Measurement of Living Standards Deprivation in Punjab Using AF Method (Periodical Comparison Approach)

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I. INTRODUCTION

In spite of taking and implementing various special measures by the government of Punjab and the Pakistan to alleviate poverty in Punjab, poverty is still there and has become a constraint in the way of economic progress and prosperity of the people of the Punjab-Pakistan. Poverty is pronounced deprivation in well-being. The conventional view links well-being primarily to command over commodities, so the poor are those who do not have enough income or consumption to put them above some adequate minimum threshold.

The broadest approach to well-being and hence poverty focuses on the capability of the individual to properly function in the society. The poor lack key capabilities, and may have inadequate income or education, and last but not the least living standards. How we measure poverty can importantly influence how we come to understand it, how we analyse it, and how we create policies to influence it. In recent years, the literature on multidimensional poverty measurement has blossomed in a number of different directions. The 1997 Human Development Report vividly introduced poverty as a multidimensional phenomenon, and the Millennium Declaration and Millennium Development Goals (MDGs) have highlighted multiple dimensions of poverty since 2000.

Salahuddin and Zaman (2012) in the article entitled "Multidimensional Poverty Measurement in Pakistan: Time Series Trends and Breakdown" applied Alkire-Foster Multidimensional (AFM) poverty measure given in 2007 for building time-series trends

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of poverty in Pakistan for the period 1998-2006. Their study results show that multidimensional poverty measures provide more elaborate and precise picture of poverty in Pakistan. The authors found that people of Pakistan were highly deprived in education and health.

Naveed and Tanweer-ul-Islam (2012) in their paper entitled "A New Methodological Framework for Measuring Poverty in Pakistan" presented a critical analysis of poverty measurement in Pakistan and argues for adopting a multidimensional methodological framework. Utilising AF methodology over the RECOUP Household Survey data (2006-07) the paper provides multidimensional poverty estimates at the aggregate, provincial and district level and identifies the major drivers of poverty. Their paper seems helpful in elaborating how policy makers can prioritise the development budget among districts and allocation within each district based upon the level and nature of deprivation. The authors found that consumption level as a single measure of poverty alone was a poor measure of poverty in Pakistan. In another paper entitled "Estimating Multidimensional Poverty and Identifying the Poor in Pakistan: An Alternative Approach" Naveed and Tanweer-ul-Islam (2012) critically examined the Poverty Scorecard, which was recently introduced by the Government of Pakistan for the identification of poor households under the Benazir Income Support Programme. By employing the AF measure to analyse household data from two provinces, Khyber Pakhtunkhwa and Punjab, their paper recommends an alternative method to estimate multidimensional poverty and identify poor households. This paper also investigates the relationship between household consumption and multidimensional poverty. This paper contrasts the results obtained by using a multidimensional measurement of poverty with those of the official poverty line. The limitations of the official poverty line were also identified and the role of household consumption in explaining deprivations was discussed in this paper.

Contemporary methods of measuring poverty and wellbeing commonly generate a statistic for the percentage of the population who are poor–a Head Count Index (H). A practical aim of Alkire and Foster (2007, 2011) was to construct poverty measurement methods that could be used with discrete and qualitative data. It includes identifying 'who is poor' by considering the range of deprivations they suffer, and aggregating that information to reflect societal poverty in a way that is robust and decomposable.

Pakistan, being the 6th highest populous and 9th largest (with respect to size of its labour force) country of the world, have a population of about 177 million in 2011. Punjab is the biggest province of Pakistan with a population of 96.55 million (55 percent of total Pakistan's population) in 2011. The labour force participation rate remains low (32.98 percent) in Pakistan as compared to other countries of the world, reflecting the large chunk of children and old ages (67.2 percent) in the population. The civilian labor force in Pakistan is 58.41 million in 2011.The crude birth rate, death rate and infant mortality rate per 1000 persons has been found 27.5, 7.3 and 70.5 respectively, in 2011. The male (10 year and above) labour force participation rate is only 68.83 percent as against only 21.5 percent for female that remains very low in 2009-10. Some social, cultural and religious factors that prevent female workforce to participate in paid jobs are the main reasons for this low female participation rate. Agriculture sector is considered as back bone and the major sector

of the Punjab and Pakistan's economy accounting for 44.75 percent and 45.27 percent, respectively of the total employment. The officially Labour Force Survey reported unemployment rate in Pakistan stood at 5.6 percent in 2009-10. Pakistan's literacy rate for male, female and both stood at 69.5 percent, 45.2 percent and 57.7 percent, respectively as against Punjab's literacy rate for male, female and both stood at 69.1 percent, 49.8 percent and 59.6 percent, and, respectively in 2009-10. The above literacy rate figures reveal that the overall Pakistan's literacy rate is determined by overall Punjab's literacy rate because of the size of literate population in Punjab. Education expenditure as a percentage of Gross National Product (GNP) remained around 2 percent throughout the history of Pakistan [Pakistan (2010-11)].

Considering the scope and subject matter of the study, the *key objective* of this study is to measure *Multidimensional Poverty Index (MPI)* for the considered periodical segments 2007 and 2011 in the province Punjab and, in turn, going deep into different areas, divisions and districts to have neck to neck evaluations of the poverty status in the Punjab province of Pakistan.

Since the MPI is founded upon *seven different indictors* of living standards so the overall results can also be decomposed to have the absolute and relative contribution of each indicator towards the overall MPI. Using this property of the MPI, we can go deep into each division and district with the intention to observe the poverty status with regard to MPI value of each indicator. The two period comparisons i.e., the years 2007 and 2011 will prove helpful to track the changes in poverty over time in different areas, divisions and districts of the Punjab. It will also prove helpful in auditory analysis of the allocated funds to specific regions worthwhile along with political regime of *military and democracy*.

Since the results of this study are bifurcated for geographical split-ups of the province, this study aids the policy makers in Punjab to eradicate poverty in the respective areas, regions, divisions and districts. This study has its own *significance* to every reader and specifically for government institutions because it also provides a picture of the poverty status and helps to monitor the disparities among different regions of the Punjab. The study is of a *unique nature* in the respect that it is perhaps the first study assessing *Living Standards Deprivation in Punjab using MICS data and AF Method*. This study would also be helpful for policy makers for enhancing the living standards of deprived segments of the society, especially the households. The finding of this study could offer a base for formulation of sound policies for deprived regions of the Punjab, exclusively to public and private organisations for the betterment of rural households through increased their living standards. This study may catch the interest of democracy lovers regarding living standards deprivation when compared to guided democracy of General Musharif as the MICS data for the period 2007 reflect the impact of policies of the government guided by General Musharif and the MICS data for the period 2011 depicts the impact of policies of the government guided by President Asif Ali Zardari.

