ABSTRACT. The main focusing of this study is to examine empirically the interdependence 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 found 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 short run causality, which is running from GDP to female secondary school enrollment.

Keywords: Female secondary education, Employment, capital formation, economic growth, Pakistan

1. 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 [1]. 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 [2].

A recent study conducted in 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 [3]. 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 [4]. 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 [5]. 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 [6]. Similarly, another lower enrolment ratio for girl’s secondary education has shown 39.20 percent as compared to 49.45 percent for male in 2015 [7].

1.1. **Objectives of the study.** The study has following two specific objectives.

a. To examine the influence of female secondary education on the economic growth of Pakistan
b. To examine the bilateral relationship between female secondary education and economic growth of Pakistan.

2. **Literature review.** The study conducted 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 study found a significant effect on the economic growth with the enhancing of school enrolment, The conclusion of the study further 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 skillful labor then access to utilize the resources efficiently, which consequently increase the productivity level and economic growth [8].

Another study has demonstrated 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 skillful and efficient labors that have a positive impact on the production and better economic performance of a country [9].

Similarly, another study has investigated the interrelationship between gender disparity of education and economic growth. The study has shown that the status of women in developed countries is stronger than the developing 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 study have shown that education gender 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 [10].

Girl’s education has immensely a significant contribution to the economic growth of the developing world. This could be confirmed based on the research of the interrelationship between girl’s education and economic growth. 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 [11].

Another study 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 indicated 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 [12].

Similarly, another study concluded about the influence of male and female primary, secondary and territory education separately on the economic growth of India covering the period of 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 [13].

Another study 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 [14].

3. **Methodology (Econometric Model specification):** The specific econometric model for this study is based on the growth model of endogenous presented by Mankiw, indicates the linkage between educational attainment and economic growth. The Mankiw model included 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. This growth model is based on the standard neoclassical Solow growth model [8]. Solow included three factors of production in his standard growth model [15].

\[ Y = f(A, K, L) \]  

(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.

\[ \frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \frac{\Delta K}{K} \cdot \frac{\partial f}{\partial K} + \frac{\Delta L}{L} \cdot \frac{\partial f}{\partial L} \]  

(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.

\[ \gamma + \alpha + \beta = 1 \]  

(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.

\[ \frac{\Delta Y}{Y} = \gamma \frac{\Delta L}{L} + \beta \frac{\Delta K}{K} + \alpha \frac{\Delta A}{A} \]  

(4)

\[ \Delta Y \] denotes growth rate of total output, \[ \Delta A \] demonstrates the productivity level of total factor, \[ \Delta K \] and \[ \Delta L \] indicate the respective productivity level of physical capital and labor. We get the following equation when takes natural logs of the equation 4.

\[ \ln Y_t = \ln A_t + \alpha \ln K_t + \beta \ln L_t + \mu t \]  

(5)

Mankiw modified the Solow standard model of growth by adding human capital then the model general form can be written as;

\[ Y_t = A_t K_t^\alpha E_t^{\beta} L_t^{1-\alpha-\beta} e^{\epsilon t} t = 1, 2, 3 \]  

(6)

Yt indicates the aggregate outcome by making all together the share of each economic factor, A shows the development of education or training technically, Kt indicates capital accumulation, Et shows the number of female enrolment in secondary school,Lt indicates the employment ratio of the labor force and et is the error term.

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

\[ \ln Y_t = \ln A_t + \alpha \ln K_t + \beta \ln E_t + \gamma \ln L_t + \epsilon_t \]  

(7)

\[ \ln A_t \] shows constant or stable parameter, \[ \alpha \] is the capital production elasticity, \[ \beta \] is the elasticity of production by the female secondary education, \[ \gamma \] shows labor production elasticity and \[ \epsilon_t \] 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). Et denotes the number of female enrolment in secondary school, which reflects the development of human capital. Lt shows the employment of labor force. The data for gross fixed capital formation and GDP have collected from World development indicators World Bank [6]. However, the data of labor employment and female secondary school enrolment have collected from Pakistan economic survey [5].

Estimation procedure: This study has employed Dickey-Fuller and Phillip-Perron unit roots test to check stationary of the variables [16,17]. The Johansen approach will be employing for the long run co-integration relationship among the variables [19]. Finally the Granger causality will be used for the bilateral relationship between female secondary education and economic growth of Pakistan [20].

