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Analyzing the Impact of Income Inequality on Women Empowerment in Punjab, Pakistan

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Abstract

The present study investigates the impact of income inequality on women's empowerment in the districts of Punjab, Pakistan. Data on income inequality, women's empowerment, and other variables of interest are drawn from four waves of the Multiple Indicators Cluster Survey for the period 2008 to 2018. Three aspects, including education, health, and political participation of women, have been considered in the measurement of the women empowerment index. A fixed-effects approach is applied for the empirical evaluation of the data. The empirical outcomes show that a reduction in income inequality is significantly helpful in enhancing women's empowerment across all districts.

Keywords: Inequality, Women Empowerment; Fixed Effect Approach, Punjab, Pakistan

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1 Introduction

Human development is a process that expands people's choices. This process has certain dimensions such as equity, opportunity, equality, and human empowerment. Human empowerment is most important in all these (Ul Haq, 1995). It includes expanding knowledge, a healthy life, self-respect, freedom of choice, and a decent standard of living. Equal representation of men and women in the process of human empowerment is highly desired and emphasized in Sustainable Development Goals (SDG's-5), which focus on gender equality (UN, 2023). Globally, women are perceived to gain economic independence, self-confidence, and self-esteem through empowerment, which is directly related to their economic, social, and political participation. Generally, two justifications can be given for the importance of women's empowerment in the policy framework. Firstly, equity between genders (Bertay et al., 2024; Stratigaki, 2005), while the second argument is that women's empowerment has a central and significant role in development via improving women's capabilities and eliminating the barriers to achieving economic advancement and human development (Cuberes & Teignier, 2014; Kabeer & Natali, 2013).

Moreover, improving women's empowerment helps increase education and health facilities, positively affecting human capital and economic growth (Aghaei et al., 2023; Kabeer, 2020). Continuous enhancement of human development leads to economic well-being (Becker et al., 1990; Doepke & Tertilt, 2016), while a decline in women's empowerment indicates unproductive use of human capital that undermines economic and human development. Therefore, women's participation in various aspects of life may increase human and societal development. In Pakistan, the literature highlights different scenarios (Rasul, 2014). Women are struggling for their equal rights, particularly in developing economies of the world similar to Pakistan, where lower gender development can be observed. Pakistan ranked among the last thirty countries in terms of gender development (Rasul, 2014). This is not a phenomenon only in Pakistan but also in other Islamic states, which is peculiar given the lower indicator values for female participation in parliament and the labor force (Carlsen, 2020). Unfortunately, women represent half of the world's population, which means half of its potential, yet they still earn only 23 percent of the global labor market and contribute to stagnating social prosperity. However, gender equality is not only a fundamental human right, but it also provides a basis for a prosperous, peaceful, and sustainable world. Ending discrimination against women has a trickle-down effect across various areas of development that can help to achieve the SDGs (UN, 2023).

Therefore, it is important to explore the implications, consequences, and determinants of women's empowerment, particularly in developing countries like Pakistan. This study attempts to investigate the impact of income inequality on women's empowerment in the districts of Punjab (Akram, 2012). Inequality may affect women's empowerment because it has some adverse consequences for human development outcomes, such as poor health, which is associated with more unequal societies (Macinko et al., 2003; Subramanian & Kawachi, 2004; Wagstaff & Van Doorslaer, 2000; Wilkinson & Pickett, 2006). In highly unequal societies, mental illness, obesity, lower life expectancy, and high prevalence of HIV infection are observed (Babones, 2008; Carlsen, 2020; Kondo et al., 2009; Pickett, Kelly, et al., 2005; Ram, 2009; Subramanian & Kawachi, 2004; Wilkinson & Pickett, 2006).