This study is *delimited* to two period comparisons i.e., for the periods 2007 and 2011 because of the non-availability of MICS data for current periods i.e., after 2011. This study is also geographically *delimited* to Punjab province of Pakistan as the MICS data for other provinces is not available. Further, this study is delimited to only one

aspect of deprivation that is of the living standard deprivation as sound and reliable data on the other aspects of deprivations are not available in MICS data.

II. REVIEW OF LITERATURE

Keeping in vision the different dimension of the study, the review of literature has been fulfilled. The Human Development Report, 1997 presented the most realistic approach by not only high lighting the poverty of income, but also on poverty from human development outlook- poverty as a contradiction of choices and opportunities to live comfortable lifespan.

Salzman (2003) terms in her paper "Centre for the Study of Living Standards" the methodological adoptions in the construction of composite, economic and social welfare indices. The author derived out with the result that "in current years a bulk of composite and social welfare indices have been developed, but the development is made inefficiently and methodologies are ignored". This paper suggested a list of recommendations for best-practice methodologies founded upon the recent paper by Booysen (2002) and the United National Development programme [e.g., Anand and Sen (1994)].

Jamal (2003) uses the Index of Multiple Deprivation (IMD) based upon the 1998 Population and Housing Census Pakistan data. This paper focuses the poverty alleviation concerns in Pakistan. It presents the practicable ways to deal income for poverty improvement in developing countries. Furthermore, the study discussed about identification of areas of concern, building up conclusions on local and sectorial main concerns, smooth the programs for poverty lessening in the targeted community and understanding the association between poverty and its foundation.

Ashraf and Usman (2012) presented a new measure of Multidimensional Poverty Index (MPI) for the province of Punjab using a method proposed by Alkire and Foster (2007, 2009). The authors estimated MPI by applying SPSS and MS-Excel on MICS data for the period 2007-08. This paper integrates many aspects of poverty related to the MDGs into a single measure. MPI also examines the most common deprivations related to different districts of Punjab. According to this study, the less multidimensional deprived districts were: Lahore, Multan, Rawalpindi, Sialkot, Jhelum, Gujranwala, Sahiwal and Faisalabad are included. The districts with moderate multidimensional deprivations according to MPI were: Attock, Mandi-Bahauddin, Mianwali, Gujrat, Chakwal, T.T. Singh, Vehari, Khushab, Nankana Sahib, Narowal, Bhakkar, Sargodha and Sheikhupura. The districts Hafizabad, Kasur, Okara, Lodhran, Pakpattan, Khanewal, Bahwalnagar, Jhang, Bahawalpur, Layyah, Rajanpur, R. Y. Khan, D. G. Khan and Muzaffargarh were the most deprived in all dimensions.

A compact among nations to end human poverty-HDR (2003), and the innovative century opened with an exceptional accentuation of commonality and fortitude to eradicate the poverty from the world. In 2000, UN Millennium Declaration was made in the "largest ever" meeting of the head of the States of committed countries – "Rich and Poor" for doing all that can be done in order to eliminate the poverty. The main apprehensions of this declaration are to promote human decorum, maintain social equality, impartiality and achieving peace and ecological sustainability by 2015 or earlier.

Originated from the Millennium Declarations, the MDGs are associated to perceive poverty in the multidimensional way. Insufficient income prevalence of hunger, gender inequality, deficient in education and living standards are addressed for the reflection of the poverty picture in the respective countries. This task was also accepted by Pakistan being the signatory and various steps were taken in this concern. MICS linked MDGs to have most of the data on the proposed indicators to track changes over time. Various rounds of provincially MICS are being conducted in Pakistan. In Punjab, MICS 2007 and 2011 is the second and third round of MICS in the series.

The Human Development Index (HDI) is one of the most extensively used measures of human development, developed and published by UNDP's first annual Human Development Report (HDR), 1990. The HDI is structured in the order of Amartya Sen's competency approach which emphasises the consequences of standards of living, health and education [Stanton (2007)]. Before HDI, many indices like GDP per capita, GNP per capita , life expectancy, literacy and enrolment are being used but none of these has not got much as gratitude as Mahbub ul Haq's HDI [HDR (1990)]. In spite of all its significance, HDI is being criticised for choice of variables, predetermined weighting methodology and redundancy. Another imperative apprehension regarding HDI is its equally weighting method. Ghaus, Pasha and Ghaus (1996) and Noorbakhsh (1998) have provided the other ways of giving weights to the dimension and variables.

Jamal (2009), constructed District Human Development Indices for the Punjab for the periods 2004 and 2008 by using HDI that integrates three dissimilar factors (a) a long and healthy life (life expectancy) (b) education as a combination of adult literacy and school enrolment and (c) a decent level of livings. The research utilises the district based MICS 2004 and 2007-08 data.

While constructing Punjab Indices of Multiple Deprivations for the periods 2003-04 and 2007-08, Jamal (2011) presented the income poverty results using MICS data. However the authors ignore the multidimensional aspect of poverty. These indices of multiple deprivations are intended to evaluate the poorest or socially excluded segment of the society.

Niazi and Khan (2011) in the paper" The Impact of Education on Multidimensional Poverty across the regions in Punjab" assessed the educational deprivation and estimated the incidence of multidimensional poverty in Punjab using AF Method. The study estimated the contribution of lack of education in the incidence of multidimensional poverty in urban and rural areas of province Punjab, Pakistan. The overall educational deprivation of the multidimensional poor segment during 1998-99 was found to be 60.8 percent, which significantly increased to 83.4 percent in 2001-02 but decreased as 72.4 percent in 2004-05 and again increased to 79.8 percent during 2005-06 along with little decline as 78.0 percent in 2007-08, whereas the incidence of multidimensional poverty during the same period was 48.6, 49.99, 40.80, 45.72 and 42.38 percent, respectively over the time. This study also found lowest educational deprivation as well as the incidence of multidimensional poverty in urban area as compared to the rural areas of the Punjab throughout the period under consideration.

