
Role of Climate Change and Gender Parity on Poverty Alleviation in Pakistan

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ABSTRACT

Climate is changing overtime at the Globe as well as at the national level. Further, female enrollment is improving over time even in developing economies like Pakistan. Whereas poverty is decreasing over time. This study estimates the role of climate change and gender parity in poverty alleviation in Pakistan. For this purpose, the study uses the pooled data from 1998/99 to 2018/19. Thus, the panel data techniques are used. The results show that climate change (i.e., precipitation) has statistically significant favorable impacts on poverty, but there is no role of temperature on poverty. As far as gender parity is concerned, it has also statistically significant favorable effects on poverty. It is suggested that the government should make proper arrangements to increase precipitation (i.e., artificial rain, availability of water) and focus on increasing female education which will lead to a rise in gender parity.

Keywords: Keywords: Poverty; temperature; precipitation, gender parity; Pakistan.

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INTRODUCTION

“Poverty is pronounced deprivation in wellbeing.” World Bank (2000). In developing countries, poverty is a severe problem. Before the millennium development goals, poverty was 32.2 percent in 1998-99(World Bank), so at that time there was a need to take action to reduce poverty. In 2000 the millennium development goals came into existence. There were eight goals among them the first goal was to half the poverty. These goals were to be completed in 2015. Due to the millennium development goals, the poverty rate decreased in Pakistan which was 35 percent in 2002 and 13.6 percent in 2011, and 10 percent in 2015. The poverty headcount ratio decreased to 3.9 percent (World Bank). So, we can say that the target of halving poverty was not just achieved but reduced poverty by more than half and this target had been achieved before the given period. After the millennium development goals, the sustainable development goals came into existence. There were 17

goals by the United Nations General Assembly and the first goal was to end poverty in all its forms. These goals were to be completed in 2030. According to the sustainable development goals report 2019 the world is not going toward ending poverty in all its forms. The report further projected that poverty will remain at approximately 6 percent by 2030 if it goes on decreasing at this speed. The report shows that in 1990 the rate of poverty all over the world was 36 percent which decreased to 10 percent in 2015. In 2018 the world poverty rate was 8.6 percent. Now work is continuing on SDGs, but poverty can only be finished if and only if we do work in all dimensions and take action on those shocks which could be the cause of poverty.

No doubt economic growth is necessary factor for the reduction of poverty (Ali et al., 1999; Adams, 2004; ul Mustafa, & Nishat, 2017; Bhalla, 2002; Cheema & Sial, 2012; Dollar & Kraay, 2002; Foster & Szekely, 2008; Kraay, 2006; Ravallion, 1995,1997, 2001; Ravallion & Datt, 2002; Ravallion & Chen, 1997,2003,2007; Sibte Ali, Raza, & Abidin, 2018). Population, poverty and economic development nexus: Empirical study of some selected developing countries.), yet there needs to explore other factors to affect poverty. Among them, climate change is an important factor. Climate is changing all over the globe. Dell, Jones, and Olken (2009) showed an inverse relationship between heat and economic growth, whereas Dell et al. (2008) found a positive relation between precipitation and economic growth in poor countries. Burke et al (2015) and Awan, Abro, & Mustafa, (2021) estimated the effect of climate change on economic growth and concluded that there is a nonlinear relationship between temperature and economic growth. Leichenko & Silva (2014) and Dell et al. (2008) showed negative relationships between poverty and precipitation. But as far as Pakistan is concerned, there is little evidence to find the relationships between them.

Among other factors, gender disparity is also a problem. Females are having less opportunity for education than males and the gender gap concerning education in poor countries is higher. To reduce poverty, we must equalize the number of females and males in educational institutions. Different studies (Ali, 2015; Blumberg, 2005; ul Mustafa, Abro, & Awan, 2021; Abu-Ghaida & Klasen, 2004; Wahid et, al 2019; Lagerlof, 2003) have shown that there is a positive affiliation between gender parity and economic growth at the global level. A few studies at the international level (Abdullahi, 2014; Kendo et al., 2008; Sibte-e-Ali, Chaudhary, & Farooq, 2018; Morrisson et al., 2007) have examined the association between gender parity and poverty and concluded that there was a significant negative association between gender parity and poverty. As far as Pakistan is concerned there is minute evidence of the effect of gender parity on poverty alleviation.

