RELATIONSHIP BETWEEN FEMALE SECONDARY EDUCATION AND ECONOMIC GROWTH OF PAKISTAN

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Abstract. *The main focusing of this study is to examine empirically the connection between female secondary school enrollment and economic growth of Pakistan taking the period of 1975-2014. The variables of the series passed the test of stationary by the first difference as evaluated by the ADF and PP test. Therefore, by employing the Johansen test of cointegration, the result shows that female secondary school enrollment and labor employment have insignificantly long run positive influence on economic growth, however, capital formation has significantly positive impact on economic growth of Pakistan. The Granger causality test based on VECM shows that female secondary school enrollment and GDP have long run two-way causality, however, the short run bidirectional causality does not exist but unidirectional causality, which is running from GDP to female secondary school enrollment.*

Key words: Female secondary education, Employment, capital formation, economic growth, Pakistan

Introduction

The opportunity of secondary education when provides especially to girls tends to get out a country from extreme poverty and enhance economic growth through high chances of achieving quality work place, tends to have low fertility level, securing good health condition of the women and increase productivity level by the human capital development (The World Bank, 2008). Girls Secondary education completion have most of the advantages such as to boost up drastically the life time earnings of the girls, similarly dramatically reduce the rate of fertility and mortality. Each year 0.58 percent long-run economic growth can be achieved by the addition of secondary schooling per year. Further, the 100 countries study as demonstrated by the World Bank that one percent increase in girl's secondary education tends to enhance 0.3 percent income per capita. (UNGEI, 2014). A recent study conducted n a panel of Asian economies to explore empirically the influence of female education at primary, secondary and territory level on economic growth. The result of the analyses indicated a significant contribution of the female primary, secondary and territory education to the economic growth of the selected Asian countries (Cooray & Hassan, 2013).

Pakistan has a large number of out of school children around 6.7 million, of which girls are 5.5 percent, this becomes a big obstacle from a long time in the way of economic and social development of the country. The secondary education proportional marginally decreases with the increasing of educational level. Total enrollment in the secondary school is 2.8 percent, of which 42 percent are female and 58 percent are male. (Malik et al., 2015). According to Pakistan, economic survey (2014) Education determines significantly the development of the economy of a country. High literacy rate guarantees the sustainable economic growth, economic prosperity and high productivity of the labor force. Equal opportunity of education to boys and girls eliminates gender discrimination and strengthens to compete for the emerging and modern challenges to adopting new technology and upgrading the intellectual power. The main aim of the gender equality of education is to remove gender disparity at all level of education such as primary, secondary and territory education. Pakistan gender disparity ratio indicates 47 percent literacy rate of female and 70 percent of male, which demonstrates that more financial and human resources are needed to achieve gender parity. According to World Bank (2015) the female secondary school enrolment in Pakistan is sufficiently lower than the male enrolment of secondary education. The gross enrolment ratio of secondary education in 2014 is 36.6 percent for female and 46.3 percent for a male. Similarly, UNESCO (2016) has also demonstrated the lower enrolment ratio of 39.20 percent for girl's secondary education as compared to 49.45 percent for a male in 2015.

1 Objectives of the Study

The study has following two specific objectives.

1. To examines the influence of female secondary education on the economic growth of Pakistan; and
2. To examines the bilateral relationship between female secondary education and economic growth of Pakistan.

2 Literature Review

Mankiw, Weil and Romer (1992) conducted a research based on the growth model of endogenous to find out the interrelationship between education and economic growth. Human capital, capital formation, government policies, political stability, market distortion and technology have considered as factors of the growth model of endogenous etc, which have a significant contribution to overall economic growth. The main objective of the study is to explore the several countries enrolment rate modification. The result of the research found a significant effect on the economic growth with the enhancing of school

enrolment, The conclusion of the study indicated a significant influence of the schooling on economic growth, which reflects that secondary school enrolment for girls will tend to low fertility and mortality, high employment opportunities, promoting human capital development. The efficient and skilful labor then access to utilize the resources efficiently, which consequently increase the productivity level and economic growth.