On 14 July, 2010, UNDP and Oxford Poverty and Human Development Initiative (OPHI) presented a new index of measuring poverty level in a multidimensional way. Alkire and Santos (2010) presented a paper on this new Multidimensional Poverty Index (MPI) for 104 countries.

The Punjab provincial Reports of MICS, 2007 (vol–I) and MICS, 2011 (vol–I), are the outcome of continual efforts of Bureau of Statistics, Planning and Development Department, government of the Punjab to provide reliable data for monitoring the effectiveness of interventions to eradicate poverty in the province. The indicators of MDGs for education, health, water and sanitation and poverty are accessible in both reports to track the changes in poverty over time and areas of distressing concerns being highlighted.

Pakistan Economic Survey, 2010-11 reviews the development of Pakistan's economy over the years; the reported source uses the absolute poverty line method based upon the calorie method. The poverty line was used for cutoff at 1.25 $ a day.

The above literature review indicates that poverty and its dimensions remained the interest of social scientists since 1990. A number of studies were also carried out in the recent past to assess the scope of poverty in Pakistan both at micro and sectorial levels, but very few studies have put emphasis on the fundamentals of poverty. Poverty is a sign of many disorders in the configuration of Nations, so, it is an effect of many causes. MPI is the very adequate alternative for the measure of acute, absolute and relative poverty. Instead of using direct income or consumption approaches, which have their own data constrains and are very probable to be influence with the annexation of random disturbance terms, due to fact that data on these variables is attached to the human verbal and behavioural outcomes and by nature these numerical facts and figures are tensional or intentional over reported or under reported at the sweet will of the plaintiffs.

The idea of using multiple variables for the identification of deprivation and in turns going for the poverty index measures through the filters of dual cutoff is justified in manifold reasons. Just having the sole identification process as most of the uni-dimensional measures does, may include the certain number of individuals who are deprived in particular indicator, but they may be at higher level of satisfaction in having the sagacity that they have achieved such glassy.

Measuring social problems in a truthful way is an essential element of modern and democratic governments and measuring it in a multidimensional way helps government to do better in terms of policy making as poverty is the multidimensional phenomenon and it must be tracked over time for changes in the multidimensional way. This study opens the new horizon and many innovations are in line to be considered by having the series of the MPI measures with regular time lags. In this connection the two different rounds of MICS are considered to have MPI measures and changes over time are tracked. This will reflect and provide the guide lines to design social polices strategically with desired objectives for public sectors. The results can serve as practical instruments for monitoring policies and are useful alerts for decision making at a short and long term time spans.

III. DATA SOURCES, SAMPLING PROCEDURE AND METHODOLOGY

Data Sources

MICS (Multiple Indicator Cluster Survey) Punjab, 2007 and 2011 provide representative household survey estimates regarding more than 100 indicators *vis-a-vis* province, area of residence (major cities, other urban and rural), 9 divisions, 36 districts

and 150 tehsils/towns. It was one of the largest surveys in the history of Pakistan with a sample size of 102,545 households for MICS 2011 and 91280 for MICS 2007 with an exceptional response rate of 97 percent. The survey was planned, designed and implemented by Punjab Bureau of Statistics under the supervision of second author. The sample design of both MICS was provided by Pakistan Bureau of Statistics. Technical input was obtained from Regional Office for South Asia-UNICEF (ROSA) and Global Desk on MICS4. Fieldwork was carried out from July to December in both surveys for their respective rounds. Report and data of MICS Punjab, 2011 is also available at one of the UN web domain Child info.

Sample Design

The sample has been selected in two stages. In urban areas, the first-stage selection unit is the Enumeration Block. In the rural areas, the first-stage selection unit is the Village. From each first-stage sample unit, a sample of households has been selected: 16 in the rural areas and 12 in the urban areas. The second stage units are selected with equal probability. This gives a sample that is more or less self-weighing within each selection stratum.

Multidimensional Poverty Index (MPI)

The MPI measure is very smooth and robust and the advantage of using MPI is that it is sensitive to the changes as compared to simple Head Count Ratio (H), the H remnants unbothered if a person who is censored as poor after the poverty cutoff becomes more deprived or less deprived, the H only changes when the person become non-poor or become poor. On the contrary, the MPI being the product of H and Average Intensity of Poverty (A) grosses the changes according to the deprivation rank of the censored poor.

The MPI can be used to imitate the clear depiction of the individuals, households or communities and even countries living in poverty. With the decomposition property of MPI it is also potential to perceive shallow into each of the dimension and bifurcating some certain geographical split-ups. Additionally, we can have the pattern of the poverty by taking array of poverty cutoffs to expedite the policy maker with poverty index rendering to different bands of poverty namely low, medium and high.

The AF Method generates Head Counts and also a unique class of poverty measures (M_α). M_0 (for $\alpha = 0$) is an adjusted Head Counts. This M_0 reflects both the incidence (the percentage of the population who are poor) and intensity of poverty (the number of deprivations suffered by each household, A). M_0 is calculated by multiplying the proportion of people who are poor by the percentage of dimensions in which they are deprived ($M_0 = H \times A$).

For the measurement of the MPI, seven indicators from the Household Characteristics Module of MICS 2007 and 2011 are considered with the total weight evenly distributed among them. The reason for the inclusion of these indicators is that most of the data obtained in this module are the results of the observational and visual retorts of the enumerators. So, the chances of false information are very low.

