DETERMINANTS OF FEMALE LITERACY RATES: EVIDENCE FROM CROSS-COUNTRY PANEL DATA.

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Abstract:

The present study seeks to examine the key determinants influencing the female literacy rate across countries. To achieve this objective, a comprehensive review of previous research addressing similar economic issues was conducted. Based on the findings of the literature review, the main independent variables were identified and subsequently incorporated into the estimated model. The dataset was obtained from the World Bank and covers a 30-year period from 1990 to 2020. Panel data comprising indicators from 217 countries were employed for the analysis. The regression results indicate that female literacy rates are significantly influenced by poverty levels, the number of secondary education teachers, the proportion of the rural population, and fertility rates. However, the wage rate was found to be statistically insignificant.

Furthermore, the analysis was extended by categorizing countries according to their development index, and the corresponding regression results were presented and discussed in the results section. The study also verified and interpreted the assumptions underlying the Ordinary Least Squares (OLS) method. Nevertheless, due to data limitations, some OLS assumptions could not be fully satisfied, which constitutes one of the study's main constraints. Despite these limitations, several policy recommendations were proposed to enhance female literacy levels globally.

Key words: Literacy rate, gender inequality, economic development, poverty rate.

Introduction:

Education is widely recognized as one of the most essential factors contributing to a country's economic development. Numerous studies have demonstrated that education not only fosters economic growth but also enhances individual and social development. However, gender disparities persist across many sectors, and education is no exception. According to global statistics, the number of people who are unable to read and write reaches nearly one billion. Additionally, there are approximately 300 million school-aged children who do not attend school. It is estimated that two-thirds of these children are girls lacking basic literacy skills, and around 60 percent of girls worldwide are not enrolled in formal education. For instance, in Africa, 75 percent of boys are enrolled in primary education compared to only 57 percent of girls. Education holds particular importance for women, as they play a vital role in the upbringing and development of future generations, which in turn directly influences the prosperity and progress of the state (Adetude and Akensina, 2008). For example, women constitute about 53 percent of the population in Pakistan. Therefore, if half of the population remains uneducated, national development becomes unattainable. An uneducated woman who lacks access to knowledge and skills cannot effectively contribute to social and economic advancement. Children primarily learn through observation, particularly from their mothers, as they spend the majority of their early years in maternal care. Hence, a mother's knowledge plays a crucial role in shaping a child's personality and values. Educated mothers are aware of the importance of education and are more likely to ensure that their children receive it as well. Nevertheless, in Pakistan, girls continue to face discrimination and limited access to educational opportunities compared to boys. Many parents underestimate the value of female education, perceiving it as unnecessary or unproductive. Consequently, the literacy rate among women remains significantly low, posing a serious barrier to the country's overall development (Suleman et al.).Thepresent study aims to analyze and identify the key determinants influencing female literacy rates, drawing on insights from previous research discussed in the literature review. Furthermore, the study outlines the research questions, objectives, and provides a detailed description of the variables included in the estimated model in the methodology section. The investigation presents the expected relationships supported by empirical evidence and offers a structured overview of the study, including its conclusions, limitations, policy recommendations, and references.

Literature review:

Based on the study by Klasen (2002), which focused on the issue of low-quality education in schools, it was demonstrated that such deficiencies lead to a decline in economic growth. Using data from various countries, the author confirmed that economic growth is affected by gender inequality in education. Moreover, panel data were utilized in the research to identify the long-term effect of gender inequality in education on economic growth. The results showed that gender inequality directly reduces human capital.

According to another study, the main determinant that affects the literacy level of females is poverty, as the majority of the population lives in rural areas. Therefore, parents are often unable

to afford the costs of uniforms, books, and transportation. Nevertheless, there has been a significant improvement in female education and literacy rates over the years. Sharmilla and Dhas (2010), using multiple regression analysis, estimated that poverty in rural areas is a major factor that negatively affects women's education. Similarly, Chernichovsky (1985), who used data from a 1971 survey on rural income distribution in Botswana, found that the number of school-aged children in a household influences school enrollment. In large families, some children are engaged in agricultural work while others attend school. However, the author found that girls' school enrollment decreases when there are babies in the family, as they are often required to look after them.

Urbanization, on the other hand, has been shown to have a positive effect on female literacy rates. When parents face financial constraints and must choose between educating their sons or daughters, the likelihood of choosing boys is much higher, which greatly affects girls' literacy levels. Imran and Rizwana (2004) found a positive correlation between school attendance and household income, indicating that financially disadvantaged large families tend to prioritize boys' education over girls'. In general, household income is positively correlated with literacy levels. To support the family, children often engage in various income-generating activities, leaving them little or no time to study. These activities differ by gender but contribute to the family's financial situation (Pirzado et al., 2006).

Another important factor influencing female education is culture and tradition. In many societies, women are assigned the primary roles of wives and mothers. Consequently, parents often withdraw their daughters from school before graduation, believing that domestic skills can be learned at home. Social norms view investing in girls' education as a waste of time and money, as their future contributions will benefit their husbands' families. Parents also tend to believe that sons are the main breadwinners and therefore prioritize their education. While most parents acknowledge the importance of girls' education, they still consider boys' education a priority, as future family income depends on them (Humala and Eshaya, 2000).