Lucas (1988) was of the view that education is one of the important factors, which determines to stimulate the development process by the accumulation of human capital, where the role of human capital is the main factor in the process of production. As argued by this study that Human development by the education produces skilful and efficient labors that have a positive impact on the production and better economic performance of a country.

Dollar and Gatti (1999) investigated the interrelationship between gender disparity of education and economic growth. They were of the view that the status of women in developed countries is stronger than developing the world. Mostly in developing countries, the Government spending on female education and health is quite less than the investment on male; therefore, girls have very less access to education, political power and to their legal rights in the society. The main findings of the research are that education gander disparity has significantly a negative influence on economic growth, the result of the study also indicates a significantly positive influence of female secondary school attainment and insignificantly a negative impact of male attainment of secondary school on the economic growth.

Klasen (2002) contended that girl's education immensely has a significant contribution to the economic growth of developing the world. The study also stressed on the equal access to education is required for both girls and boys. If more opportunities of education provide to girls then their outcome is higher than the return of the boys. It means that in developing countries the girl's education has a marginal increasing return.

Hassan and Cooray (2013) employed Bounds testing approach to finding out empirically the impact of male and female education at primary, secondary and territory level on the economic growth of a penal of Asian economies. The findings of the empirical analysis of the study indicate that the enrolment ratios of the male and female at primary secondary and territory level have a significantly positive influence on the economic growth of the Asian countries.

Self and Grabowski (2004) found the influence of male and female primary, secondary and territory education separately on the economic growth of India covering period 1966-1996. The conclusion of the study demonstrated that male

primary education has a strong positive influence on the economic growth of India, where secondary education has a week positive effect on growth. However, the female education at all level has a significantly positive influence on the economic growth of India.

Knowles, Lorgelly and Owen (2002) examined the impact of gender gap of education on economic development, especially to find out whether the boosting of female enrolment in school enhances the productivity level of labor in the long run. The empirical findings of the study demonstrated a positive and significant influence of female education on the productivity level where the unclear result has shown by the effect of male education on the economic productivity.

3. Methodology

Econometric model specification

The specific econometric model for this study is based on the growth model of endogenous presented by Mankiw, Romer, and Weil (1992), which indicates the linkage between educational attainment and economic growth. Mankiw included in his model the endogenous factors such as human capital, political instability, market distortion, capital accumulation, public policies, modern machinery and technology have a significant impact on the overall growth and development process. The growth model of Mankiw et al. (1992) is based on the Solow (1956) standard neoclassical model of growth. Solow (1956) included three factors of production in his standard growth model.

$$Y = f(A, K, L) \quad \text{……..……..(1)}$$

Y shows total output or production by bringing together the three production factors, A stands for the productivity of total factors or the promotion or advancement of the training or education technically, K indicates capital accumulation physically and L stands for the employment ratio of the labor force. When taking derivative of the above equation 1, we get the following equation 2.

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \frac{A\partial F}{\partial K}.\frac{K}{Y} + \frac{A\partial F}{\partial L}.\frac{L}{Y} \quad \text{……..…..(2)}$$

It has been hypothesized that the production function of Solow standard growth model is based on production function of Cobb-Douglas indicates constant return, meaning that by adding altogether the share of each factor such as physical capital, technology or technical training and labor equal to one as demonstrated in the following equation.

$$\gamma + \alpha + \beta = 1 \text{……..(3)}$$

α shows the share of capital, β indicates the share of labor and γ is the shares of technology or knowledge.

By adding equation 2 and 3 we get the following basic equation of Solow.

$$\frac{\Delta Y}{\mathrm{Y}} = \gamma \frac{\Delta L}{L} + \beta \frac{\Delta K}{K} + \alpha \frac{\Delta A}{\mathrm{A}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4)$$

$\frac{\Delta Y}{\mathrm{Y}}$ denotes growth rate of total output, $\frac{\Delta A}{\mathrm{A}}$ demonstrates the productivity level of total factor, $\frac{\Delta K}{K}$, and $\frac{\Delta L}{L}$ indicate the respective productivity level of physical capital and labor.