The findings reveal that there is a statistically significant negative relationship between poverty and precipitation in Pakistan, whereas temperature has no significant role in it. The results further show that there are also statistically significant inverse relationships between poverty and gender parity. It is endorsed that the proper arrangements should be made by the Government to raise precipitation (i.e., artificial rain) and pay attention to the education of females which will lead to an escalation in gender parity.

This study adds to the literature by estimating the effects of climate change and gender parity, especially in Pakistan. All over the world as well as at the national level, research about poverty estimation exists in the majority, but literature about the impacts of climate change and gender parity on poverty is very scanty. Climate is changing not only all over

the globe but at the national level also. This study will be the pioneer to find the impact of climate change (temperature and precipitation) on poverty at the national level. As far as gender parity is concerned, it is improving over time around the globe as well as at the national level. This study will again be the first study to explore the effects of gender parity on poverty at the national level. There is no time series data regarding poverty and gender parity available because both variables are measured from PSLM surveys and there are breaks between them. This study hardly gets the data on climate change (temperature and precipitation) for only 13 districts and pools the data for 13 districts of all provinces for the period from 1998-99 to 2018-19 and applies the panel data techniques for the said purpose that have never been done previously.

The scheme of the paper is given as under: After the introduction, Section 2 presents the poverty and gender parity profile of selected districts of Pakistan. Section 3 deals with data and methodologies. Section 4 explains the results and the section final concludes the paper.

POVERTY AND GENDER PARITY IN SCATTERED 13 DISTRICTS OF PAKISTAN

Table 1 in the appendix shows poverty and gender parity trends in the selected districts of Pakistan.

Lahore

The poverty trend given above is in Lahore. It indicates that in 1999 the headcount ratio was 17.82. That increased in 2006 to 52.35 and it was the highest poverty rate in Lahore over that time. The lowest poverty rate was in 2019, at 5.51.

As far as the net gender parity index is concerned, it indicates that in 1999 the net gender parity index in Lahore was 1.44, which means that girls' net enrolment at the primary level was 44% greater than boys'. There was inequality for boys. But later on, this inequality decreased, and in 2002, the gender parity index was 1.09, which was very close to gender equality in net enrolment. In 2006, the net gender parity was lowest at 0.38, which indicates that girls' enrolment was 38% of boys' enrolment at the primary level. It indicates the inequality concerning girls. After ups and downs, the gender parity in 2019 was 1.05, which was also very close to equality.

Faisalabad

The Faisalabad poverty headcount ratio trend is given above. It indicates that in 1999, the headcount ratio was 40.72, but after this year, the poverty rate declined to 21.42 in 2011. Then it increased in 2012 to 41.42, and it was the highest poverty rate in Faisalabad over that time, and the lowest poverty rate was in 2019, at six points seven.

As far as the net gender parity is concerned, it shows that in 1999, the net gender parity in Faisalabad was 0.88, indicating that boys' net enrolment in primary school was 12% higher than girls'. There was inequality for girls. However, this inequality decreased over time, and the net gender parity in 2002 was 0.98, which was very close to gender equality in net enrolment. In 2011, the net gender parity was the lowest at 0.67, indicating that girls made up 67 percent of primary school enrollment. It demonstrates the disparity between girls and boys. After some fluctuations, the gender parity index in 2019 was 1.04, which was also very close to equality.

Islamabad

The Islamabad poverty headcount ratio trend is given above. It indicates that in 1999 the headcount ratio was 14.05, but after this year the poverty rate increased to 26.54 in 2002, and again in 2005 to 12.77. In 2011, the poverty rate increased to 28.39. After this, it tends to decrease, except in 2016. That was the year with the highest poverty rate, at 32.3. The lowest poverty rate was in 2019 when it was only six.

As far as the net gender parity is concerned, it indicates that in 1999 the gender parity index in Islamabad was 1.15, which means that girls' net enrolment at the primary level was 15% greater than boys'. There was inequality concerning boys. But later on, this inequality decreased, and in 2002, the net gender parity was 0.92, which was very close to gender equality in net enrolment. In 2005, the net gender parity was lowest at 0.78, which indicates that girls' enrolment was 78% of boys' enrolment at the primary level. It indicates the inequality concerning girls. After ups and downs, the gender parity index in 2019 was 1.19.

