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Multidimensional Poverty in Pakistan: An Analysis

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ABSTRACT

The underlying study has focused on investigating the influences of rising urbanization and climatic variations on multidimensional poverty in Pakistan. Poverty reduction has been deemed as one of the key policy agenda in the developing countries. Sustainable Development Goal (SDG-1) maintains focus on zero poverty by the end of 2030, which is committed by the global community in 2015. For empirical purpose, PSLM (2019-20) has been employed. The application of binary Logit model is suggestive that urbanization has its advantageous influences on the multidimensional wellbeing of the households; while at the same time climatic shocks have harmonious but non-linear U-shaped impacts on multidimensional poverty. The joint occurrences of both the climatic shocks and the urbanization have shown the harmonious effects on the multidimensional poverty in Pakistan. Policy makers must consider climate change seriously and act accordingly with their impact on multidimensional poverty, especially if they desire to achieve the SDG 1 up to 2030.

Keywords	Binary Logit Model, Climate Change, Multidimensional Poverty, PSLM, Urbanization

Introduction

Reducing multidimensional poverty has become the one of the leading policy agenda for developing countries like Pakistan. According to official estimates, 4 out of 10 Pakistanis are multidimensional poor, which means that 39% households are facing multidimensional poverty (Wasti, 2015). There are multiple factors, which influence the household wellbeing such as idiosyncratic and covariate shocks. Idiosyncratic shocks are household-specific such as loss of income, loss of lives, etc., while the covariate shocks include climatic shocks, inflationary shocks, or other natural hazard (Mustafa, 2022).

Climatic-shocks poses a major threat to all dimensions of sustainable development. Pakistan holds fourth position on the global index, which measures countries' vulnerability to climate change (Mustafa, 2022). Climatic-shocks repeatedly hits the economy through droughts, floods and extreme waves of rainfall and temperature norms. From 1995 to 2018, 143 extreme weather events have brought about loss of around $ 3 billion annually (Wang et al., 2019). Available literature on regarding Pakistan has shown that climatic-shocks has adverse impacts on households' food security and agricultural productivity in Pakistan (Mustafa, 2022; Ahmed et al., 2016).

Along with these shocks, overly spread in urbanization has become the important determinant of household-wellbeing or multidimensional poverty. Approximately, 80 percent of population from developed countries is dwelling in

urban areas, while developing countries have relatively lower share in urban population. Nonetheless, the urbanization has been increasing remarkably during last couple of decades (i.e. 17.6% in 1950 and 46.5% in 2018). Likewise, Pakistan is also considered among those countries which have unplanned urbanization wherein the average urbanization growth rate is 3.56% from 1971 to 2018, which indicates the rapid urbanization trend in Pakistan with 14.97 million urban population in 1971 increased 77.80 million in 2018 (Ritchie & Roser, 2018).

Generally, it is considered that poverty reduction is a natural byproduct of the urbanization process but there is still disagreement consideration in the academia and policy literature regarding the impact of urbanization on the poverty. One strand of the available literature is suggesting that due to overwhelming urbanization there are certain problems thrive into urban areas such as costly housing, sanitization, urban flooding, increasing demand of health and education amenities (Jeremić et al; 2014, Wang et al., 2020,Li et al; 2014 Chen et al; 2019). The majority of available literature regarding Pakistan has focused linking the urbanization and climate change with other aspects of the wellbeing such as food security, health outcomes or energy demands (Waheed et al., 2020; Khan and Akram, 2018; Idrees and Baig, 2017; Iqbal and Nawaz, 2017; Khan et al., 2016; Ahmed et al., 2016). On the reflection of above discussion, this study contributes in literature by setting up objectives as follows. 1) to explore the impact of urbanization on multidimensional poverty.2) to explore the impact of climate changes on multidimensional poverty.3) to estimate the joint impact of urbanization and climate change on multidimensional poverty.4) to suggest some policy implications to address multidimentional poverty based on the above-mentioned objectives. This study helps in better allocation of scarce resources to remove poverty from the country at local to national level. Results of the findings would also be helpful in drawing policy prescriptions to achieve the sustainable development by 2030 with the respect to household level and district level.