Consequently, redistributive policies may help narrow disparities in economic resources and enhance development (Attari et al., 2017; Dasgupta & Ray, 1987; Preston & Green, 2005); increased development may positively affect women's empowerment. Similarly, more equal societies have more social cohesion, better solidarity, less likelihood of conflict among different ethno-linguistic groups (Deaton, 2003; Tamang, 2024; Van Staveren & Pervaiz, 2017), better performance in terms of development (Easterly, 2001) and economic growth (Pervaiz & Chaudhary, 2015), and enlarge their citizens' choices by offering more social capital, public goods and social support (Pickett & Wilkinson, 2009). However, the proposition that income inequality is adversely associated with women's empowerment has received comparatively limited district-level attention in the literature. The present study investigates the harms of income inequality for women's empowerment in Punjab (Akram, 2012) using panel data from thirty-four districts for the period 2008-2018; a panel fixed-effects model is applied. The remaining part of the study is organized as follows: Section 2 reviews the existing literature on inequality and human empowerment. Section 3 explains the data and methodological procedure. Section 4 interprets empirical results. Section 5 discusses the empirical findings, and Section 6 presents the conclusion.

The present analysis contributes to this discussion by treating women's empowerment as a multidimensional district-level outcome rather than relying exclusively on national indicators of gender inequality. In particular, its focus on education, maternal healthcare, and political representation allows examination of important differences in the resources and opportunities available to women. However, these indicators should be interpreted as observable dimensions of empowerment rather than exhaustive measures of agency or decision-making autonomy (Malhotra et al., 2002; Kabeer, 2020). The district-level approach is especially pertinent when conditions differ across geographical areas and national averages may conceal regional disparities (Akram, 2012; Pervaiz & Akram, 2018).

2 Review of Literature

Women's participation in economic, social, and political life is closely connected with equitable development opportunities. Nevertheless, access to productive resources, educational opportunities, healthcare and representation remains uneven in many settings. Therefore, investigating the distribution of resources alongside distinct dimensions of empowerment is essential to understanding the challenges women face in developing regions (Kabeer, 2020; Malhotra et al., 2002).

Literature relating the impact of income inequality on women's empowerment in the Pakistani context is scarce. However, discussion of the socioeconomic and development implications of inequality has become a critical issue for researchers and policymakers. We broadened our research scope to bridge this research gap. It is a matter of fact that patriarchal societies like Pakistan, religious blindness, controlled marriages, and male-dominated social systems place women in disadvantaged positions (Kohtamäki et al., 2024).

Unfortunately, most of the researchers have examined the impact of different forms of inequality on development outcomes containing Gross Domestic Product (GDP), GDP per capita, GDP growth rate, social capital, education, health, human well-being, criminality, living standard, unemployment, corruption, environmental degradation, capital formation, and gender inequality. Literature on inequality and development proposes the channels through which income inequality prevails within countries, among countries, and regions: transformation of the economy from agriculture to the industrial sector (Kuznets, 1955; Thorbecke, 2013), higher rates of inflation (Walsh & Yu, 2012), fiscal policies (Atkinson et al., 2011), technical progress, globalization, and productivity differences between developing and developed countries(Atolia et al., 2024; Atolia & Prasad, 2011). It is recognized that income inequality holds back growth in developing countries (Barro, 2000) because of credit constraints of households, imperfect credit markets, political instability, extent of poverty, ethnic strife, and social conflicts (Alesina & Rodrik, 1994; Easterly, 2007; Helpman, 2006; Murphy et al., 1989; Piketty, 2014; Sukiassyan, 2007; Venieris & Gupta, 1986). Reductions in economic growth perpetually clogged other human development indicators (Alesina & Perotti, 1996). Alesina and Rodrik (1994) supported a negative association between income inequality and economic growth; furthermore, they explained that tax policies and the rate of inequality determined the level of growth (Alesina & Rodrik, 1994).

Higher inequality can reduce investment due to socio-political instability and weak governance (Ojo, 2021). It also controls the ability of low income households to spend on health, education, physical capital and stop income mobility (Corak, 2013; Galor & Zeira, 1993; Yang & Qiu, 2016) which may affect adversely to women's empowerment (Alesina & Perotti, 1996; De La Croix & Doepke, 2003; Mariella, 2023; Perotti, 1996) conclude that inequality negatively affect access of education and human capital formation. Lower human capital development generates class differences, which reduce women's empowerment (Kabeer, 2020; McCall, 2001). It shows that, in the presence of income inequality, economic growth is poor, keeping household income low, and people are bound to spend little on education and health, which can reduce women's empowerment.