Hyderabad

The poverty trend is given above in Hyderabad. It indicates that in 1999 the headcount ratio was 23.82, which increased in 2006 to 69.59, and it was the highest poverty rate in Hyderabad over time. The lowest poverty rate was in 2011, at 15.5. In 2019, the poverty rate was 19.39.

As far as the net gender parity is concerned, it shows that in 1999, the gender parity index in Hyderabad was 0.77, indicating that boys' net enrolment in primary school was 23% higher than girls'. There was inequality concerning girls. However, this inequality decreased over time, and the net gender parity index in 2002 was 0.97, which was very close to gender equality in net enrolment. In 2006, the net gender parity was the lowest at 0.49, indicating that girls made up 49 percent of primary school enrollment. It demonstrates the disparity between girls and boys. After some fluctuations, the net gender parity in 2016 was 0.98, which was also very close to equality. In 2019 the net gender parity in Hyderabad was 0.86. In 2019 the gender parity in Hyderabad was 0.86.

Jacobabad

The above table depicts the trend in Jacobabad's poverty headcount ratio. It shows that the poverty rate was 65.71 in 1999, but it rose to 84.08 in 2002, which was the highest poverty rate in Jacobabad over time, then fell to 4.82 in 2005, which was the lowest poverty rate. The poverty rate rose to 73.99 percent in 2006. Then, except for 2014 and 2016, it tends to decrease. In 2019, the poverty rate was 23.83.

As far as the net gender parity is concerned, it shows that in 1999, Jacobabad's net gender parity was 0.41, indicating that boys' net primary enrolment was 59 percent higher than girls'. There was inequality for girls. However, this disparity decreased over time, and the net gender parity in 2002 was 0.61, which was close to gender equality in net enrolment. In 2005, the net gender parity was at its lowest, 0.11, indicating that at the primary level, girls enrolled at 11 percent of boys. The net gender parity in 2012 was 1.07, very close to equality. The gender parity index in 2019 was 0.81.

Karachi

The above table depicts the trend in Karachi's poverty headcount ratio. It shows that the poverty rate was 13.82 in 1999, but it rose to 37.43 in 2002, then fell to 25.41 in 2005. In 2006, the poverty rate increased to 62.8 percent. Then, except in 2014, it tends to decrease. With a poverty rate of 62.95, that was the year with the highest rate. In 2019, the poverty rate was at 5.6 percent, which was the lowest.

As far as the net gender parity index is concerned, it shows that in 1999, the net gender parity in Karachi was 0.73, indicating that boys' net enrolment in primary school was 17% higher than girls'. There was inequality concerning girls. However, this inequality decreased over time, and the gender parity index in 2006 was 0.99, which was very close to gender equality in net enrolment. In 2011, the net gender parity was the lowest at 0.53, indicating that girls made up 53 percent of primary school enrollment. It demonstrates the disparity between girls and boys. After some fluctuations, the net gender parity in 2019 was 1.03, which was also very close to equality.

Rohri

The trend in the Rohri poverty headcount ratio is shown above. It shows that the headcount ratio was 34.01 in 1999. Then, in 2002, it rose to 83.58 percent, the highest poverty rate in Rohri during that time. However, after this year, the poverty rate fell to 15.25 percent in 2011, and the lowest poverty rate was 11.06 percent in 2019.

As far as the net gender parity index is concerned, it shows that in 1999, Rohri's net gender parity was 0.67, indicating that boys' net primary enrolment was 33 percent higher than girls'. There was inequality for girls. In 2002, the net gender parity index was at its lowest, 0.54, indicating that at the primary level, girls enrolled at 54 percent of boys. However, this disparity decreased over time, and the net gender parity index in 2012 was 1.08, which was close to gender equality in net enrolment. The net gender parity index in 2019 was 1.03.

Nawabshah

The above table indicates the poverty trend of Nawabshah. The poverty rate was 16.18 percent in 1999. Then it began to rise until 2006 when it peaked. It was the highest rate in history, at 57.53 percent. In 2008, it began to show a downward trend after this year. However, it increased to 51.53 in 2011. Following this period, it tends to decline until 2019. The lowest rate was 12.98 in 2019.