We get the following equation when takes natural logs of the equation 4.

$$LnY_t = LnA_t + \alpha LnK_t + \beta LnL_t + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Mankiw, Romer and Weil (1992) modified the Solow standard mode of growth by adding human capital then the model general form can be written as;

$$Y_t = A_t\, K_t^{\alpha}\, E_t^{\beta}\, L_t^{1-\alpha-\beta}\, e_{it} \qquad t = 1, 2, 3\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Y_t indicates the aggregate outcome by making all together the share of each economic factor, A_t shows the development of education or training technically, K_t indicates capital accumulation, E_t shows the number of female enrolment in secondary school, L_t indicates the employment ratio of the labor force and e_{it} is the error term.

We get the following equation 7 when taking natural logs both sides of the above equation 6.

$$lnY_t = lnA_t + \alpha lnK_t + \beta lnE_t + \gamma lnL_t + e_{jt} \qquad t = 1, 2, 3\ldots\ldots\ldots(7)$$

lnA_t shows constant or stable parameter, α is the capital production elasticity, β is the elasticity of production by the female secondary education, γ shows labor production elasticity and e_{jt} is the error term or the influence of external factors, which are outside the model.

4. Sources of Data

The study has chosen the country of Pakistan using Time series data of the period 1975-2014. Gross fixed capital formation (Current LCU) proxies for the variable of capital accumulation (K). GDP (Constant LCU) proxies for the aggregate output or total economic growth (Y). E_t denotes the number of female enrolment in secondary school, which reflects the development of human capital. L_t shows the employment of labor force. The data for gross fixed capital formation and GDP have collected from World Bank (2015). However, the data

of labor employment and female secondary school enrolment have collected from Pakistan economic survey (2015).

Estimation Procedure

This study has employed Dickey and Fuller (1979) and Perron (1988) unit roots test to check stationary of the variables, the Johansen (1988, 1991) approach for long run cointegration, and the Granger test for bilateral causality. It has been assumed by the analysis of classical regression that gross domestic product, female secondary school enrolment, labor and gross fixed capital formation should be stationary, meaning that the variables should have a constant mean and variance. However, if the variables have no constant mean and variance over time, meaning that they are non-stationary then the result of the classical regression analysis will be considering as invalid or spurious (Thomas, 1997). Despite if, the variables have a significant association but still, their result will be invalid. Therefore, the study first employed the PP and ADF test to find out unit roots in the selected variables of the model. However, the Granger (1987) has pointed out that if the residuals of ordinary least square estimation of the non-stationary variables are stationary then the non-stationary variables shows long run cointegration association. Thus the study has used Johansen (1988, 1991) approach to examine the long-run cointegration among the variables. Finally, the test of Granger (1969) causality has been employed by this study to find out the bilateral association between enrolment number of female secondary education and GDP. The standard causality test of Granger will be used only if all the variables have no unit roots, meaning that the variables are stationary at level or I(0). The following equations having a lag length of k will be used for the standard Granger test for the bilateral causality among the variables.

$$GDP_t = a_1 + b_1GDP_{t-1} +..+ b_kGDP_{t-k} + c_1E_{t-1}+..+ c_kE_{t-k} + e_1 \quad \ldots\ldots\ldots(8)$$

$$E_t = a_2 + b_1E_{t-1}+..+ b_kE_{t-k}+ c_1GDP_{t-1}+..+ c_kGDP_{t-k}+ e_2 \quad \ldots\ldots\ldots\ldots\ldots(9)$$

a_1 and a_2 indicates constants, b_1……..b_k and c_1……..c_k are the slope coefficients.

The causality test of Granger will be employing for the joint hypothesis by using Wald test.

$$c_1 = c_2 = c_3 =\ldots..c_k = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

The null hypothesis of equation 8 indicates that female secondary school enrolment in Pakistan does not have a unidirectional causality on GDP. Conversely, the equation 9 demonstrates that GDP does not have a one-way causation on the number of female enrolment in secondary school. However, the alternative hypothesis indicates the existence of bilateral causality between

female secondary school enrolment and GDP. The optimum lag length will be selecting by minimising the criteria of Akaike information.

