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A Comparative Analysis of MPI Through Socio Economic Indicators in Punjab and Sindh Provinces of Pakistan

Abstract

This study analyzes multidimensional deprivations and vulnerability in two major provinces of Pakistan using the data of Pakistan Social and Living Standard Measurement (PSLM) 2014. It compiles a Multidimensional Poverty Index (MPI) for provincial and regional levels on the basis of identification and equal weight approach as conceptual framework. The study proposes a comprehensive operationalization of a Multidimensional Poverty Index for developing countries like Pakistan, including a justification for several social and economic dimensions. This study may be helpful for structuring new policy metrics, and may provide useful information to human development experts and statisticians for assessing and using poverty indices M_0, M_1 and M_2.

Keywords: MPI, Social Dimensions, Vulnerability, Poverty Indices

1. Introduction

Economic development is a complex concept which is influenced by a number of factors such as state of technology, social attitude of people, political condition of country, availability of natural resources, capital and human resources. It has been observed that over time most of the developing countries are not in a position to utilize their resources properly. On the other hand, some countries such as Japan, South Korea and Switzerland have shown rapid progress on the basis of human development, use of advance technology, inventions and innovations. The researchers have confirmed that educated, efficient, patriot, skilled and healthy labor force contribute significantly in the development process of an economy. After the initiative of Human Development Index (HDI), the idea of researchers and practitioners have transformed from income based poverty to multidimensional poverty analysis. HDI highlights that individuals themselves are the true valuable sources and assets for the success of a country and can pave the

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way for its rapid development. In an overpopulated country unemployment, illiteracy and unskilled labor force may become a major hurdle in the way of prosperity.

The researchers and policymakers have pointed out that poverty is a state of multiple deprivations that poor face such as poor health, inadequate education, low living standard, less women empowerment, inadequate freedom, insufficient social rights, non-availability of safe drinking water and unimproved sanitation facilities. These problems exert adverse impact on the development process of an economy.

The last two decades have witnessed the remarkable efforts initiated worldwide for improving the well-being through different approaches. For proper analysis of the issue of poverty significant improvements have been introduced in the methodology of multidimensional poverty measurements as well (Alkire and Santos, 2011). This study intends to assess and compare the status of poverty through MPI in terms of three indicators i.e. M0, M1 and M2 using counting and equal weight approach at different cut offs in two major provinces of Pakistan. Furthermore, this study tries to explore the socio economic determinants which are regarded as the major causes of multidimensional poverty in Pakistan.

This study has its own significance as it may provide the micro level picture about the poverty status and its findings may be helpful in designing appropriate policies for deprived regions of Punjab and Sindh. This study also covers the research gap by analyzing the major causes of poverty in Punjab and Sindh through econometric model. Furthermore, the main concern of this study is to show that non-monetary based measures generally reflect the real magnitude of both poverty and inequality particularly in developing countries like Pakistan.

2. Literature review

In order to conserve time and space the study will review the literature briefly. Awan et al, (2011) are of opinion that urban deprivations are lesser than rural deprivations for all the provinces of Pakistan. Batana, (2013) points out that education contributes more in poverty and multidimensional poverty is higher in rural areas as compare to urban area due to the implementation of inappropriate policies regarding education and health. Sial et al, (2015) show that poverty and inequality have declined in Pakistan and education and health have contributed more in the reduction of poverty and inequality in the country.

Mitchell and Maccio (2018) attempt to assess the impact of the NGO TECHO's crisis lodging program on multidimensional poverty. It utilizes a semi exploratory 'pipeline' assessment plan and depends on family unit overview information from 34 casual settlements in Buenos Aires, Argentina. The study shows that extra bits of knowledge that can be picked up from utilizing a multidimensional structure is dependent on the Alkire and Foster (2011) technique to assess a program's effect. The results demonstrate that the program reduces both the incidence and the intensity of poverty and causes the multidimensional destitution measure to fall by the greater part. The study concludes that security, relations and mental wellbeing are the main factors that contribute in reducing the multidimensional deprivations.

Garriga and Foguet (2018) are of opinion that water, sanitation and cleanliness are at the center of feasible advancement. For illustrative purposes, one community in

Mozambique is chosen as the underlying contextual investigation. The study concludes that multidimensional measure is helpful for increasing the comprehension of the setting in which wash service are conveyed. It catches both the frequency and power of wash neediness and gives another instrument to support monitoring and reporting.