According to Suleman et al. (2015), educated parents are more likely to educate their daughters. Comparing rural and urban households, families living in urban areas devote more time and resources to raising and educating their daughters. Teachman (1987) found a positive relationship between parents' education and the literacy levels of their children. Similarly, Kung and Bellew (1991) observed that when parents are educated, their daughters are more likely to complete their education. Burney and Irfan (1991) further confirmed that daughters of highly literate parents are more likely to continue their studies in higher education institutions.

A lack of female teachers is another factor that negatively affects girls' education. When female teachers are present, girls are more likely to attend school. However, in schools with only male teachers, parents often perceive a higher risk of physical or sexual harassment from teachers or male students (Hallman et al., 2006). Suleman (2015) also found that the distance between home and school negatively affects girls' literacy levels. In rural areas, where schools are scarce, children must travel long distances, raising safety concerns and discouraging parents from sending their daughters to school. Moreover, the poor condition of rural schools — including a lack of classrooms, educational materials, and qualified teachers — further reduces attendance rates, particularly among girls.

Sundaram and Vanneman (2008) found that an increase in female labor force participation contributes to widening the education gap between men and women. Their findings demonstrate that higher participation of women in the labor market negatively affects female literacy rates.

Buchmann et al. (1996) studied the factors influencing girls' secondary school attendance based on international data from 1975–1987. They analyzed 17 countries and considered national indicators such as urbanization, women's employment in industry, economic development, domestic investment, and structural adjustment policies. The results revealed that economic development positively influences school enrollment, whereas structural adjustment programs have a negative effect.

Fertility rate is another factor influencing female literacy. Improvements in nutrition and hygiene are closely linked to reductions in fertility rates. Education, especially among women, has a multiplier effect on development. Higher education levels among women are associated with lower fertility and mortality rates, regardless of residence or socioeconomic status. Using data from the 2011 Sample Registration System, Suman et al. (2013) found a significant negative relationship between fertility rate and female literacy rate ($\beta = -0.363$, $p < 0.001$).

Education is a key indicator of national development and is equally important for men and women. According to Islamic teachings, seeking knowledge is a duty for every man and woman. Despite this, the level of women's education remains low. Several factors affect women's access to education, including poverty, culture, tradition, parental education and attitudes, lack of qualified teachers, distance to schools, poor school conditions, weak communication between parents and teachers, early marriage, fertility rate, and inadequate policy implementation.

Alhassan (2017) emphasized that living in a rural area is a critical factor influencing girls' education. In rural regions where no schools are available, girls must commute long distances or live away from home to attend school. The success and completion rates of girls' education largely depend on the type and quality of schools. Akande (1987) found that female students in rural schools perform worse than those in urban schools. Weiss (1986) also supported this finding, noting that 86% of girls in Ghana from low-status families were enrolled only in secondary school. The lack of educational institutions in rural areas limits opportunities for higher education. Similarly, schools located in rural areas often exhibit poorer academic performance compared to urban schools, reflecting negatively on female literacy levels.

Parental income is another determinant that positively affects girls' education. Studies show that parents with higher incomes can afford to support their daughters' education from early childhood, thereby laying a strong foundation for future academic achievement. Sanabary (1989) found a significant relationship between parental income and girls' education, showing that daughters from middle- and high-income families are more likely to enroll in and complete higher education compared to those from low-income households.

Odaga and Heneveld (1995) analyzed the factors influencing girls' education before school age and identified economic, cultural, institutional, and school-related determinants. Hyde (1989) emphasized the importance of social and family-level factors in shaping academic performance in Africa. Stromquist (1998) further identified barriers to women's education, including high education costs, early pregnancy, domestic labor, opportunity costs, inappropriate curricula, family poverty, and insecurity.

Several studies have confirmed that early marriage significantly reduces women's participation in education. In many societies, parents view marriage as a means of easing economic burdens. For instance, in 1996, 38% of girls in India aged 15–19 were married, while in rural Tajikistan and Albania, early marriages were also common. In countries such as Somalia, Ethiopia, and across West Africa, marriage at the age of 7–8 is not uncommon. Early marriage often leads to school dropout, thereby lowering female literacy rates. Studies consistently show that school

attendance declines when girls marry early, and women's overall participation in education decreases due to early marriage.

Research question:

What are the determinants that affect literacy level of female in developing and developed countries?

Research Hypothesis:

H_0: The literacy level of females affects to economic development of state.

H_1: The literacy level of females does not affect to economic development of state.

Objectives:

-Analyzing the impact of literacy level to economic growth.

-Identify the main factors that affect education level of girls.

-Estimate the proper quantitative and qualitative measurement for dependent and independent variables.

-Identify the relationship of each independent variables to literacy rate of females.

-Obtain and analyze the results that increase or drop the rate of literacy level of girls.