In contrast, a few studies conclude that inequality has a positive impact on economic growth (Aghion et al., 1998; Benabou, 1996; Bourguignon, 1990; Forbes, 2000; Li & Zou, 1998; Ratnawati, 2020; Sutanto et al., 2024; Voitchovsky, 2005). However, the increasing impact of inequality on short-run economic growth is determined by a panel of countries (Forbes, 2000) and depends on the initial distribution of income and the form of inequality (Chen, 2003; Voitchovsky, 2005), along with investment patterns. Inequality can spur growth by empowering the elite class to invest more, increasing incentives, fostering innovation, and promoting entrepreneurship; as a result, people can find employment and improve health, education, and their standard of living. Differences in returns to education can also encourage

people to pursue higher education. Some other studies claim no association between income distribution and economic development, such as (Lee & Roemer, 2001; Lopez, 2004; Panizza, 2002; I. Shin, 2012) and (K.-Y. Shin & Kong, 2014). But, generally it is assumed that economies with unequal distribution of income have class division (Benhabib & Rustichini, 1996), political disturbance (Santos & Souza, 2007), higher rate of crime and violence, high level of child and maternal mortality (Spencer, 2004), lower life expectancy (Wilkinson, 1992), low level of human capital (Gregorio & Lee, 2002) and higher gender gap (Sharma et al., 2021) which is detrimental for human and women's empowerment.

Pickett and Wilkinson (2015) explained that inequality harms social cohesion, leading to larger class differences and lower human capital formation. This notion is also supported by other social scientists in the literature (Perotti, 1996). Galor and Zeira (Galor & Zeira, 1993) hypothesize that higher inequality implies a larger share of the population is liquidity-constrained; as a result, society accumulates less human capital, which further leads to lower development. Women's empowerment can be affected from lower level of human development (Galor & Zeira, 1993). In contrast, economies with lower income inequality have higher levels of human capital formation (Deaton, 2007; Laaksonen et al., 2009). The human development process empowers people to recognize their potential, improve self-confidence, and lead lives of dignity. Improvement in human capital leads to human empowerment, including women's empowerment. However, further evidence is needed to explain the association between income inequality and women's empowerment. This study seeks to fill this gap by investigating the impact of income inequality on women's empowerment.

The theoretical rationale for expecting an adverse association between income inequality and women's empowerment can be organized around three related pathways. First, unequal income distribution may constrain household expenditure on education and healthcare, thereby limiting human capital accumulation, particularly among financially disadvantaged groups (Galor & Zeira, 1993; Corak, 2013). Second, inequalities in access to economic and social resources may weaken the conditions that support women's participation in public life and their ability to make meaningful choices (Malhotra et al., 2002; Kabeer, 2020). Third, economic disparities may be connected with lower social cohesion and uneven access to public services, although these channels are not directly estimated in the present study (Easterly et al., 2006; Van Staveren & Pervaiz, 2017). Therefore, the central empirical expectation is a negative association between district-level income inequality and the composite women's empowerment index, conditional on the control variables included in the model.

In addition, women's education, health and political representation may respond differently to unequal resource distribution. Household financing constraints and the accumulation of human capital influence educational opportunities (Galor & Zeira, 1993; Gregorio & Lee, 2002). Maternal healthcare may depend on access to preventive and postnatal services, which can be unevenly distributed across socioeconomic groups (Macinko et al., 2003; Wagstaff & Van Doorslaer, 2000). Similarly, political representation reflects a separate institutional dimension that may not change in parallel with improvements in education or healthcare (Reynolds, 1999; Weldon, 2002). These distinctions justify examining the three dimensions explicitly when discussing the composite index, while avoiding claims that the present regression has empirically established their separate associations.