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 [18]. 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 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 [22]. Thus the study has used Johansen approach to examine the long-run cointegration among the variables [19, 21]. Finally, the test of Granger causality has been employed 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) [22]. The following equations having a lag length of k will be used for the standard Granger test for the bilateral causality among the variables.

\[
\begin{align*}
\text{GDP}_t &= a_1 + b_1 \text{GDP}_{t-1} + \ldots + b_k \text{GDP}_{t-k} + c_1 \text{Et}_{t-1} + \ldots + c_k \text{Et}_{t-k} + e_1 \\
\text{Et}_t &= a_2 + b_1 \text{Et}_{t-1} + \ldots + b_k \text{Et}_{t-k} + c_1 \text{GDP}_{t-1} + \ldots + c_k \text{GDP}_{t-k} + e_2 
\end{align*}
\] (8)

\[
\begin{align*}
a_1 \text{ and } a_2 \text{ indicates constants, } b_1, \ldots, b_k \text{ and } c_1, \ldots, c_k \text{ are the slope coefficients. The causality test of Granger will be employing for the joint hypothesis by using Wald test.}
\end{align*}
\] (9)

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.

\[
\begin{align*}
\Delta \text{GDP}_t &= a_1 + b_1 \Delta \text{GDP}_{t-1} + \ldots + b_k \Delta \text{GDP}_{t-k} + c_1 \Delta \text{Et}_{t-1} + \ldots + c_k \Delta \text{Et}_{t-k} + d_1 \text{EC}_{t-1} + \mu_1 \\
\Delta \text{Et}_t &= a_2 + b_1 \Delta \text{Et}_{t-1} + \ldots + b_k \Delta \text{Et}_{t-k} + c_1 \Delta \text{GDP}_{t-1} + \ldots + c_k \Delta \text{GDP}_{t-k} + d_2 \text{EC}_{t-1} + \mu_2 
\end{align*}
\] (11) (12)

\(\Delta\) stands for the change or difference and \(\text{EC}_{t-1}\) 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 \(\text{EC}_{t-1}\) 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.
- 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.
- 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.
- 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.

5. **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, shows a consistent result 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 enrolment, labor employment and gross fixed capital formation show unit roots at level but they become stationary when converted the data of all these variables into first difference or I(1).
As we have confirmed from the above partial result of ADF and PP tests that all the variables have integrated of the same order I(1) therefore, the Johansen approach will be used to find out the long run association among the variables. But before employing Johansen test of cointegration we will have to 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), allowed for lag 1, however, the Akaike information criterion (AIC) and the criterion of final prediction error (FPE) together have shown 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

<table>
<thead>
<tr>
<th>Lag</th>
<th>LogL</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>70.28405</td>
<td>NA</td>
<td>2.96e-07</td>
<td>-3.682447</td>
<td>-3.506501</td>
<td>-3.621037</td>
</tr>
<tr>
<td>1</td>
<td>280.3586</td>
<td>361.7950</td>
<td>6.19e-12</td>
<td>-14.46437</td>
<td>-13.58463*</td>
<td>-14.15732*</td>
</tr>
<tr>
<td>3</td>
<td>317.1286</td>
<td>32.62832*</td>
<td>5.40e-12</td>
<td>-14.72937</td>
<td>-12.44206</td>
<td>-13.93104</td>
</tr>
</tbody>
</table>

* shows the criterion selection of the optimum lag

We take the optimum lag of 4 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 the respective 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, indicating that the value of Trace statistics is insignificant and lower than its 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 vector has been accepted by the Eigenvalue test, indicating that the Eigenvalue statistics is insignificant and lower than its respective critical value. Therefore, it indicates that the variables have long run cointegration relationship.