Literature Review

This section elaborates the relationships between multidimensional poverty, climate change and urbanization through considering the relevant empirical literature. Bulk of literature is available on this issue. However, the literature reviewed in this section has been chosen reverent to the objectives of this study. Multidimensional poverty is defined as "the poverty beyond income or consumption including some other non-monetary dimensions for example education, health and living standard". This definition is adopted by from Alkire .S and it is based on the Amartya Sen's Capability Approach. The Alkire-Foster methodology presents the more accurate picture of wellbeing through three dimensions (education, health and living standard) and ten indicators (two from education, two from health and six from living standard) (F. Khan & Akram, 2018).Moreover, multidimentional poverty calculated two aspects of poverty in one hand is the incidence of poverty and while on the other hand intensity of poverty. Recently, the impacts of climatic change on poverty have become debatable. The available literature on the climate change and poverty nexus conflicting results on the significance and direction. Some studies indicated that climate change has negative impact on poverty. While others reported that climate effect the poverty in both ways, positively and negatively (Hallegatte, 2014; Leichenko & Silva, 2014). Therefore, according to the latter group, the adverse effect of climate change on poverty is inconclusive. Climate change more effect poverty with different channels. Poor are more vulnerable to climate change and they face difficulties to fulfil their basic needs. Climate is the driver of the great concern, claiming more attentions around the world as time goes by (María, García-del-Amo,

& Reyes-García, 2020).It is fact that temperature increasing and rainfall pattern changing which shows that climate changes is a serious problem, it is urgent need to deal with today.

Rapid urbanization poses challenges for multidimensional poverty and sustainable development. The World is presently experiencing rapid urban transitions as well as rapidly changing global climate (I. P. O. C. J. C. c. Change, 2014).Urbanization and majority of urban population growth at present and projected in the future, is markedly different from the past (Basu & Bazaz, 2016).There are many direct and indirect impact of urbanization on multidimensional poverty via climate changes. Understanding and acting the interface of urbanization on multidimensional poverty is the most pressing and desirable challenge of the 21st Century. Urbanization changes the climate for example heat islands affects, floods, droughts etc. Furthermore, it is a reality that urbanization changes climate and climate effect the food security. There are conflicting findings about urbanization-poverty nexus, Some studies explore that urbanization negatively effect on the poverty (G. Chen, Glasmeier, Zhang, & Shao, 2016; Cuong, 2014; Davis & Wang, 2009) and some studies finds the significantly positively effect of urbanization on poverty (Cali & Menon, 2009; Ravallion, Chen, Sangraula, & review, 2007).Where some studies finds that the urbanization both positively and negatively affect the poverty (Liddle, 2017; María del Rosario, 2020).So the effect of urbanization on poverty is unknown a prior.

Although research and studies have been conducted on the measuring of the multidimensional poverty, there is a dearth of research to explore the impact of climate change and urbanization on multidimensional poverty in the context of Pakistan. Most of the studies focused only measuring the multidimensional poverty using different dimensions of wellbeing. However, some studies explore the impact of climate change on multidimensional poverty and someone explore the impact of urbanization on multidimensional poverty. There is not a single study, which incorporated the both emerging challenges of climate change and urbanization to measure the multidimensional poverty at district level in the context of Pakistan. Finally this study differentiate the previous studies by incorporating the emerging challenges of climate change and urbanization to measure the multidimensional poverty and moreover this fill this research gap

Conceptual Framework

Different studies come up with different conceptual framework but the objective of this study is to develop the theoretical framework of multidimensional poverty incorporating the relationship between climate change and urbanization. Theoretical framework captures; first, the independent impact of climate change on multidimensional poverty .Second, the impact of climate change on multidimensional poverty through the impact of urbanization. Climate changes can effect poverty through many channels. Some of these are the direct and some are indirect brief description given below.