Alkire, *et al* (2019) apply the individual level examinations with the matrix of deprivations hidden in MPI on South Asian countries. The study examines the extent of denied children living in multidimensional poor family units and to what extent of denied youngsters or young ladies or young men; and what extent of denied kids live in families in which other children are not denied in same indicators. The results show that crosswise over south Asian region, 36.7 million children are out of the school through evaluation and around 32.3 million of these individuals have a place with multidimensional poor family unit. The 70 million children in South Asia younger than 5 are underweight. The investigation about gender astute portrays that 9 percent of the boys are out of school and are multidimensional poor. Afghanistan has most noteworthy proportion with 24.8 percent boys and 44 percent of young ladies are out of school which are also multidimensional poor.

The review of literature shows that the problem of poverty and income inequality may become a major challenge in coming decades particularly for developing countries. This calls for the need to analyze the problem of multidimensional poverty that can be overcome through appropriate policies in developing countries like Pakistan.

3. Data Source and Methodology

The present survey has been conducted by the acquired data of Federal Bureau of Statistics, Government of Pakistan in 2013 to 2014. The PSLM 2014 of Pakistan covers 32331 households of Punjab and 29127 for Sindh. For the identification of poor, this study uses multiple approaches such as Union ($c_i \geq 1$) Intersection ($c_i = d$) and dual cutoff (ci $\geq$k) methods. Union approach often predicts high numbers and dual cutoff approach identifies person as poor when the number of dimensions in which the person is deprived is at least k. Otherwise, if the number of deprived dimensions falls below the cutoff k, then the person is not poor. Censor matrix *ci* is explained by zero and one value for poor and non-poor households respectively, (Bourguignon and Chakravarty, 2003; Atkinson, 2003). The important point of this methodology is to assign the weight of each indicator. The relative weight of $W_{edu,heal,livng} = [1/9, 1/9, 1/9,\ 1/9,\ 1/9,\ 1/9, 1/18,\ 1/18, 1/18,\ 1/18, 1/18, 1/18]$ of the education, health and living standard indicators are applied to deprivation matrix. The value of score will be zero if a person is not deprived in any dimension and score value increases with the increase in deprivations. The households are identified as poor by applying the poverty cutoff k.

$ci \geq k$, then $(k) = ci$ (deprivation score of the person)

If $ci < k$, then $(k) = 0$

The present study measures the multidimensional poverty in Pakistan in term of M_0, M_1 and M_2 and considers the range of poverty cut offs on the basis of union, dual and intersection approaches.

The adjusted head count ratio (M_0) reflects the incidence of poverty (H) and intensity of poverty (A) capturing the joint distribution of deprivations. i.e.

$$M_0 = \text{ H} * \text{A}$$

$$where \; H = \frac{q}{n} \;\; and \; A = \sum_{i=1}^{n} c_i(k)/q$$

The advantage of incidence (H) is that it is simple to construct and easy to understand. However the major problem is that it does not consider the intensity of poverty and violates the property of dimensional monotonicity. It is totally insensitive to difference in the depth of poverty because it remains unchanged if a poor person become poorer. Furthermore, it violates the principle of transfer.

Intensity (A) of poverty is the number of deprivations suffered by a household and c_i (k) is the censored deprivation score of individual i and q is the number multidimensional poor. It brings up the need to estimate the intensity and MPI as well.

The Adjusted Poverty Gap M_1 reflects the average weighted deprivation gap experienced by the poor out of the total number of deprivations which is obtained as follows:

$$M_1 = \text{ H} * \text{A} * \text{G}$$

The Adjusted Squared Poverty Gap Measure M_2 reflects the average weighted squared gap or poverty severity experienced by the poor out of the total number of deprivations a society could experience, (Alkire and Foster, 2011).

$$M_2 = H \times A \times S$$

Deprivations and Poverty cut offs of Punjab and Sindh (M_0, M_1 and M_2) are presented in Table 1.

Table 1: Deprivation and Poverty Cut Offs of Punjab and Sindh (M_0, M_1 and M_2)