-Determine which of the variable has statistically significant impact on dependent variable.

Methodology and Expectations:

In order to find out whether the discussed factors in the literature review affect the literacy level of women, six independent variables were considered: poverty, wage rate, secondary education teachers, population living in rural areas, fertility rate, and gross domestic income. These variables are considered quantitative. Based on the literature review, poverty is the main variable that influences women's education; therefore, a good measurement that can represent this variable is the poverty gap. Another factor that influences the level of education is income, and as a proxy variable, the study included the wage rate. The third factor that might increase the literacy rate is the presence of female teachers in secondary education.

Gross domestic income was also considered as an independent variable, as it can represent economic development. Due to the large values in this variable, a new variable was generated by taking the logarithm of gross domestic income. In order to identify whether location matters, the population living in rural areas was included. Early marriages of girls, which lead to pregnancy at a young age and subsequently to childcare responsibilities, affect school attendance; therefore, fertility rate was considered as another independent variable included in the estimated model.

The literacy rate in the estimated model is considered the dependent variable, representing the education level of females. Consequently, to test the hypotheses and identify which of the variables are statistically significant, panel data was chosen in order to compare whether the included variables impact developed and developing countries. Initially, it was planned to use time series data from Pakistan for the period 1995 to 2015. However, due to the possible lack of

data for each selected variable, the study was changed to panel data by including developing countries, and the total number of observations was 217.

The data were collected from the World Development Indicators, covering the period from 1990 to 2020. The data were sorted and structured in panel form so that regression analysis could be run in Stata. The classical Ordinary Least Squares, random effects, and fixed effects methods were utilized in the investigation. In order to identify which test was appropriate for the collected data, the Hausman test was performed. Additionally, for the purpose of examining the credibility of the results, essential assumptions were tested.

Thus, the estimated model is as follows:

Literacy rate = β_0 + β_1 Poverty gap + β_2 Wage rate + β_3 Secondary education teachers+ β_4 Gross Domestic Income+ β_5 Population in rural areas + β_6 Fertility rate +u_i

Where β_0 is intercept, all β are coefficients and u_i is the error term.

Interpretation of variables:

The poverty gap is a coefficient calculated by the average income of the poor who fall below the poverty line. Half of the median household income of the total population is determined as the poverty line. The poverty gap helps to determine the level of poverty in all countries. Wage is the amount of regular payment that an employee receives per unit of time. Gross domestic income measures how economically wealthy a country is, based on all the money earned from goods and services produced in the country over a given period. Secondary education teachers refer to the number of female teachers working in high schools. It is measured as the percentage of teachers instructing students aged 9 to 12. The rural population refers to people living in areas with a smaller population compared to cities and dispersed over a large area. Fertility rate indicates the number of children born to women of a given age during the year, calculated as a percentage of the average annual number of women of the same age. The fertility rate is the ratio of the number of live births across a woman's childbearing age, on average between 15 and 50 years, during a year. Literacy rate indicates the education level of the population aged 15 and above, expressed as a percentage of the corresponding population. In this case, the percentage of educated females from the total population was utilized.

The prier estimation of results:

The poverty gap will most likely negatively affect the literacy rate, as people with low income may not pursue education because they prefer to spend money on food, clothing, or medicine. The study conducted by Afzal et al. (2012) examined education and its determinants. After conducting a Granger causality test, a negative relationship between education and poverty was identified.

Conversely, when the wage rate increases, literacy levels are also expected to rise, as individuals earning more income may allocate resources to self-development. Therefore, this particular variable is expected to positively impact literacy levels. Green and Ridden (2001) investigated the contribution of literacy skills and education to earnings. The aim of their study was to examine the factors contributing to income levels. As a result, they found a positive relationship

between literacy rate and wage, indicating that individual earnings increase with stronger literacy skills.

The presence of female secondary education teachers is also likely to positively affect education. When teachers are women, parents can be confident that their daughters are safe, which may increase literacy rates. The role of female teachers has been considered instrumental in reducing the gender gap in developing countries. The authors examined gender disparities in primary schools and suggested that female teachers have a positive impact on girls' education.

Gross domestic income, which indicates the economic welfare of a country, is expected to positively affect literacy rates. When GDP is high, governments tend to invest more in education, which in turn leads to higher literacy rates. Therefore, this independent variable is anticipated to have a positive influence on female literacy levels. The impact of GDP on literacy rates has also been analyzed in previous studies. According to Hanushek and Wößmann (2007), a positive relationship exists between GDP and literacy levels. Economically prosperous countries generally have higher literacy rates, and a correspondingly high per capita income plays a major role in improving standards of living, as the state can allocate substantial resources to education and infrastructure.

The population living in rural areas negatively affects literacy rates. This is largely due to the lack of schools, insufficient numbers of qualified teachers, and greater distances to educational institutions. Consequently, a negative relationship is expected between rural residency and literacy levels. Wenna et al. (2020) analyzed urban–rural disparities as a factor influencing literacy levels. Their results indicate that living in rural areas significantly impacts literacy rates, with a negative relationship observed.