As far as the net gender parity index is concerned, it indicates that in 1999 it in Nawabshah was 0.81, which indicates that girls' net enrolment at the primary level was 81 percent of boys, which means that there is gender disparity concerning girls. But later on, this inequality decreased, and in 2012, it was 1.06, which was very close to gender equality in net enrolment. In 2008, it was lowest at 0.43, which indicates that girls' enrolment was 43% of boys' enrolment at the primary level. It indicates the inequality concerning girls. After ups and downs, the net gender parity index in 2019 was 0.86.

Peshawar

The above table depicts the trend in Peshawar's poverty headcount ratio. It shows that the poverty rate was 38.21 in 1999, but it rose to 74.81 in 2006. That was the year with the highest rate, then fell to 48.5 in 2011. In 2012, the poverty rate increased to 56.45 percent. In 2016, the poverty rate was at its lowest point ever, at 12%. In 2019, the poverty rate was 15.91.

Peshawar's net gender parity index is depicted in the table above. It shows that in 1999, Peshawar's net gender parity was 0.65, indicating that boys' net primary enrolment was 35 percent higher than girls. There was inequality for girls. However, this disparity decreased over time, and it in 2006 was 0.94, which was close to gender equality in net enrolment. In 2002, it was at its lowest, 0.28, indicating that at the primary level, girls' enrollment was at 28 percent of boys'. It, in 2019 was 0.71.

Dera Ismail Khan

The table above shows the trend in the poverty headcount ratio in Dera Ismail Khan. The poverty rate was 35.38 percent in 1999, but rose to 52.51 percent in 2002, then fell to 34.33 percent in 2005. The district's poverty rate reached 67.67 percent in 2006, the highest in the region. It then tends to decrease, except in 2012 and 2014. The poverty rate was 20.14 percent in 2016, the lowest it had ever been. In 2019, there was a slight increase in poverty, which stood at 20.71 percent

As far as the net gender parity index is concerned, it shows that in 1999, it in Der Ismail Khan was 0.37, indicating that boys' net enrolment in primary school was 63% higher than girls. There was inequality concerning girls. However, this inequality decreased over time, and it in 2019 was 0.94, which was very close to gender equality in net enrolment. In 2008, it was the lowest at 0.27, indicating that girls made up 27 percent of primary school enrollment. It demonstrates the disparity between girls and boys.

Chitral

The above table shows the trend in Peshawar's poverty headcount ratio. It shows that the poverty rate was 14.24 in 1999, but it rose to 45.59 in 2006. The poverty rate rose to 80.52 percent in 2008, the year with the highest poverty rate, before dropping to 71.27 percent in 2011. In 2012, it then tends to decrease, except for 2019. In 2016, the poverty rate was 15.48 percent, the lowest it had ever been. In 2019, there was a slight increase in poverty, which stood at 20.9 percent.

As far as the net gender parity index is concerned, it shows that in 1999, it in Chitral was 0.62, indicating that boys' net enrolment in primary school was 38% higher than girls'. There was inequality for girls. However, this inequality decreased over time, and it in 2006 was 1.04, which was very close to gender equality in net enrolment. In 2002, it was the lowest at 0.49, indicating that girls made up 49 percent of primary school enrollment. It demonstrates the disparity between girls and boys. After some fluctuations, it in 2019 was 0.97, which was also very close to equality.

Quetta

The above table depicts the trend in Quetta's poverty headcount ratio. The poverty rate was 13.4 percent in 1999, but it rose to 34.21 percent in 2002. In 2006, the poverty rate increased to 72.05 percent. The headcount ratio was the highest ever in 2008, which was

75.62 percent. Then, except in 2012, it tends to decrease. The poverty rate in 2019 was 33.66 percent.

As far as the net gender parity index is concerned, it shows that in 1999, Quetta's gender parity index was 0.67, indicating that boys' net primary enrolment was 33 percent higher than girls'. There was inequality concerning girls. However, this disparity decreased over time, and it in 2008 was 1.01, which was close to gender equality in net enrolment. In 2005, the net gender parity was at its lowest, 0.32, indicating that at the primary level, girls enrolled at 32 percent of boys. The gender parity index in 2019 was 0.83.