Step 1 Achievement Matrix	Step 2 Deprivation Cut off	Step 3 Deprivation score	Step 4 Identification Function
$X = \begin{bmatrix} x_{1,1} & \cdots & x_{1,12} \\ \vdots & \cdots & \vdots \\ x_{n,1} & \cdots & x_{n,12} \end{bmatrix}$	$g^0 = \begin{bmatrix} go_{1,1} & \cdots & go_{1,12} \\ \vdots & \cdots & \vdots \\ go_{n,1} & \cdots & go_{n,12} \end{bmatrix}$	$C = \begin{bmatrix} c_1 \\ \vdots \\ c_n \end{bmatrix}$	$\rho k\,(xi\cdot;\,y)=1$ $\rho k\,(xi\cdot;\,y)=0$
Step 5 Poverty Cut off (Key of AF method)	Step 6 Censored deprivation Matrix	Step 7 Censored Normalized Gap Matrix $= M_1$	Step 8 Censored Squared Normalized Gap Matrix $= M_2$
$g^0(k) = \begin{bmatrix} go_{1,1}(k) & \cdots & go_{1,12} \\ \vdots & \cdots & \vdots \\ go_{n,1}(k) & \cdots & go_{n,1} \end{bmatrix}$	$C\,(k) = \begin{bmatrix} c_{1\,(k)} \\ \vdots \\ c_{n\,(k)} \end{bmatrix}$	$[(zj - yji)/zj]$ if deprived, 0 if not deprived $g^1(k) = \begin{bmatrix} g1_{1,1}(k) & \cdots & g1_{1,12} \\ \vdots & \cdots & \vdots \\ g1_{n,1}(k) & \cdots & g1_{n,1} \end{bmatrix}$	$[(zj - yji)/zj]2$ if deprived, 0 if not deprived $g^2(k) = \begin{bmatrix} g2_{1,1}(k) & \cdots & g2_{1,12}(\\ \vdots & \cdots & \vdots \\ g2_{n,1}(k) & \cdots & g2_{n,12}(\end{bmatrix}$

4. Econometric Analysis and Methodology

This study analyzes the socio economic factors which contribute to multidimensional poverty. For analysis purpose the following binomial logit model has been used.

$$Y_{iJ} = \propto + \beta_1 X_{primary\ edu} + \beta_2 X_{read\ and\ write} + \beta_3 X_{health} + \beta_4 X_{Assets} + \beta_5 X_{water} + \beta_6 X_{sanitation} + \beta_7 X_{earning} + \mu_i$$

Where

$$Y_{iJ} \text{ is MPI}$$

Table 2: Description of variables

Variables		Description
Dependent variable		1= if households are MPI poor (cutoff = 33%)
		0 = if households are not under the category of MPI poor
Education	Highest level of education	The person is deprived if highest level of education which he/she received is minimum primary, 1 otherwise = 0.
	Read and write	If age is 10, the person is deprived if he can't not write & read in any language with understanding, 1 otherwise = 0
Health	assets	The person is deprived if the child has not been immunized, 1 other wise 0
		The person has less than six articles (iron, fan, TV, Car, refrigerator and etc.) in their possession, 1 other wise 0
Living standard	drinking water	The assets means that the person is deprived if clean drinking water is not available in house, 1, if clean drinking water is available after walking distance/outside the house, 0
	sanitation	The person is deprived if there are no proper sanitation facilities, 1 other wise 0
Earning members		If the earning members are less than 2 in a family, the value of score will be zero otherwise 1.

4.1. Results and Interpretation

The pattern of H, A and MPI is presented in Table 3.

Table 3: Identification at different cut off approaches (k)

| Comprehensive analysis, (Punjab + Sindh)	Incidence (H)	Intensity (A)	$M_0 =$ MPI	
ci ≥ 1	0.60	0.43	0.26	Union approach
ci ≥ 2	0.45	0.52	0.23	Dual cut off approach
ci ≥k (k≥4)	0.37	0.60	0.21	intermediate approach
ci ≥k (k≥6)	0.16	0.83	0.14	Intermediate approach
c = d	0.05	0.98	0.05	Intersection approach

Source: Author's Own Calculations

The incidence (H) of poverty shows decreasing trend with the increase in poverty cut off (k). As we move from union to intersection approaches, the head count ratio decreases respectively because at intersection approaches, the very narrow

number of population experience deprivation in all indicators but still we have some value of MPI poor (0.05). It is observed that at intersection approach H = MPI = 0.5 which reveals the validity of analysis.

The incidence, intensity and MPI are presented in Figure 1 given below:

Figure 1: Incidence, Intensity and MPI at Different Cut Offs

	ci ≥ 1	ci ≥ 2	ci ≥k (k≥4)	ci ≥k (k≥6)	c = d
Intensity	0.43	0.52	0.6	0.83	0.98
MPI	0.26	0.23	0.21	0.14	0.05
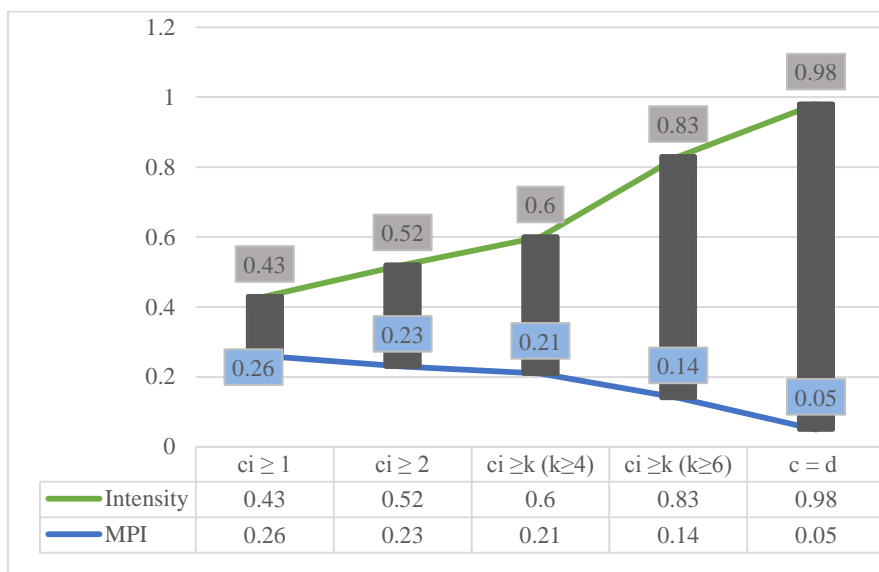
The above figure highlights the trends of H, A and MPI at different cut off approaches. Incidence (H) and MPI have same downward trend with the increase in poverty cut off, the percentage of population become less deprived when household face more deprivation in each indicators. The average intensity has increasing trend over the different poverty approaches.

4.2. Decomposition of the Analysis at Provincial Level

The provincial analysis of MPI is presented in Table 4.

Table 4: Provincial Analysis of M_0

Provincial Analysis	Incidence (H)	Intensity (A)	M_0 = MPI
Punjab	0.32	0.52	0.16
Sindh	0.45	0.57	0.26

Source: Author's Own Calculations

Usually 33.3 percent (k) is used as the poverty line which means if a household has more than 33.3 percent deprivation then he is declared as multidimensional poor. The provincial comparative analysis reveals that the value of MPI in Punjab is 0.16 and this value in Sindh is 0.26. This indicates Sindh is more multidimensional poor as compare to Punjab. The provincial analysis of M_1 and M_2 are presented in Table 5 and Table 6 respectively.

Provincial analysis	Incidence	Intensity	Deprivation gap	Adjusted Poverty Gap
	H	A	G	M_1
Punjab	0.32	0.52	0.24	0.04
Sindh	0.45	0.57	0.30	0.08

Table 5: Provincial Analysis of M_1

Source: Author's Own Calculations

Table 6: Provincial Analysis of M_2

Provincial analysis	Incidence	Intensity	Severity	Squared poverty gap
	H	A	S	M_2
Punjab	0.32	0.52	0.19	0.03
Sindh	0.45	0.57	0.15	0.04

Source: Author's Own Calculations

The results indicate that M_0 values of all the provinces are higher than M_1 and M_2 generated after the calculation of G and S value respectively. M_0 gives the snapshot of overall deprivation of household in each dimension.

The information about the depth of deprivation of each household in each dimension is provided by M_1. Poverty gap index at provincial level ranges from 4 % in Punjab to 8% in Sindh. The adjusted poverty gap index is considerably low in Punjab as compare to Sindh. The poverty gap M_1 has the advantage of depicting the depth of poverty but it does not capture the severity of poverty among the provinces as it ignores the inequality among the poor in different regions.

The squared poverty index M_2 shows the severity of multidimensional poverty and lays more emphasis on larger deprivations in each indicator among the provinces (Relative measure). Sindh has relatively higher poverty incidence but the degree of inequality among the poor is low as compare to Punjab. In Punjab, the incidence of poverty is low as compare to Sindh but the degree of inequality is higher. The higher value of S may be due to lack of monetary resources available to the people. It is not appropriate that people living under one umbrella face different socio economic circumstances. It may due to the dual policies followed by the government. It needs proper attention and understanding of the policy makers to introduce appropriate policies for both provinces of Pakistan.

4.3. Region Wise Analysis (Urban and Rural)

The region wise analysis (urban, rural) is presented in Table 7.

Table 7: Region Wise Analysis (Urban and Rural)

	Punjab(k≥33.3)			Sindh(k≥33.3)		
	H	A	MPI	H	A	MPI

Urban	0.21	0.49	0.11	0.39	0.45	0.18
Rural	0.48	0.55	0.26	0.45	0.61	0.28

Source: Author's Own Calculations

The main benefit of MPI is to bring up a true picture of the people living in poverty and to permit assessments across regions by urban and rural locations. The logistic analysis of Punjab and Singh is presented in Tables 8 and 9 respectively.