Finally, literacy rates are negatively impacted by fertility rates. Early marriage and childbirth require females to devote time to childcare, leaving little opportunity for education and school attendance, which reduces literacy levels among girls. Suman et al. (2013) examined fertility and mortality rates as factors affecting literacy levels. Their investigation confirmed that education levels are indeed influenced by fertility rates, and a negative correlation between these variables was observed.

Results interpretations and discussions:

Descriptive Statistics:

Table. 1

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Literacy rate	833	88.255	19.179	8.946	100
Poverty gap	1711	3.694	7.729	0	64.1
Wage	5423	56.618	28.189	1.04	99.59
Secondary educatio~s	2862	51.592	18.584	3.761	88.041
ln GDI	4571	27.199	3.225	18.8	36.906
Rural population	6665	42.968	24.514	0	94.584
Fertility rate	5820	59.641	47.216	.283	223.69

Descriptive statistics of the data were analyzed and interpreted in Table 1, which includes the number of observations, mean, standard deviation, minimum, and maximum values for each

variable. The literacy rate has 833 observations in the dataset, with a mean of 88.255, a standard deviation of 19.179, a minimum value of 8.946, and a maximum value of 100. The poverty gap has 1,711 observations, with a mean of 3.694 and a standard deviation of 7.729. The smallest value is 0, and the largest is 64.1. The wage variable consists of 5,423 observations, with a mean of 56.618 and a standard deviation of 28.189. The minimum value in the dataset is 1.04, and the maximum is 99.59. Secondary education teachers have 2,862 observations, a mean of 51.591, a standard deviation of 18.584, a minimum value of 3.76, and a maximum value of 88.04.

In order to compress the data of gross domestic income, the logarithm was taken, and this variable has 4,571 observations, a mean of 27.199, and a standard deviation of 47.215, with minimum and maximum values of 18.8 and 36.906, respectively. Rural population contains 6,665 observations, with a mean and standard deviation of 42.96 and 24.513. The minimum value is 0, whereas the maximum is 94.584. The last independent variable is the fertility rate, which has 5,820 observations, a mean of 59.64, and a standard deviation of 47.216. The minimum and maximum values in the dataset are 0.283 and 223.69, respectively.

Correlation:

Table. 2

Variables	1	2	3	4	5	6
(1) Poverty gap	1.000					
(2) Wage	-0.660	1.000				
(3) Secondary educ	-0.570	0.641	1.000			
(4) ln GDI	0.153	-0.292	-0.264	1.000		
(5) Rural population	0.549	-0.649	-0.318	0.034	1.000	
(6) Fertility rate	0.619	-0.765	-0.568	0.182	0.437	1.000

The correlation matrix was illustrated in table.2, which indicates the relationship of the selected variables. Itwas revealedthat wage and poverty gap has the highest negative correlation, which is (-0.66). On the other hand, wage hasthe positive relationship with secondary education teachers (0.64) and negative with the population in rural areas (-0.64). Furthermore, poverty gap also correlated with secondary education teachers, which is equal to (0.56), but in terms of rural population, it was observed positive relationship, which is (0.54). The gross domestic income is not strongly correlated with other independent variables.

The results:

Literacy rate = β_0 -0.220 Poverty rate + 0.153Secondary education teachers - 0.149 Fertility rate+ u_i

Table. 3

VARIABLES	(1) OLS	(1) FE	(1) RE
Poverty gap	-0.220***	-0.336***	-0.220***
	(0.0640)	(0.0763)	(0.0640)
Secondary education teachers	0.153***	0.00389	0.153***
	(0.0459)	(0.0563)	(0.0459)

Fertility rate	-0.149***	-0.126***	-0.149***
	(0.0242)	(0.0322)	(0.0242)
Constant	92.54***	102.7***	92.54***
	(3.300)	(3.494)	(3.300)
Observations	199	199	199
Number of c code	70	70	70
R-sq	0.5357	0.520 0.4768	0.5357

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Literacy rate = β_0 - 0.311 Poverty rate + 0.0383 Wage rate + 0.143 Secondary education teachers - 0.172 Gross Domestic Income -0.133 Rural population -0.0993 Fertility rate u_i

Table. 4

VARIABLES	(1) OLS	(2) FE	(3) RE
Poverty gap	-0.311***	-0.491***	-0.311***
	(0.0758)	(0.101)	(0.0758)
Wage	0.0383	-0.00757	0.0383
	(0.0522)	(0.0797)	(0.0522)
Secondary education teachers	0.143***	0.00672	0.143***
	(0.0530)	(0.0721)	(0.0530)
Ln Gross domesticincome	-0.172	-1.156	-0.172
	(0.333)	(1.576)	(0.333)
Rural population	-0.133**	-0.145	-0.133**
	(0.0621)	(0.107)	(0.0621)
Fertility rate	-0.0993***	-0.0809	-0.0993***
	(0.0284)	(0.0534)	(0.0284)
Constant	98.95***	138.8***	98.95***
	(11.80)	(43.85)	(11.80)
Observations	192	192	192
Number of c code	67	67	67
R-sq	0.6464	0.511 0.4547	0.6464