There are four transmission channels can affect the poverty indirect and direct ways. All the channels shows that how climate change harmful to poverty. Every channel negatively affect the poverty and other studies also reported the same results (Leichenko & Silva, 2014; María del Rosario, 2020).However, in Pakistan the poverty rate has been decreasing and while the urbanization has happened rapidly over the last two decades. Urbanization can increase the wages of rural workers. Firms and

industrial units generally established in cities and their wages are higher than rural areas, they attract rural workers. In this way rural labour supply decrease and as a result the rural labour wages increasing. Urbanization can lead to increase nearby cities rural land prices. Higher land prices increase the income of the rural household (Cali & Menon, 2009).Urbanization often involves migration from rural to urban areas for better economic opportunities. Migration is expected to increase income of migrants as well as their household (Cuong, 2014).Migration can have numerous impact on household poverty. The direct impact of migration is the increase income through remittances (McKenzie & Sasin, 2007).Positive impact of remittances on household welfare and poverty reduction are found in many studies like (Adam, 2006; Adams Jr & Page, 2005). On the other hand there are several empirical studies which do not find poverty reduction effect of migration (Azam & Gubert, 2006; Y. P. Wang, 2004).

Data and Variable Description

Primarily, the underlying research employs two types of the data; household survey data, and district level data. To measure the impacts of urbanization and climatic factors on households' multidimensional poverty, the study has used the most recent available household survey, PSLM (2019-20), which is conducted by Pakistan Bureau of Statistics (PBS). The climatic variables are taken from Pakistan Metrological Department (PMD) from 1990 to 2019.

Variable Construction

The main dependent variable of this research is multidimensional poverty index (MPI). The study has constructed this variable by using Alkire and Santos (2010 & 2014), which is widely used by researchers. The MPI has been constructed by using three dimensions such as education, health, and living standards. These three dimensions include further indicators, which are given in table-1. All these dimensions and cut-offs, and weights are set by the Government of Pakistan to keeping in view the priorities, which are the part of their national plans. Table 1 comprises the identification and cut-offs of deprivation by indicators. For household level MPI, a binary variable is computed by using the deprivation of all the indicators of the MPI, which has been the dependent variable in household level analysis. Moreover, for pooled data analysis, we have constructed district level MPI by using data of PSLM 2019-20.

Table 1
Pakistan's National Multidimensional Poverty Index (MPI), Deprivations and Weights

Dimension	Indicators	Deprivation Cut-off	Weight
Education	Years of Schooling	Household is deprived if no man OR no woman above 10 years of age has completed 5 years of schooling	1/6
	Child school attendance	Household is deprived if any school aged child is not attending school between 6 and 11 years of age	1/8
	School quality	Deprived if any child is not going to school because of quality issues	1/24
Health	Access to health Facilities	Deprived if health facilities such as basic health units and hospitals, etc. are not used at all.	1/6
	Immunization	Deprived if any child <5 is not fully immunized according to the vaccinations calendar	1/18

	Ante-natal care	Household is considered deprived if any woman who has given birth in the last three years did not receive ante-natal check-ups	1/18
	Assisted delivery	Households are deprived if any woman has given birth in the last 3 years attended by untrained personnel such as family member, friend, traditional birth attendant, etc.	1/8
Standard of Living	Water	Household is deprived if the households have no access to an improved level of source of water such as tap water, hand pump, motor pump, protected well, and mineral water	1/21
	Sanitation	A household is considered as deprived if she/she has no access to adequate sanitation such as flush system etc.	1/21
	Walls	A household is deprived if he/she has no improved walls	1/42
	Overcrowding	A household is deprived if the household has 4 or more people per room	1/42
	Electricity	A household is deprived if she/she has no access to electricity	1/21
	Cooking fuel	A household is deprived if he/she has solid cooking fuels for cooking	1/21
	Assets	"A household is considered as deprived if he/she does not have more than two small assets (radio, TV, iron, fan, sewing machine, video cassette player, chair, watch, air cooler, bicycle) OR no large asset (refrigerator, air conditioner, tractor, computer, motorcycle), AND has no car".	1/21
	Land and livestock (rural)	"Deprived if the household is deprived in land AND deprived in livestock, i.e.: a) Deprived in land: the household has less than 2.25 acres of non-irrigated land AND less than 1.125 acres of irrigated land b) Deprived in livestock: the household has less than 2 cattle, fewer than 3 sheep/goats, fewer than 5 chickens AND no animal for transportation (urban households are considered non-deprived)"	1/21