3 Methodological Framework

This study examines the effect of income inequality on women's empowerment. Women's empowerment is quantified by constructing a composite index with three basic dimensions: women's education, women's health, and women's political participation. To measure income inequality, we calculate the Gini coefficient. The data are taken from the Multiple Indicator Cluster Survey (MIC) (Acemoglu & Robinson, 2000) for the available period of 2008 to 2018. The analysis uses 34 districts of Punjab, which differ in size, location, fertility, political background, and natural resources. When sections differ in size, region, and other indicators, panel data is a more appropriate and efficient technique than cross-sectional or time-series data because it accounts for the behavior of each variable observed over time (Gujarati & Porter, 2009). Generally, the fixed-effects model assumes that each section differs in its intercept term. The fixed-effects approach assumes that slope coefficients are constant while the intercept term varies across districts, with each district having a specific intercept. The Hausman test is an appropriate technique used to identify the appropriate model estimation method. It determines the suitability of the fixed-effects model for empirical analysis. It also discovers

the association between predictor and outcome variables within a unit (Gujarati & Porter, 2009). Following (Acemoglu & Robinson, 2000), the succeeding econometric equation has been estimated:

$$Wempi = f(Inineq, Pci, Rem, Tfr, Uiw) \quad \text{......(1)}$$

$$\log Wempi_{it} = \alpha + \beta_1 \log Inineq_{it} + \beta_2 \log Pci_{it} + \beta_3 \log Rem_{it} + \beta_4 \log Tfr_{it} + \beta_5 \log Uiw_{it} + \mu_{it} \quad \text{......(2)}$$

Where,

Wempi = Women empowerment index, *Inineq* = Income inequality, *Pci* = Per-capita income

Rem = Remittances, *Tfr* = Total fertility rate, *Uiw*= Use of improved water source

μ = Error term, i = Cross sectional units, t = Time period

Measurement and description of the variables used in the study is given below in detail:

3.1 Women Empowerment Index (WEMPI)

"Empowering" women has become the most discussed and repeatedly cited development agenda. It was first advocated by feminists and women's organizations from Third World countries; women's empowerment was used to frame the struggle for social justice and achieve women's equality at national and international levels through the transformation of social, political, and economic structures. Later, in the early 90s, researchers and agencies used the term women's empowerment for a variety of strategies related to expanding human choices and women's productivity (Beneria & Bisnath, 2001). Despite its status as a primary development goal, neither the World Bank nor any other institution developed a rigorous methodology for measuring and tracking variations in the level of women's empowerment (Malhotra et al., 2002). However, most studies used a multidimensional index to measure women's empowerment, comprising political, social, and economic variables. In this study, we have calculated a composite index using women's education, women's health, and women's political participation. The Women's Empowerment Index (WEMPI) is constructed using three sub-indices: the women's education index (WEDI), the women's health index (WHI), and the women's political participation index (WPPI). Equation 3 describes the women's empowerment index and uses equal weights for index construction.

Using equal weights ensures that each of the three dimensions contributes one-third to the composite index. This transparent procedure facilitates interpretation; however, it reflects a normative measurement choice rather than statistical evidence that education, health, and political participation are equally important. In addition, prenatal and postnatal care capture particular aspects of maternal healthcare rather than all dimensions of women's health, while legislative representation does not directly measure individual political agency. Consequently, WEMPI should be interpreted as an index of selected, observable empowerment-related outcomes, and the sensitivity of the findings to alternative index weights is a relevant issue for future validation (Malhotra et al., 2002; Kabeer, 2020).

$$WEMPI_{it} = 1/3(WEDI_{it}) + 1/3(WHI_{it}) + 1/3(WPPI_{it}) \quad \text{......(3)}$$

3.2 Women Education Index (WEDI)

The Women's Education Index (WEDI) combines two basic variables to measure education level: the literacy rate of young women and women's mean years of schooling for ages 15-24 and 15-49, respectively. Goals in the quantification of two sub-indices named "women's mean years of schooling index (WMYSI)" and "women's literacy index (WLI)" are determined; 90% is taken as the maximum and 27 as the lowest in WLI calculations, which is achieved only by Chakwal and Rajanpur, respectively in the series. For women's mean years of schooling, 7.7759 is considered the highest and 1.3592 the lowest, which were achieved by Rawalpindi and Rajanpur, respectively. Equations 4, 5, and 6 explain the procedure of WLI, WMYSI, and WEDI, following (Acemoglu & Robinson, 2000).