Table 8: Logistic Analysis of Punjab

MPI Factors	Punjab			Punjab Urban			Punjab Rural		
	exp_β	$slop_\beta$	p-values	exp_β	$slop_\beta$	p-values	exp_β	$slop_\beta$	P values
Read and write	4.17	1.43	.00	8.28	5.76	.00	10.32	3.23	.00
Highest level of education	4.18	1.43	.00	14.57	2.68	.00	3.95	1.37	.00
Health	2.01	.70	.00	5.14	2.90	.00	15.82	1.76	.00
Assets	5.51	1.71	.00	12.71	3.03	.00	6.11	4.09	.00
Drinking water	2.29	.83	.00	2.16	.77	.07	2.01	.70	.00
Sanitation	1.15	.14	.05	5.53	3.57	.00	9.06	.06	.00
Earning member	0.52	-.64	.00	0.30	-3.41	.00	.68	-.38	.00
Constant	-2.8(000)			-6.9(.00)			-5.1 (000)		
Negelkerkey R^2	0.63			.79			.76		
Hosmer-Lemeshow	23.3(.13level of significance)			10.0(.36level of significance)			9.2(.33 level of significance)		

Source: Author's Own Calculations

The results presented in Tables 8 and 9 describe the analysis of logistic regression with seven independent variables with odd ratios after satisfying all assumptions of logistic regression. The coefficients of all variables are significant at 5% and 1% level of significance. Amongst other things, lack of adequate housing facilities determines the extent of exposure to risks associated with lack of education, malnutrition and poor health issues. It is worth noting that the population of rural region does bear a disproportionate load of poverty in both provinces. Furthermore, both provinces lag behind in education due to their outdated traditions and value system. Both provinces of Pakistan face the problem of quality of education as a few people get an opportunity of better education.

Table 9: Logistic Analysis of Sindh

MPI Factors	Sindh			Sindh Urban			Sindh Rural		
	$exp_β$	$slop_β$	p-values	$exp_β$	$slop_β$	p-values	$exp_β$	$slop_β$	P values
Highest level of education	2.27	3.29	.00	6.379	2.796	.000	4.611	3.61	0.00
Read and write	7.18	1.01	.00	3.59	1.28	.026	2.22	-1.17	0.00
Health	13.01	3.2	.00	12.35	2.51	.003	16.59	1.17	0.01
Assets	6.11	2.21	.00	11.98	2.48	.003	17.13	1.88	0.00
Drinking water	12.92	.13	.00	14.74	2.69	.00	9.01	2.01	0.10
Sanitation	9.15	4.10	.05	8.91	2.188	.000	11.18	3.11	0.10
Earning member	.23	-1.5	.06	.31	-1.17	.042	.431	-1.50	0.00
Constant	-3.3(.002)			-2.1(.00)			-1.8 (00)		
Negelkerkey R^2	0.69			.73			.71		
Hosmer-Lemeshow	12.4(.46level of significance)			20.1(.26level of significance)			7.2(.40 level of significance)		

Source: Author's Own Calculations

A disparity between urban and rural areas of Punjab and Sindh indicates that more than half of the population in Sindh have no access to clean drinking water and proper sanitation facilities especially in rural areas. Furthermore, the position of sanitation facility is substantially different between rural and urban areas and majority of the rural population of Sindh use non improved toilet facilities.

5. Conclusion

Pakistan being a developing country has been facing the issue of poverty since its independence and it is still in the process of transformation from embryonic to progressive stage. Presently, Pakistan is considered a hub of socioeconomic activities due to several initiatives introduced by the government in addition to spread of job oriented education in the country. Unfortunately, despite the best efforts taken by the government the problem of poverty cannot be tackled properly due to the reason that government has paid relatively more attention to achieve sustained economic growth which alone has turned up insufficient to reduce the problem of poverty. The results of the study bring up the need for progressive changes in the society regarding the social wellbeing of the people. The present study may be helpful for the policymakers in formulating appropriate policies and in identifying regions and areas which are lagged behind in both provinces of Pakistan. In order to achieve this objective there is a need to spread the quality education and ensure the availability of employment opportunities particularly in farfetched and backward areas of both provinces. Furthermore, government should

initiate the process of society's mobility from multidimensional towards convergence with an aim to reduce the socioeconomic gap among the different belts of society.

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