Table 3. The result of unrestricted Trace test of Johansen

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None *</td>
<td>0.650518</td>
<td>72.64304</td>
<td>47.85613</td>
<td>0.0001</td>
</tr>
<tr>
<td>At most 1 *</td>
<td>0.424692</td>
<td>35.84743</td>
<td>29.79707</td>
<td>0.0089</td>
</tr>
<tr>
<td>At most 2 *</td>
<td>0.306983</td>
<td>16.49768</td>
<td>15.49471</td>
<td>0.0352</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.099371</td>
<td>3.663171</td>
<td>3.841466</td>
<td>0.0556</td>
</tr>
</tbody>
</table>

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

Table 4. The result of unrestricted Eigen test of Johansen

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigen value</th>
<th>Max-Eigen Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None *</td>
<td>0.650518</td>
<td>36.79561</td>
<td>27.58434</td>
<td>0.0025</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.424692</td>
<td>19.34975</td>
<td>21.13162</td>
<td>0.0872</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.306983</td>
<td>12.83451</td>
<td>14.26460</td>
<td>0.0831</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.099371</td>
<td>3.663171</td>
<td>3.841466</td>
<td>0.0556</td>
</tr>
</tbody>
</table>

Max-eigenvalue 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

<table>
<thead>
<tr>
<th>Cointegrating Eq:</th>
<th>CointEq1</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP(-1)</td>
<td>1.000000</td>
</tr>
<tr>
<td>lnK(-1)</td>
<td>-0.319662 (0.05047) [-0.33419]</td>
</tr>
<tr>
<td>lnL(-1)</td>
<td>-0.079602 (0.19755) [-0.40294]</td>
</tr>
<tr>
<td>lnE(-1)</td>
<td>-0.122398 (0.09599) [-1.27511]</td>
</tr>
<tr>
<td>C</td>
<td>-19.72615</td>
</tr>
</tbody>
</table>

Note: The values inside ( ) and [ ] are the standard error and t-statistics respectively
The long run Johansen equation in the normalized form have identified in the equation below.
\[
\ln\text{GDP}_t = 19.72615 + 0.319662\ln\text{K}_t + 0.122398\ln\text{E}_t + 0.079602\ln\text{L}_t + \epsilon_t
\]  
\[(13)\]

The above long run Johnson equation identifies that the coefficient sign of capital accumulation is positive and statistically significant, indicating that capital formation has a significantly positive impact on the economic growth of Pakistan. The coefficient of capital formation shows that 0.3197 percent positive variation will be happening in GDP due to the 1 percent increase in capital formation. The value of t-statistics is higher than 1.96, which shows the significant influence of capital formation on GDP. Similarly, female secondary school enrollment and labor employment have also a 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. The coefficient of female secondary education shows that 0.122 percent in GDP will boost 0.122 percent in female secondary education will boost 0.122 percent in GDP. Where the coefficient of labor employment shows that .0796 percent contribution in GDP would be possible with the enhancing of 1 percent in labor employment.

**Granger bidirectional Causality test**

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

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECMt-1</td>
<td>-0.168625</td>
<td>-2.974011</td>
<td>0.0061</td>
</tr>
<tr>
<td>D(lnGDP)(-1)</td>
<td>0.196153</td>
<td>1.228283</td>
<td>0.2299</td>
</tr>
<tr>
<td>D(lnGDP)(-2)</td>
<td>0.206939</td>
<td>1.219710</td>
<td>0.2331</td>
</tr>
<tr>
<td>D(lnK)(-1)</td>
<td>-0.089457</td>
<td>-2.178267</td>
<td>0.0383</td>
</tr>
<tr>
<td>D(lnK)(-2)</td>
<td>-0.101820</td>
<td>-2.527300</td>
<td>0.0177</td>
</tr>
<tr>
<td>D(lnL)(-1)</td>
<td>-0.082948</td>
<td>-0.999391</td>
<td>0.3265</td>
</tr>
<tr>
<td>D(lnL)(-2)</td>
<td>-0.166566</td>
<td>-1.939699</td>
<td>0.0629</td>
</tr>
<tr>
<td>D(lnE)(-1)</td>
<td>-0.004694</td>
<td>-0.086917</td>
<td>0.9314</td>
</tr>
<tr>
<td>D(lnE)(-2)</td>
<td>0.106603</td>
<td>2.042358</td>
<td>0.0510</td>
</tr>
</tbody>
</table>

R-squared 0.532868
Hannan-Quinn criteria -4.996547
Prob(F-statistic) 0.006272
F- statistics 3.422161

ECMt-1 is the error correction term shows the speed of adjustment from short run shock towards long-run equilibrium. The coefficient of ECMt-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. The value of R-square is 53 percent, which shows that the data have fitted well, indicating that 53 percent of GDP depends on the explanatory variables where the 47 percent variation in GDP will be happening due to the external factors.