$$WLI_{it} = (WML_{it} - 27)/(90 - 27) \quad \text{......(4)}$$

$$WMYSI_{it} = (WMYS_{it} - 1.3592)/(7.7759 - 1.3592) \quad \text{......(5)}$$

$$WEDI_{it} = 2/3(WMYS_{it}) + 1/3(WLI_{it}) \quad \text{......(6)}$$

3.3 Women Health Index (WHI)

It is worth pointing out that most women in developing countries die in their productive age groups. According to the World Health Organization (WHO), almost half of the casualties are connected with the period of pregnancy and delivery in countries like India, Bangladesh, or Pakistan, while this ratio is quite near to nil in Sweden or Canada. In this respect, we have used antenatal care and postnatal care statistics as health indicators. Prenatal care is linked to pregnancy. Women receive attention from doctors, nurses, midwives, or lay health workers during pregnancy. Postnatal care is also very effective for both mother and infant. Generally, to avoid maternal death and to detect post-natal problems, it is recommended that the mother should receive a first post-natal check-up within two days of delivery. Postnatal coverage by paramedical staff, including doctors, nurses, or certified midwives, was only 41% in Punjab, compared with 30% in 2008. In this empirical analysis, we calculated the women's health index (WHI) using the percentage of women who received postnatal and antenatal health care in each district, assigning equal weight to both variables. WHI is a composite index calculated using two sub-indices: the prenatal health care index (PRNHCI) and the postnatal health care index (PNHCI). In the PRNHCI calculations, 89.6578% is set as the maximum and 45.4563% as the minimum goalposts, which Rawalpindi and Rahim Yar Khan attained in sequence. Whereas, PNHCI is computed by setting 97.5 (Hafizabad) and 47.7 (D.G. Khan) as maximum and minimum values. Equations 7, 8, and 9 indicate the procedure for calculating PRNHCI, PNHCI, and WHI.

$$PRNHCI_{it} = (PRNHC_{it} - 45.4563) / (89.6578 - 45.4563) \quad \text{..... (7)}$$

$$PNHCI_{it} = (PNHC_{it} - 47.7) / (97.5 - 47.7) \quad \text{..... (8)}$$

$$WHI_{it} = 1/2(PRNHCI_{it}) + 1/2(PNHCI_{it}) \quad \text{..... (9)}$$

3.4 Women Political Participation Index (WPPI)

The United Nations Research Institute for Social Development (UNRISD) first defined political participation as closer to political empowerment. Political empowerment is categorized by groups of producers to enhance women's negotiation power and expand their influence on the policymaking process. Representation in parliament is a strength of women (Reynolds, 1999; Vijayalakshmi, 2002; Weldon, 2002). This study constructs the Women's Political Participation Index (WPPI) by considering female representation in both provincial and national assemblies. Equation 10 describes the procedure used to calculate the Women's Political Participation Index (WPPI). 49 reserved seats in both the provincial and national assemblies are set as the maximum benchmark, which Lahore has attained across the series. 0 (Lodhran) is considered the minimum benchmark, indicating no political participation in either the provincial or national assemblies.

$$WPPI_{it} = (WPP_{it} - 0) / (49 - 0) \quad \text{..... (10)}$$

3.5 Independent Factors

Income inequality can be considered an important inequality dimension (Babones, 2008; Coburn, 2015; Pickett & Wilkinson, 2015). Gini coefficient is used to measure income inequality, a common measure developed by the statistician Corrado Gini (1912) in his paper "Variabilita e mutabilita," which means "Variability and mobility". For this calculation, income data of individuals from each district were used from MICS (2008-2018). The Gini coefficient ranges from 0 to 1, indicating perfect equality and perfect inequality, respectively (Goldthorpe, 2010; Leigh & Van der Eng, 2009). The Gini coefficient is an appropriate measure for estimating the correlates of inequality (Babones, 2008).

The second important independent factor is each district's per capita income. At the initial stage, the per capita income of all households in a district is calculated; then we prefer to calculate the per capita income of a specific district through households' per capita income. The total fertility rate, as calculated by MICS for the period 2008-2018, is used as a proxy for fertility. Another important explanatory variable is remittances; to quantify it, we selected the percentage of the population that receives remittances from abroad and other districts. The percentage of women using improved water sources is another explanatory variable. Data for the variables of interest were taken from various waves of MICS household data for the period 2008-2018.