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The interpretation of results:

The data was collected from the World Bank and sorted out. When all materials were posted in one table, even though the number of observations was 266, including developed and developing states taken for ten years (2005–2015), there were many missing observations in the dependent and independent variables. When the regression was run, some variables became insignificant, and the number of observations decreased to 28. Therefore, the data was rearranged again, excluding the developed countries, and the time period was extended to 30 years (1990–2020). In order to decrease the number of missing observations in the data, all possible proxies were

included. Data was plugged into Stata and run. First of all, the data was summarized in order to identify which variables had the highest number of observations. Thus, the dependent and all independent variables were selected and the regression was run. Based on the results, it is possible to state that the initial predictions were correct, but some of them turned out to be statistically insignificant. Indeed, all included variables are statistically significant except wage and gross domestic income. The first model had 199 observations, and the R-squared was 0.5357. On the other hand, when three more variables were included and the regression was run, the number of observations dropped to 192, and the R-squared decreased by 0.11, showing the significance of the determinants.

The statistical results are provided in Tables 1 and 2. The R-squared interprets the percentage of the dependent variable explained by the included independent variables. In the case of Table 1, R-squared is equal to 0.5357, but in Table 2 it is 0.6464, making it possible to estimate that included variables such as Poverty Gap, Secondary Education Teachers, Rural Population, and Fertility Rate are statistically significant since the p-values are less than the 95% confidence interval. On the other hand, Wage and Gross Domestic Income became statistically insignificant. In the case when the poverty gap increases by one percentage point, it will decrease the literacy rate by -0.311 percentage points on average, ceteris paribus. However, when the number of female teachers in secondary education increases by one percentage point, holding all other variables constant, the literacy rate will rise by 0.143 percentage points on average. Increasing the fertility rate by one percentage point will lead to a decrease of -0.0993 percentage points in literacy rate on average, ceteris paribus. In terms of the population living in rural areas, if it rises by one percentage point, a decrease of -0.133 percentage points in the literacy rate of females will be observed. For further progress, more determinants will be included in the estimated model, such as labor force and population in rural areas.

In order to test whether the results are reliable, the OLS assumptions were tested. Moreover, to support further forecasting of literacy rate using the included variables, fixed and random effect analyses were implemented and illustrated. In terms of random effect coefficients, the significance of variables did not change. However, in fixed effect analysis, only the poverty gap became statistically significant, whereas the others turned out to be insignificant. In order to identify which test is suitable for further prediction of literacy level, the Hausman test was checked, and according to the results, fixed effect is more reliable for the data (Appendix 1).

Additionally, the data was divided into two groups, which are developed and developing states, as illustrated in Table 5. The reason for that is to identify whether the literacy rate is impacted by the estimated variables equally in both groups. After running OLS regression analysis, it was revealed that in developing states, all variables except rural population and fertility rate became statistically insignificant, whereas in comparison with developed states, poverty gap, secondary education teachers, gross domestic income, rural population, and fertility rate were statistically significant.

Table. 5

VARIABLES	(1) developing countries	(2) developed countries
Poverty gap	-0.161	-0.108***
	(0.137)	(0.0358)
Wage	-0.0458	0.00148
	(0.118)	(0.0129)
Secondary education teachers	0.164	0.0351***
	(0.128)	(0.0130)
Ln GDI	0.0189	0.104*

	(0.692)	(0.0574)
Rural population	-0.306**	-0.0333***
	(0.153)	(0.0119)
Fertility rate	-0.230***	-0.0328***
	(0.0646)	(0.00604)
Constant	112.7***	96.18***
	(23.42)	(2.376)
Observations	64	128
Number of c code	31	36
R-sq	0.7058	0.6464

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Conclusion:

The study analyzed the economic issue that occurs with females and their discrimination in terms of education. It discussed the importance of female education, even more compared to males. Due to the fact that women will take care of babies and children will be educated with fundamental knowledge from their mothers, this will be reflected in the economic development of the state. Moreover, in order to find out what kind of determinants impact literacy rate, the essential factors affecting literacy were reviewed and interpreted in this paper. It was revealed that poverty has a significant negative effect on the education level of females, but in terms of wage, the opposite occurred. Based on the literature review, it is positively correlated with the level of literacy. Another determinant found was female teachers, who influence literacy rate among girls positively. The reason for that is safety and credibility. The gross domestic income also plays a role in changing literacy levels, since if the state is financially stable, it will contribute more to the education sector, which will lead to an increase in the literacy rate of girls. Furthermore, living in rural areas also impacts education. Due to the fact that schools located in rural areas are not conditionally sufficient, many school-age children do not attend classes. Besides, the lack of qualified teachers also stands as a barrier to increasing the level of literacy. The last indicated independent variable was fertility rate, which indeed impacts the education of girls. It was found that in rural areas, the majority of girls marry at school age and give birth early, which later decreases attendance, or the female is even able to leave school.