Table 1

Weights and Deprivation Cutoff for Each Indicator

Indicator	Relative Weight	Deprivation Cutoff
Access to Drinking Water	$\frac{1}{7}$	A household is consider *deprived* if it has unimproved source for "access to drinking water" (unprotected well, unprotected spring, pond, tanker-truck, cart, surface, other)
Source of Sanitation (Toilet Facility)	$\frac{1}{7}$	A household is consider *deprived* if it has unimproved source of "sanitation (toilet facility)":(flush somewhere else, flush to unknown place, pit latrine without slab, composite toilet, bucket, no facility/bush/field, other).
Main Material of Floor	$\frac{1}{7}$	A household is considered *deprived* if it has unimproved "floor material" (earth/sand, dung plastered)
Main Material of Roof	$\frac{1}{7}$	A household is considered *deprived* if it has unimproved "roof material" (no roof, thatch/palm leaf, wood planks, metal, wood)
Main Material of Walls	$\frac{1}{7}$	A household is considered *deprived* if it has unimproved "walls material" (no wall, cane/palm/trunks, dirt, bamboo with mud, stone with mud, uncovered adobe, plywood, cardboard/crate, reused wood)
Cooking Fuel	$\frac{1}{7}$	A household is considered *deprived* if it uses unimproved "cooking fuel" (coal/lignite, charcoal, wood, straw/shrubs/grass, animal dung, animal dung, other
Assets	$\frac{1}{7}$	A household is considered *deprived* if it has less than 50 percent assets of (motorbike ,computer, television, car/van/tractor/trolly, washing machine, air cooler/fan, motor/pump, bicycle, fridge/ air-condition)

To obtain the Achievement Matrix (X): which shows the achievement of each household in each of the seven indicators, for MICS 2011 of order (95238 X 7) and of order (91280 X 7) for MICS 2007, the responses for each indicator in the MICS: 2011 and 2007 Standards of Living Modules responses are re-coded according to the definition provided by UNICEF, Joint Monitoring Program (JMP) of improved and unimproved sources for each indicator. The definition for improved and unimproved sources for each indicator with their relative weights and deprivation cutoff are presented in Table 1. Equal weights to different living standard indicators are assigned in Table 1. Applying scientific methods to assign weights may mislead the preferences of the household to each living standard indicator as each indicator yield different importance to different households.

Achievement Matrix (X)

The X is the one which represents the outcome of the indicators for each household; it is of the order n x d, in this particular case of MICS 2011, the X will be of the form.

$$X(2011) = \begin{bmatrix} x_{11} & \cdots & x_{17} \\ \vdots & \ddots & \vdots \\ x_{95238\ 1} & \cdots & x_{95238\ 7} \end{bmatrix}$$

For MICS 2007, the X will be of the form.

$$X(2007) = \begin{bmatrix} x_{11} & \cdots & x_{17} \\ \vdots & \ddots & \vdots \\ x_{91280\ 1} & \cdots & x_{91280\ 7} \end{bmatrix}$$

Deprivation Cutoff Vector and Matrix

A vector Z_j = [Improved, Improved, Improved, Improved, Improved, Improved, 50 percent of Assets] for 7 deprivation cutoffs (one for each dimension) is used to determine whether a person is deprived. If the person's achievement level in a given dimension "j" falls short of the respective deprivation cutoff Z_j, the person is said to be deprived in that dimension; if the person's level is at least as great as the deprivation cutoff, the person is not deprived in that dimension.

According to the cited criteria the entries in the achievement matrices are substituted into dichotomy i.e., go_{ij}= 1, if $X_{ij} < Z_j$ (Deprived) and, go_{ij}= 0 if $X_{ij} \geq Z_j$ (Non-Deprived). In this way the Deprivation Matrices g^o's are obtained for both of MICS 2011and 2007.

$$g^o(2011)= \begin{bmatrix} go_{11} & \cdots & go_{17} \\ \vdots & \ddots & \vdots \\ go_{95238\ 1} & \cdots & go_{95238\ 7} \end{bmatrix}, \qquad g^o(2007)= \begin{bmatrix} go_{11} & \cdots & go_{17} \\ \vdots & \ddots & \vdots \\ go_{91280\ 1} & \cdots & go_{91280\ 7} \end{bmatrix}$$

Weighted Deprivation Matrix (WDM)

The relative weights W = [$\frac{1}{7}$, $\frac{1}{7}$, $\frac{1}{7}$, $\frac{1}{7}$, $\frac{1}{7}$, $\frac{1}{7}$, $\frac{1}{7}$] of the indicators are applied to the deprivation matrices. Such that go_{ij}= W_j = $\frac{1}{7}$, if $X_{ij} < Z_j$ (Deprived) and go_{ij}= 0, if $X_{ij} \geq Z_j$ (Non-Deprived) so that this study obtaineds the WDM as given below:

$$g^o(w)(2011) = \begin{bmatrix} go_{11} & \cdots & go_{17} \\ \vdots & \ddots & \vdots \\ go_{95238\ 1} & \cdots & go_{95238\ 7} \end{bmatrix}, \qquad g^o(w)(2007) = \begin{bmatrix} go_{11} & \cdots & go_{17} \\ \vdots & \ddots & \vdots \\ go_{91280\ 1} & \cdots & go_{91280\ 7} \end{bmatrix}$$

Deprivation Count Vector (DCV)

These vectors are the count or score of each person in all the indicators. It is the sum of weighted deprivations. *i.e.,* $C_i = g_{i1} + g_{i2} \text{ --------- } + g_{i7}$. The DCVs for MICS 2011 and 2007 are given below:

$$C(2011) = \begin{bmatrix} C_1 \\ C_2 \\ \vdots \\ C_{95238} \end{bmatrix}, \qquad C(2007) = \begin{bmatrix} C_1 \\ C_2 \\ \vdots \\ C_{91280} \end{bmatrix}$$

Poverty Cutoff

Given the poverty cutoff K, This study compares the deprivation count with the K cutoff and then censor the deprivation of those who were not identified as poor.

If $\rho_k(x, ;Z) = 1$, if $C_i \geq K$
If $\rho_k(x, ;Z) = 0$, if $C_i < K$

Censored Weighted Deprivation Matrix

It is the key matrix over which we will perform the aggregation and find the set of AF measurements for M_o (MPI). Here $go_{ij}(k) = W_j = \frac{1}{7}$, if $C_i \geq k$ (Deprived and poor) $go_{i\ j}(k) = 0$, if $C_i < k$ (Deprived or not, but non-poor).

$$g^o(k)(2011) = \begin{bmatrix} go_{11}(k) & \cdots & go_{17}(k) \\ \vdots & \ddots & \vdots \\ go_{95238\ 1}(k) & \cdots & go_{95238\ 7}(k) \end{bmatrix}, \qquad g^o(k)(2007) =$$

$$\begin{bmatrix} go_{11}(k) & \cdots & go_{17}(k) \\ \vdots & \ddots & \vdots \\ go_{91280\ 1}(k) & \cdots & go_{91280\ 7}(k) \end{bmatrix}$$