Data on the variables used to construct the Women's Empowerment Index (WEMPI), income inequality, and per capita income (excluding political participation) were collected from different waves of MICS for the period 2008-2018. Data for our control variables, including total fertility rate, remittances, and use of improved water sources, have also been obtained from MICS. However, data on the political participation index have been collected from the list of members issued by the National & Provincial Assemblies. Table 1 reports the correlations and corresponding t-statistics for the variables considered in this analysis. Per capita income and remittances are positively and significantly correlated with women's empowerment, whereas income inequality and the total fertility rate are negatively correlated with the index. However, the correlation between access to improved water sources and women's empowerment is positive but statistically insignificant ($r = 0.015944$, $p = 0.8538$). The distinction between these pairwise correlations and the conditional regression estimates should be maintained.

For transparency, the Gini calculation requires a consistent definition of district-level income and clear documentation of survey coverage, sample weighting, missing responses, and how differences between MICS waves are handled. Similarly, document the data sources and allocation rules for parliamentary representation, particularly because absolute numbers of female representatives can reflect differences in electoral constituency size rather than political empowerment alone. These are measurement considerations arising from the variables described above, not additional empirical results. Reproducible calculation procedures would allow subsequent research to test alternative definitions and examine the index's stability.

Table 1: Correlations

Correlation t-Statistic Probability	**WEMP**	**TFR**	**REM**	**PCIR**	**UIW**	**INE**
WEMP	1.000000					

TFR	-0.625143	1.000000				
	-9.271561	-----				
	0.0000	-----				
REM	0.432339	-0.290319	1.000000			
	5.550212	-3.511947	-----			
	0.0000	0.0006	-----			
PCI	0.658455	-0.643305	0.222876	1.000000		
	10.12750	-9.726604	2.646546	-----		
	0.0000	0.0000	0.0091	-----		
UIW	0.015944	0.057725	-0.106575	-0.012839	1.000000	
	0.184586	0.669327	-1.240763	-0.148635	-----	
	0.8538	0.5044	0.2169	0.8821	-----	
ININQ	-0.662941	-0.076263	0.143970	0.191357	-0.057985	1.000000
	10.830037	-0.885382	1.684115	2.256827	-0.672353	-----
	0.0000	0.3775	0.0945	0.0256	0.5025	-----

Source: Authors' Calculation

4. Empirical Results

This study examines the association of income inequality with women's empowerment in Punjab, Pakistan. Data used to estimate the econometric model are taken from MICS for thirty-four districts over the period from 2008 to 2018. Using the Hausman (1978) test, we confirm that the fixed-effects model is appropriate for our analysis. Table 2 reports the estimates of the panel fixed-effects model. The reported sample comprises 136 district-wave observations from 34 districts and four survey rounds. Although the Hausman test supports district fixed effects over a random-effects model under its assumptions, it does not establish causal identification or rule out time-varying omitted influences. Therefore, interpret the regression as a conditional association. With only four survey waves, assess the precision of inference by appropriately accounting for within-district error dependence, survey-wave effects, and the sensitivity of standard errors to alternative specifications (Gujarati & Porter, 2009).

Table 2: Estimates of Panel Fixed Effect Approach

Dependent Variable: log of Women Empowerment Index (logWEMPI)			
Independent Variable	**Coefficient**	**t. statistics**	**Prob.**
C	-0.5786***	-4.1802	0.0000
logInineq	-0.6159***	-3.9516	0.0002
logPci	0.4885***	6.9397	0.0000
logRem	0.323122*	1.7767	0.0793
logTfr	-0.38112413	-1.1234	0.2824
logUiw	0.32621**	2.2915	0.0300
R-squared= 0.9045			
Adjusted-R-squared= 0.8657			
F-statistics=23.25102			
Prob. (F-statistics)=0.000000			
Hausman Test: Chi-Sq. Statistics=14.608852			
Prob.=0.0235			
N=136			

Note: *, **, *** indicate significance at 10, 5 and 1 percent level of significance respectively.