Source: Government of Pakistan

Table 1
Construction of District Level Control Variables

Variables	**Brief Description**	**Data Source**
Police Access	% of people having access to police whenever need	PSLM
Road Facility	% of people are utilizing the facility of main roads	PSLM
Agriculture Extension	% of people having the access to agriculture extensions	PSLM
Bank Facility	% of people having access to banking facility	PSLM
Literacy Rate	% net enrollment in primary schooling	Data4Pakistan
Health Infrastructure	% of people are enjoying the health facilities	PSLM
Road Length	Length of roads in kilometers	PDS
Irrigated Area	Total irrigated area out of cultivated area (000 hectors)	PDS
Low Dependency	% households If dependency ratio is less than 1	PSLM
Medium Dependency	% households If dependency ratio is equal to 1	PSLM

Severe Dependency	% households If dependency ratio is greater than 1	PSLM

PDS= Provincial Development Statistics

Empirical Methodology

This section maintains the discussion on application of empirical strategies to estimate the specified objectives, which are discussed as follows. As we have discussed that, the underlying study aims to estimate the impacts of urbanization and climate change on multidimensional poverty in Pakistan. For this purpose, we implemented household survey data to obtain the said objectives. In addition to this, the study has used district level pooled data to measure as well. Hence, to obtain evidence from household data, we have applied binary Logit Model, because the dependent variable is a binary in nature where 1 is assigned if household is multidimensional poor and 0 otherwise. Likewise, to estimate objectives by using district level pooled data requires the implementation of panel data techniques such as district fixed effect and random effect. Therefore, to capture district level heterogeneity, the study has applied district fixed effect model. The discussion on the specification of the model is given as follows.

Empirical Strategy 01: Binary Logit Model

A growing body of literature has suggested the application of Binary Logit model whenever we have binary dependent variables (e.g. Ahmed et al., 2016; Mustafa et al., 2019) as the case of underlying study we have multidimensional variable as binary variable for household survey data setting. For empirical purpose, first we would estimate the impacts of urbanization on multidimensional poverty, which is specified as follows.

$$Y_i = \beta_0 + \beta_1 Ur_i + \gamma_i \Sigma X_i + U_i \qquad (1)$$

In above equation Y_i is showing dependent variable, which is binary in nature where 1 if household is multidimensional poor, otherwise 0. District level (%) of urbanization is explanatory variable where β_1 is its parameter. Similarly, ΣX_i is the vector of control variables, which are given in equation 1 such as age, and gender of household head, household dependency ratio, utilization of transportation at district level, and having facilities of agriculture extensions, police facility, and availability of commercial banks at district level, and provincial dummies, and Ui is the error term. After establishing the impacts of urbanization, the study would introduce the climatic variables such as average rainfall and its non-linear term, and average temperature and non-linear term of temperature. The equation 1 follows the following specification.

$$Y_i = \beta_0 + \beta_1 Ur_i + \beta_2 T_i + \beta_3 T_i^2 + \beta_4 R_i + \beta_5 R_i^2 + \gamma_i \Sigma X_i + U_i \qquad (2)$$