Based on the literature review, particular independent variables were included in the estimated model. OLS, FE, and RE analyses were implemented in order to determine the significance of those variables and their impact on literacy rate. Regarding the results, Poverty Gap, Secondary Education Female Teachers, Rural Population, and Fertility Rate have a significant impact, whereas Wage and Gross Domestic Income impact literacy rate negatively. Utilizing panel data, which was collected from the World Bank, data was analyzed and descriptive statistics were provided. In order to check the multicollinearity problem, the correlation matrix was analyzed. Moreover, to avoid the normality issue in the data, the regression was run with robust standard errors, which is available in Appendix 1.

Based on the first regression analysis, where Poverty Gap, Secondary Education, and Fertility Rate were included in the model, all variables were below the confidence interval of 95% and became statistically significant. However, when an additional three variables were included, the significance levels changed. All independent variables became significant except Wage and Gross Domestic Income. Additionally, the data was divided into two groups depending on the

development index. It was revealed that Rural Population and Fertility Rate in developing countries significantly influence the literacy rate, but in more developed states, only Wage became insignificant.

Limitations and Policy suggestions:

It was not found a paper that consists of all included independent variables that were utilized in this investigation. Furthermore, based on the previous analysis, all independent variables were predicted to be statistically significant, but after analysis, some variables turned out to be statistically insignificant. The lack of data is also another issue that affects predictor coefficients, and therefore not all OLS assumptions were satisfied.

For women's literacy, a stable political space is critical to address the cultural, sociological, and economic biases that girls face in everyday life. The right programs and policies in the area of education are needed. Policy action is central to eradicating gender disparities in literacy. Literacy and life skills programs help girls gain knowledge and skills. Furthermore, group programs promote the development of social skills that will help develop skills for networking, negotiation, and communication in a social environment.

States should increase the budget of the education sector, since education is one of the main elements of the country's development. In order to motivate women to get an education, laptops and free training seminars for loyalty and development towards increasing literacy levels, as well as medical promotion, should be offered. Moreover, the government should choose targets for the implementation of education by creating additional quotas for female teachers. Therefore, to increase the education level of females, more schools should be opened in rural areas. In addition, women teachers should be encouraged with certificates of high qualification. The environment and structure of schools must be improved to ensure the employment of women. Through the media, there should also be awareness of violence, emphasizing that the education of girls and women is important not only for the country but also for the family.

Appendix:

1.

Hausman (1978) specification test

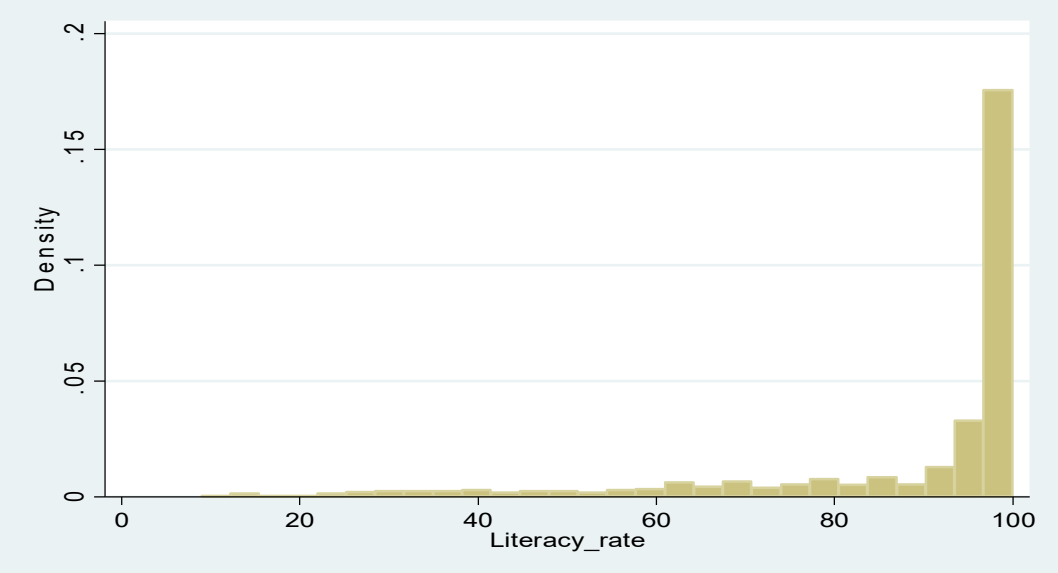
	Coef.
Chi-square test value	31.764
P-value	0