The results in Table 2 indicate that income inequality has a statistically significant negative association with women's empowerment. This negative association is consistent with previous studies suggesting that inequality has an inverse association with human development (Attari et al., 2017; Engerman & Sokoloff, 2012; Persson & Tabellini, 1991; Easterly, 2007). Inequality divides the economy into different income groups, and people belonging to low-income groups are deprived. Deprivation keeps these people away from consuming goods and services like nutritious food, safe shelter, education facilities, and health maintenance, which reduces human capital formation. Low human capital pushes societies towards higher gender gaps. Reduced income inequality may be associated with greater women's empowerment in Punjab (Pakistan), which can help achieve the Sustainable Development Goals related to women's empowerment. Per capita income and remittances are positively and significantly associated with women's empowerment. Increases in per capita income and remittances facilitate access to education and health facilities, reducing women's deprivation. The total fertility rate has a negative but statistically insignificant association with women's empowerment. Access to an improved water source has a positive and statistically significant association with women's empowerment. Water is a lifeline for human health; it keeps the body hydrated and flushes out impurities.

The reported coefficient for log income inequality is -0.6159 ($p = 0.0002$). Under the stated log-log specification, this coefficient corresponds to an estimated negative elasticity, provided the underlying transformations are valid for all included observations. However, interpretation requires confirmation that the index and every logged regressor are strictly positive or that any treatment of zero values is explicitly reported. Per capita income is positively associated with the index at the 1% significance level; remittances are positive but significant only at the 10% level; and the fertility estimate is not statistically distinguishable from zero at conventional thresholds. In addition, the improved-water coefficient is positive and significant in the multivariable specification, despite its statistically insignificant pairwise correlation in Table 1. This difference is not itself contradictory because the regression conditions on other included variables.

5. Discussion

The empirical association between income inequality and women's empowerment has been estimated for the Punjab region of Pakistan. The observed negative association between income inequality and women's empowerment in Punjab, Pakistan, is consistent with the possibility that inequality may constrain women's opportunities through different channels, including growth, human capital formation, human development, investment, poverty, and gender inequality. This interpretation aligns with research suggesting that quality of life and people's development are linked to the distribution of economic resources. In comparison, poor women; women living in rich countries and women of rich families enjoy a higher standard of living, and they also have better education and health (Kawachi et al., 1997; Kennedy et al., 1996; Wilkinson & Pickett, 2008). Long-run economic growth is reduced by inequality (Alesina & Rodrik, 1994; Clarke, 1995; Easterly, 2007). It can hamper development outcomes,

including women's empowerment, by reducing economies' growth potential (Alesina & Perotti, 1996; Alesina & Rodrik, 1994; Perotti, 1996) through different channels. These channels include liquidity constraint of the poor (Galor & Zeira, 1993), a rising distribution deman (Alesina & Rodrik, 1994), increasing social conflict (Alesina & Perotti, 1996), worsening in human capital acceleration (Acemoglu & Robinson, 2000; Bourguignon & Verdier, 2000; Easterly, 2001) deterioration of institutional quality (Easterly et al., 2006) and corrosion of social cohesion (Kawachi et al., 1997).

Income inequality may contribute to political instability, which further damages institutional arrangements. Bad quality of institutions and political instability retards the economic growth and development. and (Gregorio & Lee, 2002) estimate a negative association with human capital and income inequality. Reduction in human capital can affect the empowerment of women, particularly in underdeveloped countries like Pakistan, where most women have lower education and poor health due to limited resources. Similarly, inequality of income at national and regional level is linked to poor self-rated health (Rözer & Volker, 2016), misuse of alcohol (Elgar et al., 2005), school bullying (Elgar et al., 2009), physical assaults (Pabayo et al., 2016), teenage pregnancy (Pickett, Mookherjee, et al., 2005), and child maltreatment (Eckenrode et al., 2014). On the other hand, inequality causes macroeconomic volatility, which has adverse consequences for human wellbeing (Stiglitz, 2015). Macroeconomic instability can affect women's empowerment across different regions of a country like Pakistan by undermining the public provision of social services. Our empirical findings indicate an adverse association between inequality and women's empowerment, although the proposed causal channels have not been separately identified for women's empowerment among the districts of Punjab through the above-discussed channels. Policies that address income inequality may contribute to improved women's empowerment in different regions of Punjab (Pakistan).