In above equation, T represents average temperature, while T^2 indicates its square term to unleash the extreme temperature norms (shocks), R indicates the average rainfall, while R^2 denotes square term of the rainfall to estimate the impacts of extreme events of rainfall. Rests of the specification will be similar as presented in equation 1.Next target is to estimate the joint impacts of the urbanization and climate change on food insecurity. For that purpose, we have introduced interaction term of the urbanization and climatic factors in equation 2. The specification becomes as follows.

$$Y_i = \beta_0 + \beta_1 Ur_i + \beta_2 T_i + \beta_3 T_i^2 + \beta_4 R_i + \beta_5 R_i^2 + \beta_6 Ur_i * T_i + \beta_6 Ur_i * R_i + \gamma_i \Sigma X_i + U_i \quad (3)$$

In above equation, $Ur_i * T_i$ is the interaction term, which is measured by the multiplication of urbanization, and average temperature, which estimates the joint impacts of the urbanization, and temperature. Similarly, $Ur_i * R_i$ estimates the joint impact of urbanization and rainfall on multidimensional poverty. Hence, the rests of the specification is similar, as we have discussed in equation 2.

Results and Discussion

This section is furnished with discussion on empirically obtained findings. Firstly, the study estimates the impacts of urbanization and climate change on multidimensional poverty by using the PSLM (2019-20), while subsequently the evidences are estimated by using the district level panel fixed effect. The main objective of this essay is to explore the impacts of urbanization and climate change on households and after that, it is to estimate what happens the relationship if we employ the district level pooled data.

Impact of Urbanization on Households' Multidimensional Poverty (MP)

In order to estimate the influences of urbanization on households' multidimensional poverty the study has implemented the Binary Logit model, when multidimensional poverty is in binary form whether household is poor or not. Likewise, we have used OLS estimator when dependent variable is multidimensional poverty index (MPI).Table 3 indicates that urbanization has statistically significant and negative affects households' multidimensional poverty. Here, negative sign estimated by Logit model demonstrates that other things remaining same; the increase in urbanization brings about decline in the likelihood of households' multidimensional poor. In order to interpret the coefficients, the study has computed the odd ratio, which is estimated as 0.969, which means almost 3 percent chances of being multidimensional poor are declined owing to increase in urbanization, other things remaining constant.

Nonetheless, the application of OLS on continuous variable, MPI is suggested that influences of urbanization on multidimensional poverty are negative because with the increase of urbanization, the MPI falls by 0.006 percent. It demonstrates that although urbanization has almost brings about decline in MPI by almost 0 percent, but the impacts are beneficial overall. The application of Logit demonstrates relatively stronger impacts than that of OLS. Hence, overall, it is concluded that urbanization has beneficial effects on households' multidimensional wellbeing or causing to reduce multidimensional poverty (table 3)

Table 2
Impact of Urbanization on Multidimensional Poverty in Pakistan

	(1)		(2)
VARIABLES	**Logit**	**Odd Ratio**	**OLS**
Urbanization (%)	-0.0314***	0.969***	-0.00637***
	(0.00351)	(0.00340)	(0.00101)
Head age	-0.00446***	0.996***	-0.000673***
	(0.00105)	(0.00105)	(0.000201)
Head gender (1=male)	0.211***	1.235***	0.0745***
	(0.0451)	(0.0557)	(0.00966)
Dependency ratio	0.266***	1.305***	0.0915***
	(0.0177)	(0.0230)	(0.00404)
Transport facilities	0.384***	1.469***	0.0970***

	(0.0834)	(0.122)	(0.0163)
Agriculture extension	0.463***	1.588***	0.0806***
	(0.0859)	(0.136)	(0.0148)
Police accessibility	-0.216***	0.806***	-0.0189
	(0.0794)	(0.0640)	(0.0146)
Bank facilities	-0.370***	0.691***	-0.119***
	(0.0500)	(0.0345)	(0.0102)
Punjab	0.236	1.266	-0.0188
	(0.152)	(0.193)	(0.0316)
Sindh	0.607***	1.835***	0.157***
	(0.214)	(0.393)	(0.0480)
Balochistan	0.945***	2.573***	0.232***
	(0.206)	(0.531)	(0.0319)
Constant	0.548***	1.729***	3.616***
	(0.145)	(0.251)	(0.0301)
Observations	160,655	160,655	158,462