Censored Weighted Deprivation Count Vector

After the implementation of dual cutoffs, this vector counts the score of each person from the Censored Weighted Deprivation Matrix. Here $C_i(k) = C_i$, if $C_i \geq k$ and $C_i(k) = 0$, if $C_i < k$.

$$C(k)(2011) = \begin{bmatrix} C_1(k) \\ C_2(k) \\ \vdots \\ C_{95238}(k) \end{bmatrix}, \qquad C(k)(2011) = \begin{bmatrix} C_1(k) \\ C_2(k) \\ \vdots \\ C_{95238}(k) \end{bmatrix}$$

Head Count Ratio of MD Poor

It is the proportion of people who have been identify as poor. It is called incidence of poverty, or poverty rate and is calculated as:

$$H(2011) = \frac{\sum_{i=1}^{95238} \rho_k(x,;Z)}{95238} = \frac{q_{2011}}{95238}, \quad H(2007) = \frac{\sum_{i=1}^{91280} \rho_k(x,;Z)}{91280} = \frac{q_{2007}}{91280}$$

Intensity (Breadth) of MD Poverty

It is average proportion of deprivation in which the poor are deprived and is calculated as:

$$A(2011) = \frac{\sum_{i=1}^{95238} C_i(k)}{7q_{2011}}, \qquad A(2007) = \frac{\sum_{i=1}^{91280} C_i(k)}{7q_{2007}}$$

M_o (MPI)

This is the final step for the calculation of MPI. It is the adjusted Head Counts and is the product of H and A, *i.e.,* $M_o = H \times A$

IV. RESULTS AND THEIR INTERPRETATION

Poverty Identification

With the poverty K–Cutoff, this study is considering the range of cutoffs to observe the pattern of each of the AF measurement. Table 2 shows the results for the periods 2011 and 2007 and corresponding graphical representation are shown in Figure 1 and Figure 2.

It is substantiation from Table 2 that the Head Count Ratio (H) is very high for both time periods, when we have established the poverty cutoff at 10 percent deprivations. As one move from 10 percent to 100 percent poverty cutoff, H keeps on deceasing, but still one got some percentage of multidimensional (MD) poor people even at 100 percent poverty cutoff.

The average intensity (A) has the increasing pattern, it is due to the fact that in the Censored Weighted Deprivation Matrix as the percentage of poverty cutoff increases the household with more deprivations are censored as poor, and the Average Intensity of the poverty is the average of the MD poor people. At the initial poverty cutoffs, the A is low and with the increase in poverty cutoff the percentage of A keeps on increasing and becomes 100 percent for both time periods.

Table 2

H, A and M_0 at Different K-Cutoffs for the Periods 2011 and 2007

	2011			2007		
K- Cutoff (percent)	Head Count (H)	Average Intensity (A)	M_0 (MPI)	Head Count (H)	Average Intensity (A)	M_0 (MPI)
10	0.865	0.422	0.365	0.872	0.478	0.417
20	0.653	0.513	0.335	0.667	0.581	0.388
30	0.458	0.610	0.279	0.488	0.689	0.336
40	0.458	0.610	0.279	0.488	0.689	0.336
50	0.304	0.702	0.213	0.409	0.740	0.303
60	0.186	0.784	0.146	0.303	0.799	0.242
70	0.186	0.784	0.146	0.303	0.799	0.242
80	0.086	0.866	0.074	0.169	0.865	0.147
90	0.005	1.000	0.005	0.009	1.000	0.009
100	0.005	1.000	0.005	0.009	1.000	0.009

The M_0 is the product of H and A and it is the percentage of people who are MD poor and facing deprivations at the same time, with the increase in the poverty cutoff, the value of M_0 decreases, but even at 100 percent poverty cutoff , this study still got some percentage of the MD poor.

Overall Comparison of M_0 (2011) and M_0 (2007)

There is difference of approximately 6–10 percent in the value of M_0 (2011) and M_0 (2007) at each of the poverty cutoff level. The Figure 3 shows the prominent decrease in the poverty for the period 2011 as compared to the period 2007.

In conclusion, this study observed that each of the AF measure has shown decrease in poverty in 2011 as compared to 2007 at all cutoffs.

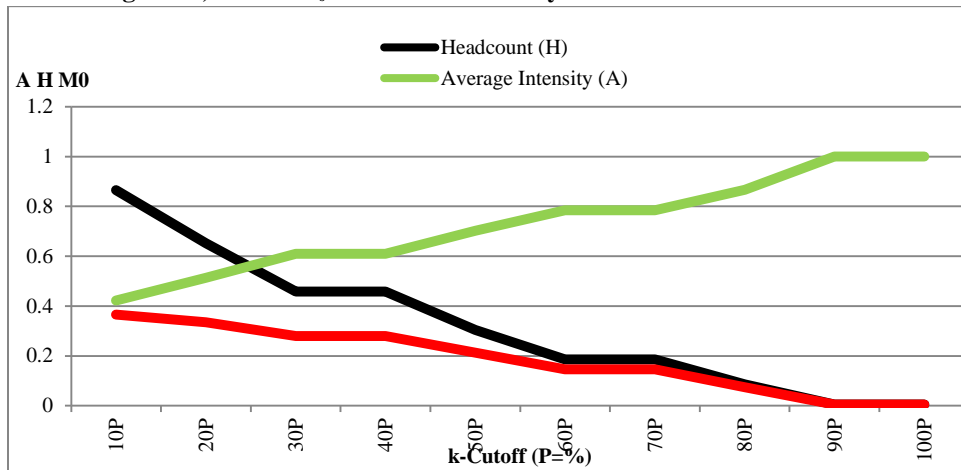**Fig. 1. A, H and M_0 at Different Poverty Cutoffs for the Period 2011**