Sibi

The above table shows the trend in Sibi's poverty headcount ratio. It shows that the poverty rate was 37.31 in 1999, but it rose to 42.42 in 2002. In 2005, the poverty headcount ratio was the smallest, at 12.24. The poverty rate rose to 87.63 percent in 2006, the year with the highest poverty rate in the district, before dropping to 76.22 percent in 2008. It shows ups and downs since 2019. In 2016, the poverty rate was 32.7. In 2019, there was an increase in poverty, which stood at 54.99 percent.

As far as the net gender parity index is concerned, it shows that in 1999, Sibi's net gender parity was 0.52, indicating that boys' net primary enrolment was 48 percent higher than girls. There was inequality for girls. However, this disparity decreased over time, and it in 2005 was 0.95, which was close to gender equality in net enrolment. In 2006, the gender parity index was at its lowest, 0.09, indicating that at the primary level, girls enrolled at nine percent of boys. The gender parity index in 2019 was 0.63.

DATA

Climate change data has been obtained from Climate Data Processing Centre (CDPC) Karachi for 13 scattered stations based on the availability of the data. Whereas gender parity and poverty data have been estimated by using the Household Income and Expenditure Survey (HIES) data set for the periods of 1998-99 to 2018-19 for the same stations. This study has pooled the data for climate change, gender parity, and poverty for the same stations. Temperature data given by the department was for 20 scattered stations in Pakistan but due to a lack of matching of data between PSLM and climate data only 13 stations are being used because coding for the remaining centers was not given in PSLM coding scheme. Temperature data was monthly for all 20 stations which were being converted into the average Annual temperature for all stations. Rain data (A proxy for Precipitation) was also given for 20 scattered stations in Pakistan but the study used only 13 stations for estimation. The data of precipitation was also monthly rainfall of all 20 stations then we convert it into annual total rainfall by taking the sum of all month's data. Net enrolment at the primary level has been taken from PSLM data for 13 stations according to climate centers for girls and boys. Net enrolment at the primary level is being used for the 5 to 9 years old age group that was enrolled in primary schools. Gender Parity Index is being calculated by using net enrolment data from 1998-99 to 2018-19.

METHODOLOGY

Headcount ratio

To check the impact of Climate Change and gender parity in poverty alleviation in Pakistan the study had the first problem calculating the poverty for the same stations and the same years. So, the study calculated the poverty in terms of headcount ratio for 13 stations and 10 different periods from 1998-99 to 2018-19.

$H = q/N$ where q =number of poor, N =population

Climate change

As discussed in the data section it has been taken from Karachi. We are unable to discuss the data in detail vide letter No. CDP-7(4)/3/B/2020/.

Net Gender Parity

For this purpose, net enrolment at the primary level for children with 5 -9 years has been calculated from PSLM data for 13 stations according to climate centers for girls and boys. Net enrolment at the primary level is being used for the 5 to 9 years old age group that was enrolled in primary schools. Gender Parity Index is being calculated by using net enrolment data from 1998-99 to 2018-19.

Net enrolment is the ratio of girls' education to the boy's education at the primary level with age 5-9 years.

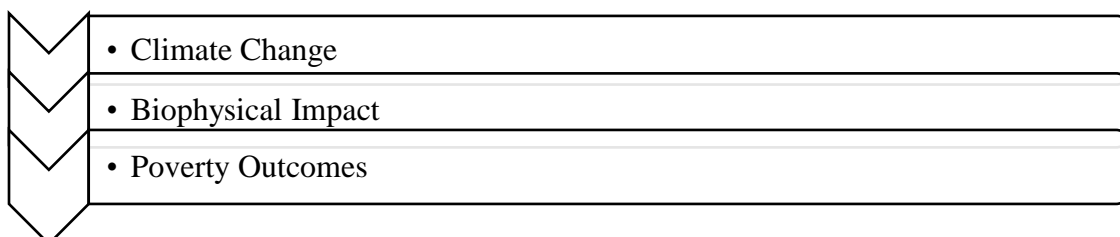
Role of climate change and gender parity in poverty alleviation

Leichenko and Silva (2014) explained the channels through which climate change can affect poverty. There are two channels of climate change to affect poverty.