If the variables of the model have long run cointegration relationship and they are integrated of the same order of I(1), then for the bilateral causality this study will use Granger causality test based on VECM, which is based on the following equation.

$$\Delta GDP_t = a_1+b_1\Delta GDP_{t-1}+..+b_k\Delta GDP_{t-k}+c_1\Delta E_{t-1}+..+c_k\Delta E_{t-k}+d_1EC_{t-1}+\mu_1 \ldots..(11)$$

$$\Delta E_t = a_2+b_1\Delta E_{t-1}+..+b_k\Delta E_{t-k}+c_1\Delta GDP_{t-1}+..+c_k\Delta GDP_{t-k}+d_2EC_{t-1}+\mu_2 \ldots\ldots(12)$$

Δ stands for the change or difference and EC_{t-1} abbreviates the error correction term shows the speed of adjustment to the long run equilibrium from short run shock.

The VECM type of causality test is more beneficial than the standard causality test of Granger. The causality test based on VECM determines to find out not only long run causality but short run too. The short run causality among the variables will be finding out by using Wald test. However, the negative coefficient along with significant of EC_{t-1} indicate the long run causality.

The four possible causality between female secondary enrolment and GDP have mentioned below.

Independence

If the two variables do not show any interdependency between them demonstrate independence, meaning that there is no causality exist between female secondary enrolment and GDP.

(b) Female secondary school enrolment induced GDP

The association between the two variables shows unidirectional or one-way causation, meaning that there is unidirectional causality running from female secondary school enrolment to GDP.

(c) GDP induced female secondary school enrolment

This type of linkage between the two variables also shows unidirectional or one-sided causality, meaning that there is unidirectional granger cause from GDP to female secondary school enrolment.

(d) Bi-directional causality

This type of relationship between the two variables indicates bilateral causality, Such as female secondary school enrolment influences GDP but conversely, GDP also affects female secondary school enrolment.

Empirical findings

This section exhibits the findings of the analysis by employing the econometrics tests to find out the linkage between female secondary school enrolment and GDP of Pakistan covering the period 1982-2014.

First, the ADF and PP unit roots test have been employed by this study to find out the stationary order of all the data of the variables.

The following table 1 shows the result of ADF and PP tests together, identifying that all the variables have passed the stationary test by the first difference, meaning that by the employing of ADF and PP test together we found that gross domestic product, female secondary school enrollment, labor employment and gross fixed capital formation got unit roots at level but they become stationary when converted to first difference or I (1).

Table 1 *Result of ADF and PP test*

	ADF Test statistics		**PP test**	
Variables	**Level**	**First Difference**	**Level**	**First Difference**
lnGDPt	-1.6743	-4.752*	-1.267	-4.722*
	(0.743)	(0.003)	(0.881)	(0.003)
lnKt	-1.336	-6.143 *	-2.323	-9.605*
	(0.603)	(0.000)	(0.170)	(0.000)
lnLt	0.563	-7.315	0.813	-7.120
	(0.999)	(0.000)	(0.999)	(0.000)
lnEt	-0.637	-4.718*	-0.9713	-4.726*
	(0.971)	(0.003)	(0.937)	(0.003)

Note: *denotes1% significance of the test statistics, value inside the parentheses is probability

As we have confirmed from the above ADF and PP tests together that all the variables have integrated of the same order I(1) therefore, the Johansen approach will be using to find out the long run association among the variables. But before employing Johansen test of cointegration we should select the optimum lag length by the criteria of VAR lag such as LR test statistics in the sequential modified form, final prediction error or simple FPE, Hanan Quinn criterion (HQ), Akaike information criterion (AIC), and the Schwarz criterion (SC). The criterions lag selection have identified in the following Table 2 that Schwarz criterion (SC) and Hanan Quinn criterion (HQ) have chosen 1 lag, however, the Akaike information criterion (AIC) and the criterion of final

prediction error (FPE) together have selected 4 optimum lags. We select 4 lags by giving more preference to the choice of AIC and FPE.