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

Despite urbanization, there are other factors, which have impacts on households' multidimensional poverty: household-specific and locational variables. Table 3 demonstrates that age of household head has statistically significant impacts on poverty. The negative sign demonstrates that those households whose heads are relatively older are less likely to be poor. Similarly, the gender of the head of household has significant impacts where positive sign demonstrates that those households whose heads are male seem more likely to be poor as compared to those who are female-headed. The dependency ratio is also one of the important factors, which have significant impacts on determining the households' multidimensional poverty, which has adverse impacts, which means the increase in dependency ratio increases the chances of the households to be poorer.

Locational factors include physical and social infrastructure related variables have significant impacts on the determination of the multidimensional poverty among households. Social infrastructure includes police accessibility has significant impacts which beneficial influences. The physical infrastructure includes transport facilities, agriculture extensions, and facilities of commercial banks are the significant factors, which are found influencing the multidimensional poverty of households. Moreover, the provincial dummies are also included in the models, which have significant impacts on multidimensional poverty (table 3).

Urbanization, Climate Change, and Households' Multidimensional Poverty

Likewise, previous section, the study has employed the same models by including climatic factors to unleash the impacts of urbanization and climatic factors on the determination of the multidimensional poverty among households. Table 4 estimates two sorts of the models: with and without temperature along with rainfall. The study has used district level climatic factors such as temperature and rainfall. The estimated results demonstrate that again the impacts of urbanization are found negative and significant, as we have discussed in previous section. Nonetheless, impact of the linear term of the rainfall has negative and significant effects, which mean that the increase in rainfall linearly, the chances of being multidimensional poor declined. The non-linear term has indicated positive and significant impacts on poverty. The significance of the non-linear term with positive sign has suggested the persistence of non-linear impacts of the rainfall. The estimated relationship is U-

shaped which exhibit that initially the rainfall is causing the decline in multidimensional poverty, while after certain level of rainfall, the chances of being poor start increasing. Such relationship looks justifiable because the beneficial linear impacts may be because of increase in productivity specifically agriculture, which contributes positively in economic growth, and it would ultimately enable governments to spend more on development programs. The non-linear impacts indicate the shocks in rainfall, which encompasses the occurrence of intense and extreme events of the rainfall patterns, which could turn into the urban flooding, and disaster in the physical and social infrastructure of the location. Such harmonious rainfall episodes could bring about the increase in the probability of multidimensional poverty among household.