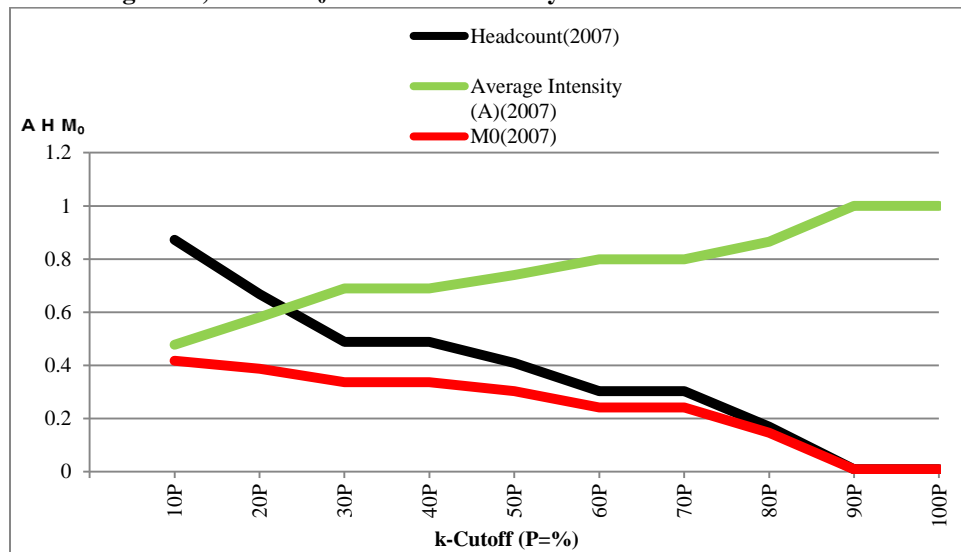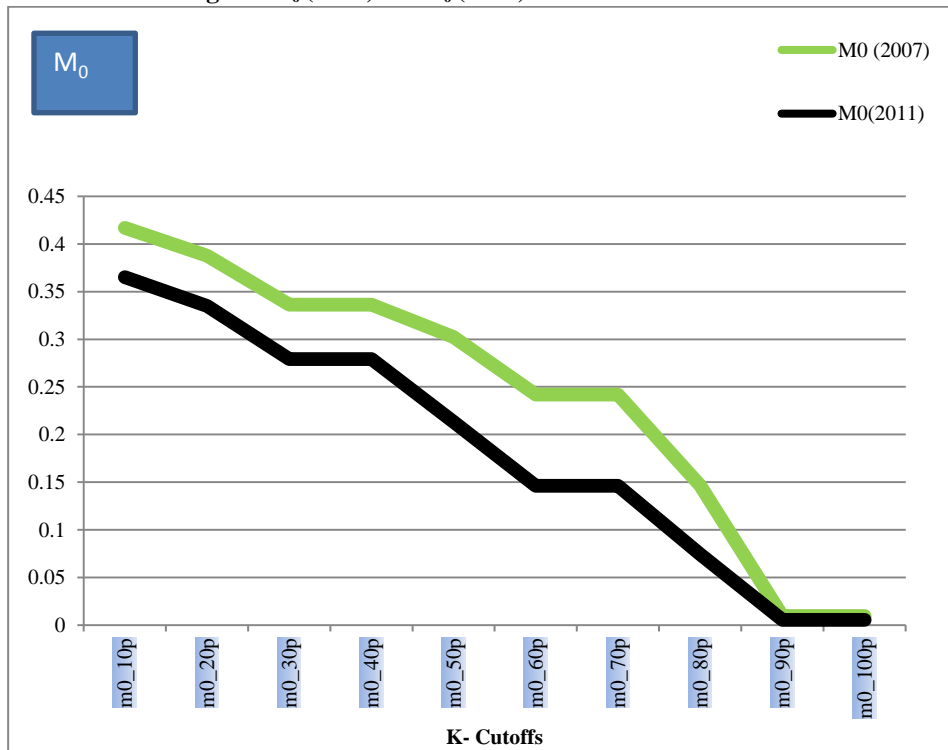**Fig. 2. A, H and M_0 at Different Poverty Cutoffs for the Period 2007**

Fig. 3. M_0 (2011) *vs.* M_0 (2007) at Different K-Cutoffs

**Poverty Identification (K-Cutoff at 33 percent)**

To converse about MPIs at a specific poverty cutoff, this study set the K-cutoff at 33 percent. Having AF measures at this cutoff this study will drill down into Regions/Divisions/Districts for independent MPIs and their contribution to the provincial MPI.

The poverty identification for poverty cutoff K=33 percent for both the considered time periods are presented in the Table 3 and Figure 4. The overall results show a decrease in each of the measure for the year 2011 as compared to the year 2007. It is worthwhile to note that the H and the A have decreased by 3 percent and 7.9 percent, respectively whereas; the MPI (M_0) has decreased to 5.7 percent. Here, the advantage of using AF method is that the H has shown just 3 percent (does not take into account the phenomena that poor become more deprived or less deprived), in contrast the M_0 (MPI) reflect the real situation and has shown the decrease of 5.7 percent.

Table 3

Comparing MPI 2007 vs. MPI 2011 at K = 33 percent

AF Measures	MICS 2007	MICS 2011	Increase/Decrease
H	0.488	0.458	-0.030
A	0.689	0.610	-0.079
M_0	0.336	0.279	-0.057

Fig. 4. Comparison MPI 2007 *vs*. MPI 2011 at K = 33 percent
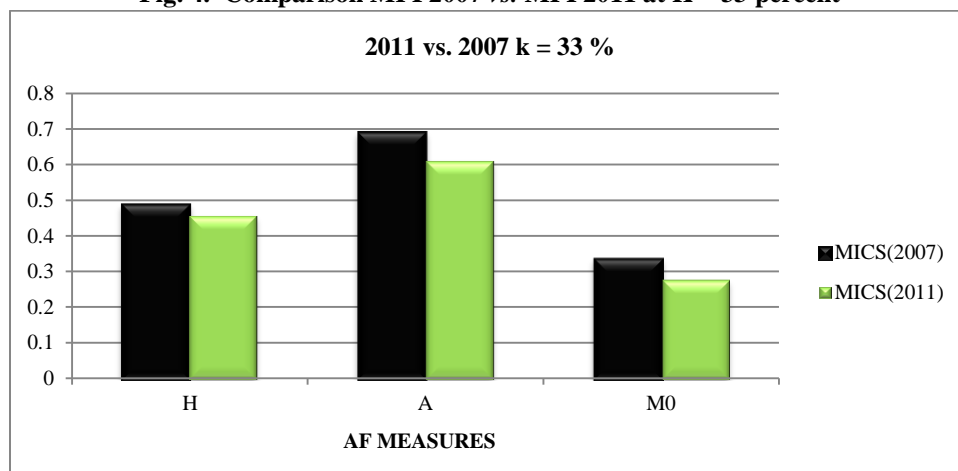
Interpretation of the Results at K-Cutoff 33 percent

(i) For the Period 2011

- The incidence of poverty H = 45.76 percent indicating the percentage of the people who are multi-dimensionally poor.
- The Intensity of Poverty A = 61.01 percent which shows that, on average, the poor people are facing 61.01 percent of the depravations.
- The value of MPI = M_0 (2011) = 0.279 which is the product of H and A. It is percentage of those people which are multidimensional poor as well as they are deprived at the same time.