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

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECTt-1</td>
<td>-0.028211</td>
<td>0.007458</td>
<td>-3.782742</td>
<td>0.0008</td>
</tr>
<tr>
<td>D(lnE)(-2)</td>
<td>-0.247880</td>
<td>0.150240</td>
<td>-1.649900</td>
<td>0.1110</td>
</tr>
<tr>
<td>D(lnE)(-3)</td>
<td>-0.169587</td>
<td>0.153373</td>
<td>-1.105714</td>
<td>0.2790</td>
</tr>
<tr>
<td>D(lnGDP)(-2)</td>
<td>0.977808</td>
<td>0.476124</td>
<td>2.053683</td>
<td>0.0502</td>
</tr>
<tr>
<td>D(lnGDP)(-3)</td>
<td>-1.221765</td>
<td>0.504188</td>
<td>-2.423234</td>
<td>0.0226</td>
</tr>
<tr>
<td>D(lnK)(-2)</td>
<td>0.100854</td>
<td>0.133008</td>
<td>0.758256</td>
<td>0.4551</td>
</tr>
<tr>
<td>D(lnK)(-3)</td>
<td>0.130322</td>
<td>0.118428</td>
<td>1.100429</td>
<td>0.2812</td>
</tr>
<tr>
<td>D(lnL)(-2)</td>
<td>0.079746</td>
<td>0.262609</td>
<td>0.303668</td>
<td>0.7638</td>
</tr>
<tr>
<td>D(lnL)(-3)</td>
<td>-0.439448</td>
<td>0.274088</td>
<td>-1.603310</td>
<td>0.1209</td>
</tr>
</tbody>
</table>

R-square 0.558358                Prob(F-statistic) 0.004584
F-statistic 3.652362               Hannan-Quinn criter. 2.801377

The error correction term (ECT-1) in the above table again significantly negative, which shows long run causality from gross domestic product, labor employment and capital formation to female secondary school enrolment. The coefficient of ECT-1 is -0.028211, which shows that 0.0282 percent short run shock is possibly to be correct in the long run per year. 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 a short-run causality from GDP to female secondary school enrolment. The value of R-squared is 55 percent which shows good fit of the data, further indicating that 55 percent variation in female secondary education will be happening due to the change of the explanatory variables. Where the remaining 45 percent change in female secondary education is due to the external factors.

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, conversely GDP has also a long run influence on female secondary school enrolment. Where the short run bilateral causality between female secondary enrolment and GDP does not exist as found by the Wald test but unidirectional short run causality, which is running from GP to female secondary school enrolment.

Table 8. Result of Short run causality derived by Wald test

<table>
<thead>
<tr>
<th>Wald modified statistics</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>lnGDP</th>
<th>lnL</th>
<th>LnE</th>
<th>lnK</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnGDP</td>
<td></td>
<td>4.406948</td>
<td>4.194767</td>
<td>10.53752</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.1104)</td>
<td>(0.1228)</td>
<td>(0.0051)</td>
</tr>
<tr>
<td>lnE</td>
<td>8.064515</td>
<td>2.983903</td>
<td>………</td>
<td>1.62623</td>
</tr>
<tr>
<td></td>
<td>(0.0177)</td>
<td>(0.2249)</td>
<td></td>
<td>(0.4435)</td>
</tr>
</tbody>
</table>

Inside the braces is the probability value
Conclusion: This study shows the empirical findings of the interrelationship between female secondary school enrolment and economic growth of Pakistan, taking the period of 1975-2014. The ADF and PP tests partially employed by this study found non-stationary of all the data of the variables at level but become stationary by converting into first difference. The cointegration technique of Johansen approach has been used by 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 by 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 run pairwise causality between female secondary school enrolment and GDP; where the short run bilateral causality does not exist between female secondary school enrolment and GDP but unidirectional causality, which is running from GDP to female secondary school enrolment.

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[7]. UNESCO. (2016). Education: Gross enrolment ration by level of education (Vol. 37).