Table 2 *The Result of Optimum lags Selection by the Unrestricted VAR Criteria*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	70.28	NA	0.000	-3.68	-3.51	-3.62
1	280.36	361.80	0.000	-14.46	-13.59*	-14.16*
2	291.59	16.85	0.000	-14.2	-12.62	-13.65
3	317.13	32.63*	0.000	-14.73	-12.44	-13.93
4	338.31	22.35	0.000*	-15.02*	-12.03	-13.97

*shows the criterion selection of the optimum lag

We put the optimum lag into the Johansen approach to finding out long run cointegration among the variables by the Trace and Eigenvalue tests. The following Table 3 demonstrates that the null hypothesis of no cointegration has been rejected by the Trace test, indicating that the value of Trace statistics is significant and greater than the critical value. Similarly, the null hypothesis of one cointegration vector and two cointegration vectors respectively have been rejected by the Trace test, implying that their values of Trace statistics are significant and greater than their critical values. However, The Trace test accepted the null hypothesis of at least three cointegration vectors, implying that the value of Trace statistics is insignificant and lower than it is respective critical value. Therefore, the series indicate a long run cointegration relationship. Similarly, the Eigenvalue test rejects the null hypothesis of no cointegration relationship among the variables, indicating that the Eigenvalue statistics is significant and greater than it is critical value. However, the null of the hypothesis of at least one cointegration association has been accepted by the Eigenvalue test, indicating that the Eigenvalue statistics is insignificant and lower than it is respective critical value. Therefore, it indicates that the variables have long run cointegration relationship.

Table 3 *Results of Unrestricted Trace Test of Johansen*

Hypothesized No. of CE(s)	**Eigen value**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None*	0.651	72.64	47.86	0.000
At most 1*	0.425	35.85	29.80	0.001
At most 2*	0.307	16.50	15.50	0.035
At most 3	0.099	3.66	3.84	0.056

Trace test shows 3 cointegrating vectors at the level of 0.05
* indicates the hypothesis rejection at the level of 0.05

Table 4 *Results of Unrestricted Eigen test of Johansen*

Hypothesized No. of CE(s)	**Eigen value**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.651	36.796	27.584	0.003
At most 1	0.425	19.350	21.132	0.087
At most 2	0.307	12.835	14.265	0.083
At most 3	0.100	3.663	3.842	0.056

Max-Eigen value test shows 1 cointegrating vectors at the level of 0.05
*denotes rejection of the hypothesis at the 0.05 level

The following Table 5 shows the estimated result of the long run coefficients interpreted by the VECM

Table 5 *The result of the estimated long-run coefficients by the VECM*

Cointegrating Eq:	**CointEq1**
LGDP(-1)	1.000
lnK(-1)	-0.319 (0.051) [-6.334]
lnL(-1)	-0.080 (0.198) [-0.403]
lnE(-1)	-0.1224 (0.096) [-1.275]
C	-19.726

Note: The values inside ( ) and [ ] are the standard error and t-statistics respectively

The long run Johansen coefficients in the normalized form have identified in the equation below.

$$\ln Y_t = 19.72615 + 0.319662 \ln K_t + 0.122398 \ln E_t + 0.079602 \ln L_t + e_{jt} \ldots\ldots(13)$$

[-6.334] 1.275] [-0.403]

We conclude from the above equation that the coefficient sign of capital accumulation is positive and statistically significant, meaning that capital formation has a significantly positive impact on the economic growth of Pakistan. Similarly, female secondary school enrollment and labor employment have also positive coefficients sign but statistically insignificant, indicating that female secondary education and labor employment have an insignificantly positive influence on the economic growth of Pakistan.

Granger bidirectional Causality test

The findings of the pairwise bilateral causality between female secondary education and economic growth based on VECM are identified below in Table 6 and 7.