(ii) For the Period 2007

- The incidence of poverty H = 48.71 percent indicating the percentage of the people who are multi-dimensionally poor.
- The Intensity of Poverty A = 68.94 percent which shows that on average the poor people are facing 68.94 percent of the depravations.
- The Value of MPI = M_0 (2007) = 0.336 which is the product of H and A. It is percentage of those people which are multidimensional as well as they are deprived at the same time.

The results for both time periods can be summed up that the overall Punjab has shown the decline in the poverty measured by MPI of 5.72 percent in 2011 as compared to 2007.

Urban and Rural Bifurcation of M_0

The region-wise comparison of MPI results is presented in Table 4. In the region-wise comparison, the AF-measures have fallen in period 2011 for both the urban and rural regions. The decrease in the poverty is found to be 6 percent for the rural areas, whereas the urban areas have shown the fall of just 0.2 percent.

The region-wise comparison of the MPIs results for both of the time periods is also presented in Figure 5. The results in Figure 5 reveal the clear difference between the poverty status of urban and rural regions and highlight the disparities faced by the rural region of the Punjab.

In conclusion, the poverty in the rural areas of the Punjab for the period 2011 is found to be 31.8 percent more than that of the urban areas, whereas the poverty in the rural areas of the Punjab for the period 2007 was found to be 37.8 percent more than that of the urban areas. This also means that although the poverty has fallen in rural areas of the Punjab in 2011 as compared to 2007, yet the poverty gap between rural and urban regions of the Punjab is still evident.

Table 4

Urban and Rural Bifurcation of MPI

Region	2011			2007		
	H	A	M_0	H	A	M_0
Urban	0.173	0.517	0.089	0.153	0.600	0.092
Rural	0.650	0.627	0.407	0.667	0.700	0.467
Punjab	0.458	0.610	0.279	0.488	0.689	0.336

Fig. 5. M_O (2011) *vs.* M_O (2007) Region-wise
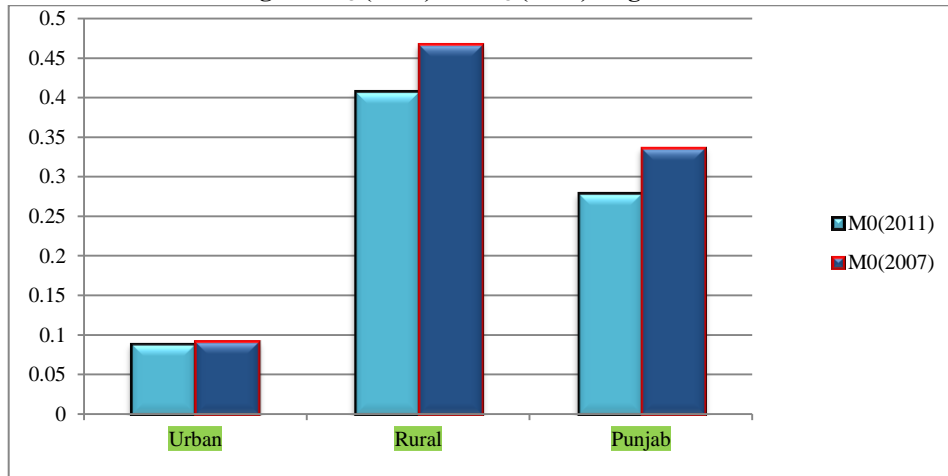
Sorting by Divisions and Bands of Poverty

The Punjab province comprises of nine divisions namely Bahawalpur, Rawalpindi, Gujranwala, Lahore, Multan, Faisalabad, Sahiwal, Sargodha, and D.G. Khan. The results for both time periods are ranked from lowest to the highest poverty level. On the basic of the poverty level the divisions are classified into the low (up to 20 percent), medium (21 percent to 35 percent) and high (above 35 percent) poverty bands in this study.
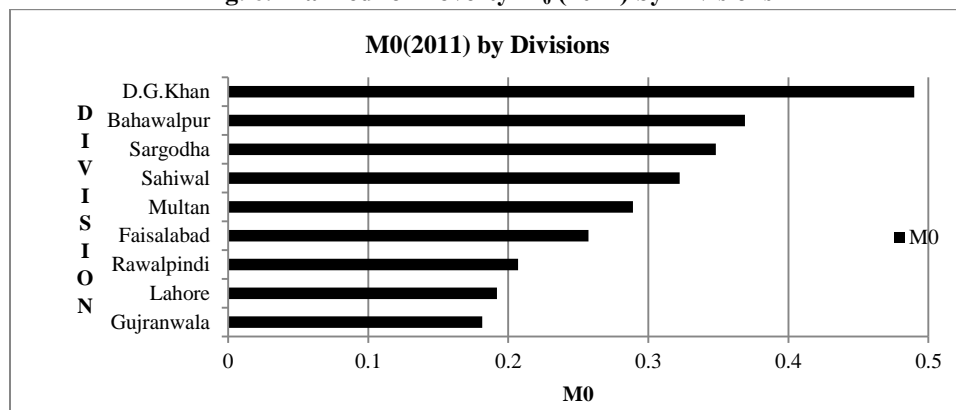
(i) For the Period 2011

The Table 5 presents MPI (2011) results for each division ordered from lowest to highest with the classification of poverty band for the period 2011. The D.G. Khan division has the highest MPI of 0.489 followed by Bahawalpur at 0.369, Sargodha at 0.348 and Sahiwal at 0.322. D.G. Khan and Bhawalpur divisions fall in the high poverty band. Faisalabad, Multan, Sahiwal, Sargodha are ranked under medium poverty band whereas, Gujranwala, Rawalpindi and Lahore having value of MPI up to 20 percent, categorised in the low poverty band. The graphical representations of divisional MPI results are also shown in Figure 6.