Table 3
Impact of climate change and urbanization on Multidimensional poverty

			OLS			OLS
VARIABLES	**Logit**	**Odd Ratio**	**Log MPI**	**Logit**	**Odd Ratio**	**Log MPI**
Urbanization (%)	-0.0261***	0.974***	-0.00524***	-0.0258***	0.975***	-0.00517***
	(0.00319)	(0.00311)	(0.00122)	(0.00259)	(0.00253)	(0.00104)
Rainfall average	-0.666***	0.514***	-0.207***	-0.318	0.728	-0.125**
	(0.195)	(0.100)	(0.0385)	(0.251)	(0.183)	(0.0501)
Rainfall square	0.0834*	1.087*	0.0269***	0.0732*	1.076*	0.0222**
	(0.0437)	(0.0475)	(0.00829)	(0.0459)	(0.0494)	(0.00863)
Temperature average				-0.120	0.887	-0.0330*
				(0.0766)	(0.0679)	(0.0178)
Temperature square				0.00421**	1.004**	0.00102**
				(0.00189)	(0.00190)	(0.000420)
Head age	-0.00297***	0.997***	-0.000342*	-0.00261***	0.997***	-0.000236
	(0.000990)	(0.000987)	(0.000206)	(0.000967)	(0.000965)	(0.000195)
Head gender	0.154***	1.167***	0.0597***	0.143***	1.154***	0.0568***
	(0.0457)	(0.0533)	(0.0107)	(0.0435)	(0.0502)	(0.00962)
Dependency ratio	0.254***	1.289***	0.0869***	0.254***	1.289***	0.0869***
	(0.0171)	(0.0221)	(0.00420)	(0.0169)	(0.0218)	(0.00421)
Transport facility	0.336***	1.400***	0.0771***	0.312***	1.366***	0.0695***
	(0.0771)	(0.108)	(0.0141)	(0.0764)	(0.104)	(0.0132)
Agriculture extension	0.437***	1.548***	0.0733***	0.416***	1.516***	0.0656***
	(0.0855)	(0.132)	(0.0132)	(0.0819)	(0.124)	(0.0116)
Police access	-0.270***	0.763***	-0.0318**	-0.263***	0.769***	-0.0303**
	(0.0765)	(0.0584)	(0.0131)	(0.0743)	(0.0571)	(0.0131)
Bank facility	-0.340***	0.711***	-0.118***	-0.337***	0.714***	-0.116***
	(0.0495)	(0.0352)	(0.00955)	(0.0493)	(0.0352)	(0.00931)
Punjab	-0.288	0.749	-0.166***	-0.285	0.752	-0.166***
	(0.282)	(0.212)	(0.0533)	(0.269)	(0.202)	(0.0497)
Sindh	-0.467	0.627	-0.162**	-0.425	0.654	-0.151**
	(0.380)	(0.238)	(0.0696)	(0.362)	(0.237)	(0.0641)
Balochistan	-0.0121	0.988	-0.0467	0.597	1.817	0.0699
	(0.364)	(0.360)	(0.0602)	(0.458)	(0.833)	(0.0721)
Constant	1.774***	5.894***	3.999***	1.093	2.983	3.965***
Observations	150,441	150,441	148,833	150,441	150,441	148,833

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

Similar to the rainfall, the study has estimated models by including the temperature shocks in the model along with the rainfall. The estimated results are showing again the persistence of the non-linear impacts of the temperature shocks on multidimensional poverty are found (table 4). Nonetheless, the influences of rainfall more intense as compared to the temperature. Moreover, the table 5 encompasses the joint impacts of the climatic shocks and urbanization on multidimensional poverty among the households. Here the main concern remains on occurrence of rainfall shocks. The results demonstrate that the joint impacts rainfall and urbanization are found statistically significant. Overall, the increase in both urbanization and rainfall simultaneously turn the beneficial impacts of the urbanization into adverse impacts, other things remaining same. However, without interaction term, the impacts of urbanization are documented beneficial, but the joint impacts are not beneficial on the prevalence of multidimensional poverty among households. These results have implication that alone urbanization seems beneficial and advantageous outcome which fosters country grow economically through increase in economic activities and industrial productivity, but the threats of climatic shocks especially the extreme and uneven patterns of rainfall are hurting the positive impacts of the urbanization.

Hence, by concluding the whole discussion, urbanization has its advantageous influences on the multidimensional wellbeing of the households; while at the same climatic shocks have harmonious but non-linear U-shaped impacts of the rainfall and temperature on poverty. The joint occurrences of the both rainfall and urbanization have shown the harmonious effects on the determination of multidimensional poverty in Pakistan (tables 4 & 5). Likewise, previous section, the factors such as household-specific and district level social and physical infrastructure has significant effects on the determination of the multidimensional poverty among households. The household-specific factors include age of household head, gender of head, and dependency ratio. The dependency ratio implies that the higher dependency ratio demands higher requirement of health, education, and household assets, and living standards of the households. Therefore, it has adverse impacts on determining the poverty among households. Similarly, the infrastructure related factors such as transport facility, police access, and agriculture extension, and facilities of banks are the significant factors (table 4 & 5).