- Direct Channel
- Indirect Channel.
- Direct Channel:

The direct impact of climate change can be explained through the productivity of crops and food prices. When the productivity of crops decreases through high temperature and variability in precipitation, poverty can increase (Leichenko & Silva, 2014). This study also concluded that there is a negative relationship between Precipitation and Poverty.

Figure1: Direct Channel



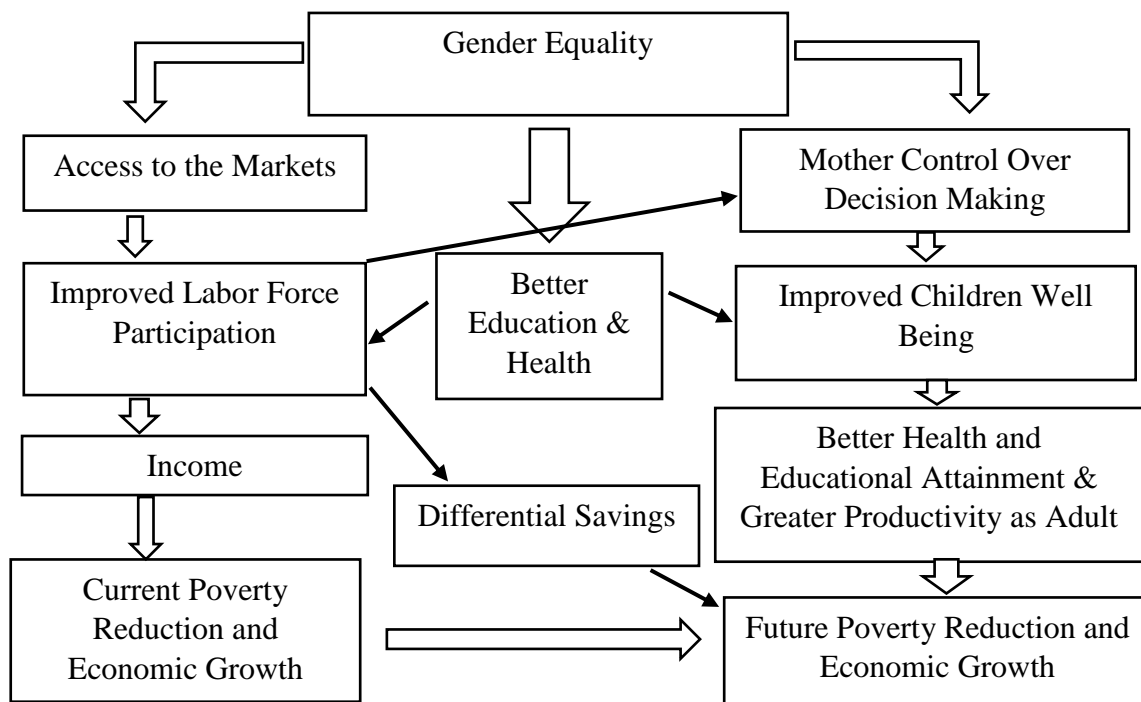
Source: Leichenko and Silva (2014).

Indirect Channel

Climate change can affect indirectly the poverty, in case of economic, political, cultural, institutional effects, biophysical impact, and existing vulnerabilities. These factors can affect the livelihood of people, and health conditions and it could cause migration due to the adverse situation in that region. Some poorest people are not in the position to migrate, they have to live in those degraded areas. Climate change may affect economic growth, if an economic growth of a country decline, it leads to poverty or it undo the efforts to reduce poverty (Leichenko & Silva, 2014).

Gender Parity and Poverty.

How does gender parity affect poverty? Gender parity can decrease current poverty as well as future poverty. If there is an increase in gender equality, first women will get better access to education, secondly better access to markets and control over decision making. Better education of women leads to an increase in labor force involvement, it will lead to a rise in income, mother's control over deciding, and differential savings.



Source (Morrison et al., (2007).

Income will reduce current poverty and differential savings can decrease future poverty. Women's education, labor force participation, and control over decision-making will lead to improved children's well-being. Children will get better health and educational attainment and greater productivity as adults. Future poverty could be reduced through this channel (Morrison et al., 2007). The Finding of this study also matches with the theoretical background, there is a significant Negative Relationship between Gender parity and poverty.

