al.,* (2005)). It uses two likelihood tests for determining the co integration relations Brooks (2002).

i. The Trace test
ii. The Maximum Eigenvalue test

Results of co-integration

According to table 2 above both trace test and max Eigen values test eliminate the hypothesis of no co integration. For the elimination of null hypothesis calculated values of both trace test and max Eigen values test must go beyond their respective critical value smooth probability value must be equal to or less than 0.05. At most 1 has null hypothesis that there exists at least one co integration relation and substitute hypothesis that there are more than one co integration relations. Max Eigen values test is incapable to reject null hypothesis at most 1 which means according to max Eigen values test there is at least 1 co integration relation that exists between the variables. Trace test has rejected the null hypothesis at most 1 and at most 2 that there are at least 1 and 2 co integration relations in that order suggesting that there exist at least 2 co integration relations. Trace test is incapable to reject at most 2 null hypotheses thus suggests that there exist at least 2 co integration relations. Trace test is more consistent than maximum Eigen values test (Cheung and kai (1993), Liang (2006)). So according to trace test there are two co integration relationships among variables.

Normalized Equation

LPOV = -15.6128 +4.39512 LLE -8.251223LLR -2.295724 LGER

S.E	(7.27040)	(1.35392)	(0.43277)
T Test	[6.65646]	[6.09434]	[5.30470]

The Normalized co-integration equation reveals that the Literacy rate and other variables have negative effect on Poverty but life expectancy has positive effect. The Life Expectancy coefficient is 4.3 and showing significant, implying in Pakistan, a one percent increase in Life Expectancy while other keep constant contributes 4.3% increase in Poverty. Similarly, the LLR coefficient is 8.2, and showing significant, implying in Pakistan, one percent increase in Literacy Rate while other keep constant contributes 8.2% decrease in Poverty. Same as the case in Gross Enrollment, its coefficient is 2.2 and showing significant, implying in Pakistan that one percent increase in Gross Enrollment while other keep constant contributes 2.2 % decrease in poverty and the values of R-square (0.66), and F-statistics (14.02) shows that the model is overall good fit and statistically significant (table 3).

Vector Error Correction Model (VECM)

Vector Error Correction model (table 4) is a restricted VAR model and it deals with those series which are non-stationary and found to be co integrated. If Co integration exists between series which suggests a long run relationship then VECM is used to check the short run properties of co integrated series. For VECM co integration must exist otherwise no need of VECM. It tells us about long run to short run adjustments of the model. In the Short run there is no adjustment from long run to short run as shown by the following co-integration. The estimated error correction model is enjoys a very low goodness of fit (R2=0.66). The empirical study is performed by using PC version of Eviews 6.0.

Table 2. Co integration

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.757333	88.06899	47.85613	0.0000
At most 1*	0.554605	41.33878	29.79707	0.0015
At most 2	0.322594	14.64858	15.49471	0.0668
At most 3	0.052959	1.795610	3.841466	0.1802

Table 3. Normalized Co-integration Coefficient

P	Constant	LLE	LLR	LGE
1.000000	15.6128	4.39512	8.25122	2.29572
St. errors		(7.27040)	(1.35392)	(0.43277)
t-ratio		[6.65646]	[6.09434	[5.30470]

Table 4. Vector Error Correction Model

	LPOV	LLR	LLE	LGER
Constant	-0.211236	0.010578	0.000569	0.096164
	(0.08346)	(0.00449)	(0.00010)	(0.09202)
	[-2.53101]	[2.35853]	[5.67153]	[1.04502]
ECM(-1)	0.880889	0.003981	-9.18E-05	-0.269355
	(0.18526)	(0.00996)	(0.00022)	(0.20426)
	[4.75499]	[0.39986]	[0.41232]	[-1.31868]
R^2	0.668086	0.851534	0.995527	0.3435586
S.D of equation	0.038539	0.002071	4.63E-05	0.042492
F-Statistics	4.920244	14.02028	544.0155	1.279493

{Values in parenthesis shows the standard error while
in [ ] shows the t-statistics at the 5% level of significance}.

CONCLUSION AND POLICY IMPLICATIONS

Investing in education is the key to economic growth process. Education helps in reducing poverty and improving the socio-economic status of both the individuals as well as the society. The present research work explores the short-run (SR), long-run (LR) linkages and causal nexus among education, and poverty in the presence of physical capital as a fourth important variable. The SR and LR relationship among variables has been examined through Bounds Testing Approach to Co integration approaches. The co integration results confirm that there exists LR relationship among education and poverty.

On the basis of the findings of the study, it is recommended that the government and other policy makers should focus on SR as well as LR solutions of poverty reduction. The study also recommends pro-poor growth and education in Pakistan. Government should also focus on the quantity and quality of education that, in turn, leads to more researches in the country.

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