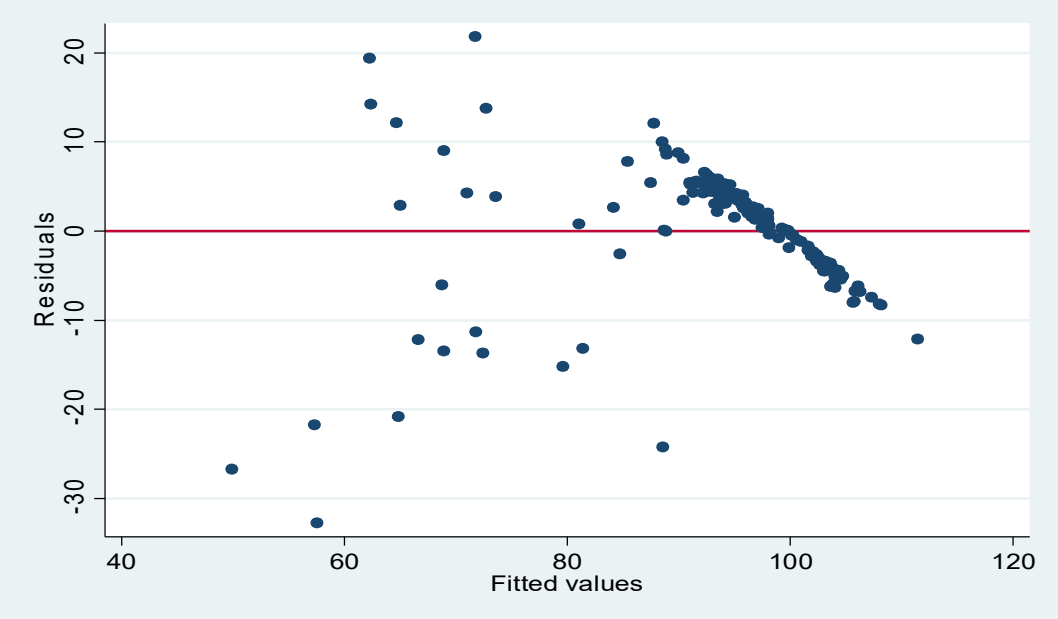
2.

VARIABLES	(1) OLS with robust
Poverty gap	-0.311**
	(0.147)
Wage	0.0383
	(0.0606)
Secondary education teachers	0.143***
	(0.0523)
Ln GDI	-0.172
	(0.290)
Rural population	-0.133*
	(0.0786)
Fertility rate	-0.0993**
	(0.0488)
Constant	98.95***
	(13.41)
Observations	192
Number of c code	67

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3.





References:

1. Adetune, I and Akensina, A. (2008). Factors Affecting the Standard of Female Education: A Case Study of Senior Secondary Schools in the Kassena-Nankana District. Journal of Social Science, 4 (4), 338-342. Available from https://thescipub.com/pdf/jssp.2008.338.342.pdf [Accessed 18 November 2021].

2. Sulema, Q. at all. (2015). Exploring Factors Affecting Girls' Education at Secondary Level: A Case of Karak District, Pakistan. Journal of Education and practice. Vol.6, No. 19. Available from https://files.eric.ed.gov/fulltext/EJ1079529.pdf [Accessed 18 November 2021].

3. Imran, T and Rizwana, P. (2004). Factors Influencing Girls' Primary Enrolment in Pakistan. Vol. 9, issue 2, 141-154. Available from http://lahoreschoolofeconomics.edu.pk/EconomicsJournal/Journals/Volume%209/Issue%202/09%20Imran%20Ashraf%20and%20Rizwana.pdf [Accessed 19 November 2021].

4. Pirzado, P. (2006). Exclusion of girls from education in rural Pakistan. EENET Asia (2), 24-25. Available from https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1020&context=pakistan_ied_pdck [Accessed 19 November 2021].

5. Humala, S and Eshaya, M. (2015). Breaking the Cycle: The Causes and Effects of Uneducated Girls in Rwanda and Pakistan. Global Majority E-Journal, Vol. 6, No.1, 4-15. Available from https://www.american.edu/cas/economics/ejournal/upload/kelly-durham_accessible.pdf [Accessed 19 November 2021].

6. Teachman, J.D. (1987). Family background, educational resources, and educational attainment. *American Sociological Review, 52* (4),548–557. Available from https://www.jstor.org/stable/2095300?origin=crossref [Accessed 19 November 2021].

7. King,E. M and Bellew, R. (1991). Promoting Girls' and Women's Education. Available from https://www.researchgate.net/publication/23550745_Promoting_girls'and_women's_education_lessons_from_the_past[Accessed 19 November 2021].

8. Burney, N and Irfan, M. (1991). Parental Characteristics, Supply of Schools, and Child School-enrolment in Pakistan. Pakistan Development Review 30, (1). 21-62. Available from https://www.researchgate.net/publication/227472164_Parental_Characteristics_Supply_of_Schools_and_Child_School-enrolment_in_Pakistan [Accessed 19 November 2021].

9. Hallman, K at all. (2006). Multiple Disadvantages of Mayan Females: The Effects of Gender, Ethnicity, Poverty, and Residence on Education in Guatemala. Available from https://knowledgecommons.popcouncil.org/cgi/viewcontent.cgi?article=1057&context=departments_sbsr-pgy [Accessed 19 November 2021].