So, to find the role of climate change and gender parity on poverty following model is estimated.

$$\text{HCRit} = \beta_0 + \beta_1 \text{Temit} + \beta_2 \text{Precit} + \beta_3 \text{NetGenderparityit} + \epsilon_{it}$$

Where i represents districts, t represents some years, HCR stands for Headcount Ratio, Tem is Temperature, Prec means Precipitation, NetGenderparity is gender parity Index, and ϵ_{it} is the error term.

Hypotheses

H₀: $\beta_1 = 0$ (There is no association between temperature and poverty).

H₁: $\beta_1 \neq 0$ (There is some connection between temperature and poverty).

H₀: $\beta_2 = 0$ (There is no relationship between poverty and Precipitation).

H₁: $\beta_2 \neq 0$ (There is some association between poverty and Precipitation).

H₀: $\beta_3 = 0$ (There is no relationship between poverty and net gender parity).

H₁: $\beta_3 < 0$ (There is a negative connection between poverty and net gender parity).

The Results and Discussion:

The study first applied the Fixed Effect Model and checked the F-test. The value of the F-test was 1.10. That indicated that the model was not significant. The P-value was also very large (0.3703). So pooled regression was the appropriate technique to be applied. Then the Random Effect model was applied. So, the results of that model were also insignificant. After analyzing the Breusch Pagan LM test, the study obtained P-value that was 1.00, which shows that this model is also insignificant. After this conclusion, the study was able to decide which model was best. Then a pooled regression model was applied to check the impacts of climate variation and gender parity on poverty. The study estimated the correlation matrix as well as variance inflation factor (vif) presented in tables 2 & 3 in the appendix to check multicollinearity and did not find the problem of multicollinearity. Then the study checked the heteroscedasticity and found the problem of heteroscedasticity see table 5. So, we also estimated the robust standard error. The results are presented in Table 5.

coefficient	HCR	HCR
Constant	62.97 (4.91)***	62.97 (4.60)***
Temperature	-0.3867 (-0.81)	-0.3867 (-0.73 [^])
Precipitation	-0.014 (-2.92)***	-0.0159 (-3.51 [^])***
Net gender parity	-13.081 (-2.31)***	-13.08 (-1.96 [^])**

Pooled OLS Regression Analysis Table and Interpretation.

Note 2: HCR=headcount ration

Within brackets are t-statistics [^] t-Values based on robust standard errors

*** indicates that the coefficient is significant at a 1% level, ** at 5 %

INTERPRETATION

Temperature and precipitation are two components of the climate. There are no relationships between temperature and poverty in Pakistan. But the results regarding the relationship between precipitation and poverty reveal that there is a statistically significant negative association between poverty and precipitation. If there is a one-unit increase in precipitation, poverty will reduce by -0.016 units. In the case of Pakistan, we observe very little rain, so when the rain comes it increases the productivity of crops, so the growth of the country might increase and poverty may be reduced. . In Pakistan, poverty has a negative relationship with gender equality. A one-unit increase in gender parity results in a 13.08-unit reduction in poverty.

Comparison with Other Studies

Dell et al. (2008) also examined the association between precipitation and growth and concluded that poor countries have a significant positive relationship between precipitation and growth. Rich countries also have a positive relationship but are less significant, this study shows a negative relationship between precipitation and poverty, and the results are statistically significant. The results of this study are consistent with those of Dell et al. (2008) and Leichenko & Silva (2014).

Morrisson et al. (2007) investigated the relationship between gender parity and poverty and found a negative relationship between them. Klasen and Lamanna (2009), and Licumba et al. (2015) revealed that there is a negative relationship between gender inequality and economic growth.

CONCLUSION

The core determination of this article is to evaluate the role of climate change and gender parity in poverty alleviation in Pakistan. Using the Climate data from CDPC Karachi and estimating gender parity and poverty from the PSLM survey the study concluded that in Pakistan there is a significant negative association between precipitation and poverty. The temperature has no significant association with poverty in Pakistan. Gender parity has also a significant favorable impact on poverty in Pakistan. If there is one point increase in Gender Parity, Poverty will reduce by 13.08 points. At a policy level, it is recommended that the proper arrangements should be made to increase precipitation (i.e., artificial rain, availability of water) and divert their expenditure to enhance the education of females.