Table 4
Interaction of Urbanization and Rainfall and Its Impacts on Multidimensional Poverty

VARIABLES	Logit	Odd Ratio	OLS
			Log MPI
Urbanization (%)	-0.0362***	0.964***	-0.00952***
	(0.00470)	(0.00453)	(0.000784)
Average rainfall	-0.916***	0.400***	-0.314***
	(0.224)	(0.0895)	(0.0379)
Rainfall square	0.136***	1.146***	0.0468***
	(0.0487)	(0.0558)	(0.00807)
Interact rainfall & urbanization	0.0163***	1.016***	0.00603***
	(0.00461)	(0.00469)	(0.000769)
Interact rain square & urbanization	-0.00399***	0.996***	-0.00138***
	(0.00116)	(0.00115)	(0.000206)
Head age	-0.00255***	0.997***	-0.000129
	(0.000906)	(0.000904)	(0.000184)
Head gender (1=male)	0.146***	1.157***	0.0537***

	(0.0427)	(0.0494)	(0.00848)
Dependency ratio	0.250***	1.284***	0.0852***
	(0.0173)	(0.0222)	(0.00432)
Transport facility	0.324***	1.383***	0.0715***
	(0.0754)	(0.104)	(0.0125)
Agriculture extension	0.420***	1.522***	0.0638***
	(0.0851)	(0.129)	(0.0119)
Police access	-0.280***	0.756***	-0.0355***
	(0.0762)	(0.0576)	(0.0113)
Bank facility	-0.332***	0.718***	-0.112***
	(0.0489)	(0.0351)	(0.00904)
Punjab	-0.391	0.677	-0.214***
	(0.308)	(0.208)	(0.0515)
Sindh	-0.405	0.667	-0.147**
	(0.391)	(0.261)	(0.0617)
Balochistan	-0.0556	0.946	-0.0811
	(0.389)	(0.368)	(0.0597)
Constant	2.002***	7.406***	4.119***
	(0.428)	(3.171)	(0.0658)

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

Above discussion is based on evidences obtained from household survey data, which encompasses the influences of urbanization and climatic shocks on the prevalence of multidimensional poverty among households. However, we need to explore further by using the district level pooled data by using the district fixed effect, so that the sensitivity of the relationship may be estimated. Moreover, district level aggregation of the data would capture the regional differences in order to measure the relationship. The next section is furnished with the discussion on district level climatic shocks, urbanization, and their influences on the prevalence of multidimensional poverty at district level.

Conclusion

Poverty reduction has been deemed as one of the key policy agenda in the developing countries. During the last couple of years, Pakistan is facing parallel rise of urbanization and happening of climatic and environmental calamities, which have raised several other challenges including feeding the rising population in both the urban and the rural areas. To design inclusive and effective policy agenda to tackle such problem, we need to gather empirical evidence on relationship among urbanization, climatic shocks, and poverty. The estimated findings indicate that urbanization has beneficial and significant impacts on multidimensional poverty reduction, while climatic factors have shown non-linear influences on multidimensional poverty. The non-linear impacts demonstrate that linear term of rainfall and temperature has shown beneficial impacts while non-linear term contains adverse effects on multidimensional poverty reduction. Nonetheless, when both urbanization and climatic factors coincide, the beneficial impacts of urbanization becomes adverse impacts on multidimensional poverty reduction.

Recommendations

- Policy makers must consider climate change seriously and act accordingly with their impact on multidimensional poverty, especially if they desire to achieve the SDG 1 up to 2030. Such finding has following implications, which need to be considered as policy agenda regarding achievement of the SDG-1 in Pakistan.
- A well-designed policy regarding dealing climatic shocks is needed to achieve reduction in multidimensional poverty because it has direct and indirect impacts on multidimensional poverty: rising urban flooding, impacts on agriculture productivity and heat waves in urban areas. Therefore, the government must expand the social protection programs to the highly vulnerable areas of both the urban and the rural population.
- A well planned and inclusive urban management is required which should be promptly responsive to the rainfall and temperature shocks.

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