Empirical findings on the control variables show positive and significant associations between remittances, per capita income, and the use of improved water sources and women's empowerment, indicating that improvements in socioeconomic status across districts can enhance women's empowerment. In addition, public provision of social services can help improve human development (Akram, 2012; Siddique, 2021). Similarly, improvement in socioeconomic status by increasing per capita income and remittances can positively affect women's empowerment in Punjab because poor socioeconomic status is associated with many diseases, including respiratory illnesses (Haan et al., 2017; Meyers et al., 2004), with an enlarged likelihood of dental caries and deficiency of iron (Dickman et al., 2017), higher blood lead levels (Brady, 2004; Chiu, 2010; Macinko et al., 2003), stunting, and sensory impairment. A negative but insignificant association with fertility rate can affect women's empowerment in Punjab through population growth and may therefore be a relevant predictor of economic and human development outcomes in society (Barro, 1991; Hondroyiannis & Papapetrou, 2005; Mankiw et al., 1992; Solow, 1956).

The estimates also have implications for interpreting district-level policy. Policies supporting access to education, maternal healthcare, and basic services may address substantive forms of deprivation that overlap with income disparities. However, the present findings do not demonstrate that any specific intervention will produce the observed change in the index, because the analysis does not identify a policy treatment or isolate individual causal pathways. Similarly, improving women's political representation requires attention to institutional arrangements that cannot be inferred from household resources alone. Therefore, the findings are best used to motivate more targeted analysis of potential mechanisms rather than to estimate the effects of particular programs directly (Malhotra et al., 2002; Kabeer, 2020; Reynolds, 1999).

6. Concluding Remarks

The present study examines the influence of income inequality on women's empowerment among the districts of Punjab (Pakistan). Using panel data for 2008-2018, a fixed-effects model indicates a negative association between income inequality and women's empowerment. The findings suggest that higher income inequality is associated with lower women's empowerment in Punjab (Pakistan). Therefore, reducing income inequality may support women's empowerment through equal participation of families in the process of enlargement of human choices. In this context, equality may promote human wellbeing by supporting the poor section of society. It implies that women-related issues are given prominence at the social and administrative levels to empower women and provide them with appropriate facilities related to education, health, and jobs. The Government of Punjab may support

women's empowerment across Punjab's districts by reducing income inequality through public provision of social services, particularly in districts with lower levels of women's empowerment. Income inequality may have adverse implications for women's empowerment in Pakistan, where income distribution is not just about income but also about political power. A skewed income distribution in Pakistan has strengthened the dominance of the elite class. The powerful country elite has developed a predatory cycle that supports one another (Hussain et al., 2009; Pervaiz & Akram, 2018). They have pursued policies that benefit elites, further strengthening their control over public policy and reducing women's empowerment by restricting equal opportunities for education, jobs, political participation, and health. Therefore, reducing income inequality may help improve women's empowerment in different districts of Punjab (Pakistan).

The interpretation of these results is subject to several limitations. First, the composite measure incorporates three selected empowerment-related dimensions and may not capture women's control over household resources, independent decision-making or participation in paid employment. Second, differences in district size, the allocation of parliamentary seats and the construction of income measures may influence comparisons. Third, the fixed-effects estimates do not remove possible confounding from unobserved factors that change between survey waves. Future research could examine the education, health and political-participation indices separately, test alternative index weights and inequality measures, and extend the district panel when comparable data become available. In addition, analysis of rural–urban disparities and other Pakistani provinces could establish whether the documented association is geographically generalizable. Such extensions would preserve the present study's central objective while clarifying the pathways connecting income inequality and women's empowerment (Akram, 2012; Kabeer, 2020; Pervaiz & Akram, 2018).

Ethical Statement: This study analyses secondary survey data and records of parliamentary representation. The manuscript does not report new participant recruitment or interventions. Any applicable requirements for secondary-data access and research ethics remain subject to the conditions of the original data providers.

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