Table 6 *Results of Granger Causality Based on VECM*

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
ECM_{t-1}	-0.169	0.057	-2.974	0.006
D(lnGDP)(-1)	0.196	0.156	1.228	0.230
D(lnGDP)(-2)	0.207	0.170	1.220	0.233
D(lnK)(-1)	-0.09	0.041	-2.178	0.038
D(lnK(-2)	-0.102	0.040	-2.527	0.018
D(lnL)(-1)	-0.083	0.083	-0.999	0.327
D(lnL)(-2)	-0.167	0.086	-1.940	0.063
D(lnE)(-1)	-0.005	0.054	-0.087	0.931
D(inE)(-2)	0.107	0.052	2.042	0.051
R-squared	0.533	Prob (F-statistic)	0.006	
Hannan-Quinn criteria	4.997	F- statistics	3.422	

ECM_{t-1} is the error correction term shows the speed of adjustment from short run shock to long-run equilibrium. The coefficient of ECM_{t-1} is -0.168625, which is negative and significant, indicating that 16 percent short run current deviation can get an adjustment in the next period, meaning that there is long-run causality running from explanatory variables to GDP. However, we use the Wald test to find out short run causality, the findings show that the chi-square statistics are insignificant for the female secondary school enrollment and labor employment; therefore, we could not found short run unidirectional Granger cause from female secondary education and labor employment to GDP respectively.

However, there exists unidirectional short run causality from capital formation to GDP, because the chi-square statistics for capital formation is significant.

Now we take female secondary school enrolment as dependent variable and GDP, labor employment and capital formation are included in the series as independent, therefore we get the following result of causality based on VECM in Table 7.

Table 7 *Results of Granger Causality Based on VECM*

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
ECT_{t-1}	-0.028	0.007	-3.783	0.001
D(lnE)(-2)	-0.248	0.150	-1.650	0.111
D(lnE)(-3)	-0.170	0.153	-1.106	0.279
D(lnGDP)(-2)	0.978	0.476	2.054	0.050
D(lnGDP(-3)	-1.222	0.504	-2.423	0.023
D(lnK)(-2)	0.101	0.133	0.758	0.455
D(lnK)(-3)	0.130	0.118	1.100	0.281
D(lnL)(-2)	0.080	0.263	0.304	0.764
D(lnL)(-3)	-0.439	0.274	-1.603	0.121
R-squared	0.558	Prob (F-statistic)	0.005	
F-statistic	3.652	Hannan-Quinn criter.	-2.801	

The error correction term in the above table is, again, significantly negative, which shows long run causality from gross domestic product, labor employment and capital formation to female secondary school enrolment. Where the short run causality have been analyzed by the Wald test, indicating that the chi-square statistics for the variables of capital formation and labor employment are insignificant, meaning that there is no short-run causality from these variables to female secondary school enrolment. However, the chi-square statistics for the variable of GDP is significant, implying that there exists short-run causality from GDP to female secondary school enrolment.

The summary conclusion of the Causality test of Granger based on VECM demonstrates that female secondary school enrolment and GDP have long run bilateral causality, meaning that female secondary school enrolment affects GDP in the long run but conversely GDP also has long run influence on female secondary school enrolment. However, the following Table 8 indicates that there is no short run bilateral causality between female secondary enrolment and GDP but unidirectional short run causality, which is running from GP to female secondary school enrolment.

Table 8 *Results of Granger Causality Tests Based on VECM*

Dependent variables	**lnGDP**	**lnL**	**LnE**	**lnK**
lnGDP	--	4.407	4.195	10.538
		-0.110	-0.123	-0.005
lnE	8.065	2.984	--	1.626
	-0.018	-0.225		-0.444

Inside the braces is the probability value

Conclusion

This study shows the empirical findings of the association between female secondary school enrolment and economic growth of Pakistan, taking the period 1975-2014. The ADF and PP tests together found at level non-stationary of all the data but they become stationary by converting into the first difference. The cointegration technique of Johansen approach has been used in this study due to the same integration level of the variables. The findings show that the variables have long run cointegration relationship. The normalized long run Johansen coefficients have been extracted from the VECM indicate that female secondary education and labor employment have an insignificantly positive influence on the economic growth of Pakistan, however, the capital accumulation has a significantly positive effect on economic growth of Pakistan. The causality test of Granger based on VECM found long pairwise causality between female secondary school enrolment and GDP; however, the Trace test does not show short run bilateral causality but unidirectional causality, which is running from GDP to female secondary school enrollment.

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