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Appendix

Table 1. Poverty and Net Gender Parity estimate over time

		1999	2002	2005	2006	2008	2011	2012	2014	2016	2019
LHE	HC	17.82	43.88	38.85	52.35	18.09	41.19	41.19	12.25	14.5	5.51
	NGP	1.44	1.09	0.98	0.38	1.35	.73	0.87	0.88	0.98	1.05
LYP	HC	40.72	37/96	31.13	37.28	30	21.42	41.42	19.19	15.67	6.73
	NGP	0.88	0.98	0.71	1.05	0.85	0.67	0.83	1.15	1.12	1.04
ISB	HC	14.05	26.54	12.77	26.34	21.23	28.39	13.19	6.26	32.3	6
	NGP	1.15	0.92	0.78	1.28	1.64	0.86	1.07	0.86	1.33	1.19
HDD	HC	23.82	29.61	19.28	69.59	61.38	15.5	49.46	30.95	23.20	19.39
	NGP	0.77	0.97	0.60	0.49	0.91	0.8	0/67	0.89	0.98	0.86
JAG	HC	65.71	84.08	4.82	73.99	69.36	26.79	31.74	50.25	40.92	23.83
	NGP	0.41	0.6	0.11	0.18	0.59	0.89	1.07	0.74	0.42	0.81
KHI	HC	13.82	37.43	25.41	62.8	41.7	25.2	22.50	62.95	11.26	5.57
	NGP	0.73	0.68	1.37	0.99	2.53	1.22	0.86	0.53	0.98	1.03
ROH	HC	34.01	83.58	52.4	52.88	51.66	15.25	43.37	39.2	21.16	11.06
	NGP	0.67	0.54	0.61	0.69	0.64	0.68	1.08	0.59	0.71	1.03
NWS	HC	16.18	23.52	35.05	57.53	48.73	51.53	42.72	41.41	32.3	12.98

	NGP	0.81	0.46	0.60	0.57	0.43	0.63	1.06	0.84	0.83	0.86
PESH	HC	38.21	38.07	52.78	74.81	51.77	48.5	56.45	33.02	12.00	15.91
	NGP	0.65	0.28	0.89	0.94	0.64	0.86	0.77	0.6	0.76	0.71
DSK	HC	35.38	52.51	34.33	67.76	56.08	25.61	52.52	48.93	20.14	20.71
	NGP	0.37	0.82	0.53	0.73	0.27	0.5	0.74	0.44	0.64	0.94
CJL	HC	14.27	45.59	15.46	64.87	80.52	71.07	52.52	28.39	15.48	20.9
	NGP	0.62	0.49	0.65	1.04	0.75	0.5	0.82	0.74	1.27	0.97
UET	HC	13.4	34.21	35.09	72.05	75.62	47.65	52.28	36.83	36.55	33.66
	NGP	0.67	0.44	0.32	0.73	1.01	0.47	1.06	0.84	0.59	0.83
SIB	HC	37.31	42.42	12.24	87.63	76.2	53.26	62.39	70.05	32.7	54.99
	NGP	0.52	0.29	0.95	0.09	0.94	0.66	0.99	0.87	0.89	0.63

Note. HC=HEADCOUNT RATIO, NGP=NET GENDER PARITY, LHE=LAHORE. LYP=FAISLABAD, ISB=ISLAMABAD, HDD=HYDERABAD, JAG=JACOBABAD, KHI= KARACHI, ROH=ROHRI WNS=NAWABSHAH, PEW=PESHAWAR, DSK=DERA ISMAIL KHAN, CJL=CHTRAL, UET=QUETTA, SIB=SIBI

Table 2. Correlation Matrix

	Headcount Ratio	Temperature	Precipitation	Net Gender Parity
Headcount Ratio	1.00			
Temperature	0.0425	1.00000		
Precipitation	-0.3153	-0.3800	1.0000	
Net Gender Parity	-0.2899	-0.485	0.3284	1.0000

Source: Author's own estimation

Table 3. Variance Inflation Factor(vif) (multicollinearity detection)

Variable	vif	1/vif
Temperature	1.18	0.8490
Precipitation	1.32	0.7593
Net gender Parity	1.13	0.8853
Mean vif	1.21	

Source: Author's estimation

Table 4. Heteroscedasticity Detection

	value	P-Value
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	4.66	0.0308

Source: Author's estimation