10. Klasen, S. (2002). Low Schooling for Girls, Slower Growth for All? Cross-Country Evidence on the Effect of Gender Inequality in Education on Economic Development. The World Bank Economic Review, vol. 16, no. 3 345–373. Available from https://openknowledge.worldbank.org/bitstream/handle/10986/17209/773960JRN0200200Schooling0for0Girls.pdf?sequence=1&isAllowed=y[Accessed 19 November 2021].

11. Sundaram, A and Vanneman, R. (2008). Gender Differentials in Literacy in India: The Intriguing Relationship with Women's Labor Force Participation, World Development, Volume 36, Issue 1, Pages 128-143. Available from: http://vanneman.umd.edu/papers/SundaramV08.pdf [Accessed 10 February 2022].

12. Sharmila N, Dhas A. (2010). Development of Women Education in India, MPRA Paper No. 20680, posted 16. Available from: https://mpra.ub.uni-muenchen.de/20680/1/Development_of_Women_Education.pdf. [Accessed 10 February 2022].

13. Chernichovsky, D. (1985). Socioeconomic and Demographic Aspects of School Enrollment and Attendance in Rural Botswana. Economic Development and Cultural Change. 33(2):319-32. Available from :https://www.researchgate.net/publication/24097343_Socioeconomic_and_Demographic_Aspects_of_School_Enrollment_and_Attendance_in_Rural_Botswana**.** [Accessed 10 February 2022].

14. Buchman, D. at all. (2000). Preference for violent electronic games, self-concept and gender differences in young children. American Journal of Orthopsychiatry, 70(2),233–241. Available from: https://doi.org/10.1037/h0087738. [Accessed 10 February 2022].

15. Stromquist, P (1998). Gender, education and the possibility of transformative knowledge. Available from :https://www.researchgate.net/publication/248980404_Gender_education_and_the_possibility_of_transformative_knowledge. [Accessed 5 April 2021].

16. Hyde, S. (1989).Gender, Mathematics, and Science. Available from:https://journals.sagepub.com/doi/10.3102/0013189X018008017. [Accessed 5 April 2021].

17. Odaga, A and Henereld, W. (1995). Socio-Cultural Constraints Facing Girl Child Education in Mochongoi Division of Baringo District, Kenya. Available from:http://erepository.uonbi.ac.ke/bitstream/handle/11295/7169/Abstract.pdf?sequence=1. [Accessed 5 April 2021].

18. Sanabary, E. (1989).Determinants of Women's Education in the Middle East and North Africa: Illustrations from Seven Countries. PHREE Background Paper Series. Available from:**https://eric.ed.gov/?id=ED378082**[Accessed 5 April 2021].

19. Suman, Y. et al. (2013). Biogenic Synthesis of Silver Nanoparticles Using *Phyllanthus emblica* Fruit Extract and Its Inhibitory Action Against the Pathogen *Acidovorax oryzae* Strain RS-2 of Rice Bacterial Brown Stripe. Available from:https://pubmed.ncbi.nlm.nih.gov/23434694/. [Accessed 5 April 2021].

20. Alhassan, A. (2017). Perceptions about Disability among Persons with and without Disabilities in Sekondi, Ghana: A Qualitative Study. Available from:**https://www.researchgate.net/scientific-contributions/Abdullah-Alhassan-2143443712.** [Accessed 5 April 2021].

21. Akande, B. (1987). Ural-Urban Comparison of Female Educational Aspirations in South-Western Nigeria. Available from:**https://eric.ed.gov/?id=EJ372557.** [Accessed 5 April 2021].

22. Weiss, A. (1986). Asymptotic Theory for ARCH Models: Estimation and Testing. Available from:https://econpapers.repec.org/article/cupetheor/v_3a2_3ay_3a1986_3ai_3a01_3ap_3a107-131_5f01.htm. [Accessed 5 April 2021].

23. Afzal, M. et al. (2012). Relationship among education, poverty and economic growth in Pakistan: an econometric analysis. Journal of Elementary Education, 22(1), 23-45. Available from:http://pu.edu.pk/images/journal/JEE/PDF-Files/3_Afzal_malik_ishrat%20final_2012JEE_Vol_22_no_1.pdf. [Accessed 5 April 2021].

24. Green, D and Riddell, W. (2001).Literacy, Numeracy and Labour Market Outcomes in Canada. Statistics Canada Catalogue number 89-552-MIE2001008. Available from:https://econpapers.repec.org/paper/mcmcilnwp/47. [Accessed 5 April 2021].

25. Awan, A and Bilal, A. (2015). The Enigma of Wealth and Education as Determinant of Rural Poverty: A case study of District Rahim Yar Khan-Pakistan. Available from:https://www.iiste.org/Journals/index.php/JLLL/article/view/24106. [Accessed 5 April 2021].

26. Hanushek, E. and Wößmann, L. (2007). The role of education quality for economic growth.

27. Wenna, W. et al. (2020). The Urban-Rural Disparity in the Status and Risk Factors of Health Literacy: A Cross-Sectional Survey in Central China. 2020 Jun; 17(11): 3848. Available from:https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7312746/# . [Accessed 5 April 2021].