Table 5

Sorting M_0 (2011) by Divisions

Division	M_0(2011)	Bands of Poverty
Gujranwala	0.181399	
Lahore	0.192033	Low poverty
Rawalpindi	0.206952	
Faisalabad	0.257276	
Multan	0.28914	
Sahiwal	0.322424	Medium poverty
Sargodha	0.348195	
Bahawalpur	0.369109	
D.G. Khan	0.489913	High poverty

Fig. 6. Ranked for Poverty M_0 (2011) by Divisions

(ii) For the Period 2007

The Table 6 presents the MPI (2007) results for each division ordered from lowest to highest with the classification of poverty band for the period 2007. The D.G. Khan division has the highest MPI of 0.5299 followed by Bahawalpur at 0.4782, Sahiwal at 0.4013 and Sargodha at 0.40. Multan, Sargodha, Sahiwal, Bahawalpur, and D.G. Khan Divisions ranked in the high poverty band. Lahore and Faisalabad are found under Medium poverty band, whereas Rawalpindi and Gujranwala divisions are found under

low poverty band. The graphical representations of divisional MPI (2007) results are also shown in Figure 7.

The above findings indicate that all the divisions of the Punjab Province are not at the similar situation with regard to the poverty status for periods 2011and 2007. In 2011, D.G. Khan division is at least 30 percent poorer than Gujranwala, Lahore and Rawalpindi. Whereas, Bahawalpur and Sargodha divisions are round about 14 to 18 percent poorer than Gujranwala and Lahore similar prevalence of disparities among the division for the period 2007.

Table 6

Sorting M_0 (2007) by Divisions

Division	M_0 (2007)	Bands of Poverty
Rawalpindi	0.178248	Low poverty
Gujranwala	0.192727	
Lahore	0.245671	Medium poverty
Faisalabad	0.316711	
Multan	0.378095	
Sargodha	0.40051	High poverty
Sahiwal	0.401381	
Bahawalpur	0.478288	
D.G. Khan	0.529922	

Fig. 7. Ranked for Poverty M_0 (2007) by Divisions
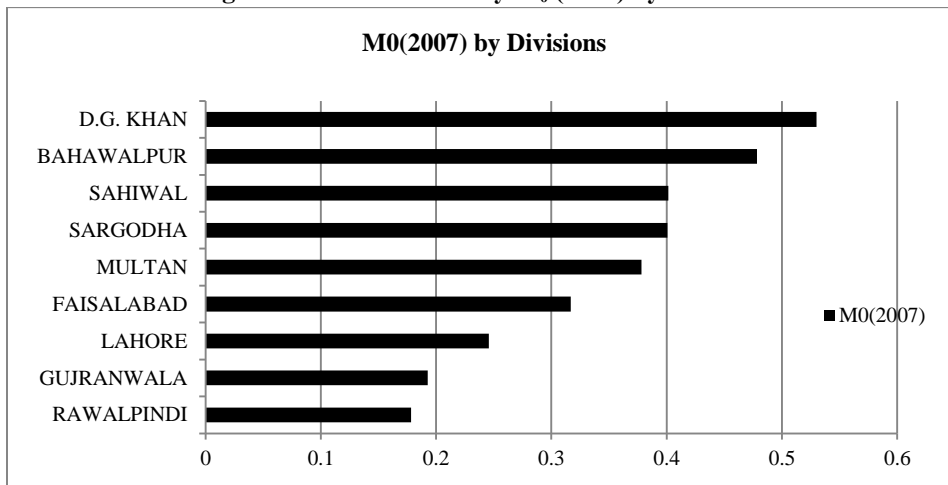
Division-wise Comparison of MPI

The division wise comparisons of the MPI results are presented in Table 7. The results show decrease in poverty for all the divisions of the Punjab except Rawalpindi division. The highest decrease is of 11 percent in the Bahawalpur division followed by 9 percent in Multan, 8 percent in Sahiwal, 6 percent in Lahore, Sargodha and Faisalabad. The lowest decrease in poverty of just 4 percent and 1 percent is observed in D.G. Khan and Gujranwala, respectively.

Table 7

Division-wise Comparison of MPI 2007 vs. MPI 2011

Division	M0(2007)	M0(2011)	Increase/Decrease
Bahawalpur	0.478	0.369	–0.109
D.G. Khan	0.530	0.490	–0.040
Faisalabad	0.317	0.257	–0.059
Gujranwala	0.193	0.181	–0.011
Lahore	0.246	0.192	–0.054
Multan	0.378	0.289	–0.089
Rawalpindi	0.178	0.207	0.029
Sahiwal	0.401	0.322	–0.079
Sargodha	0.401	0.348	–0.052

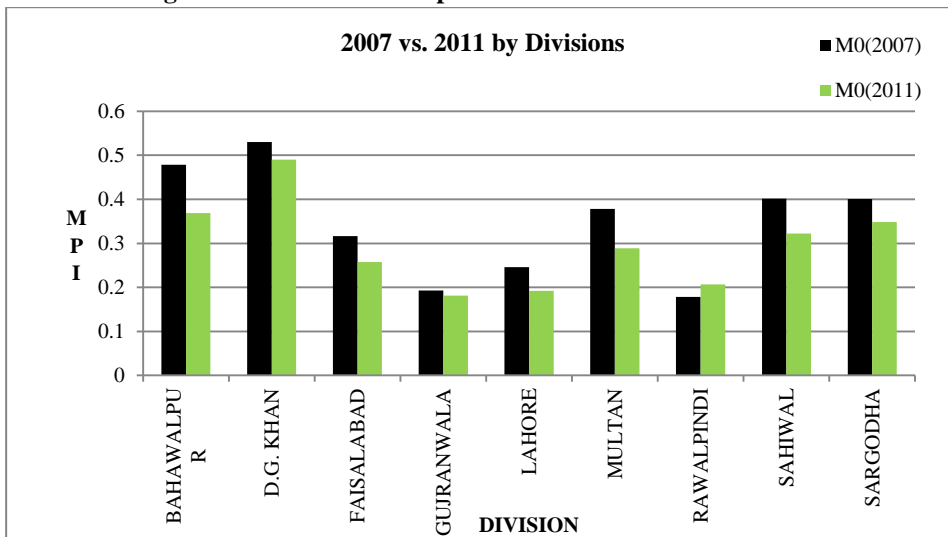**Fig. 8. Division-wise Comparison of MPI 2007 vs. MPI 2011**
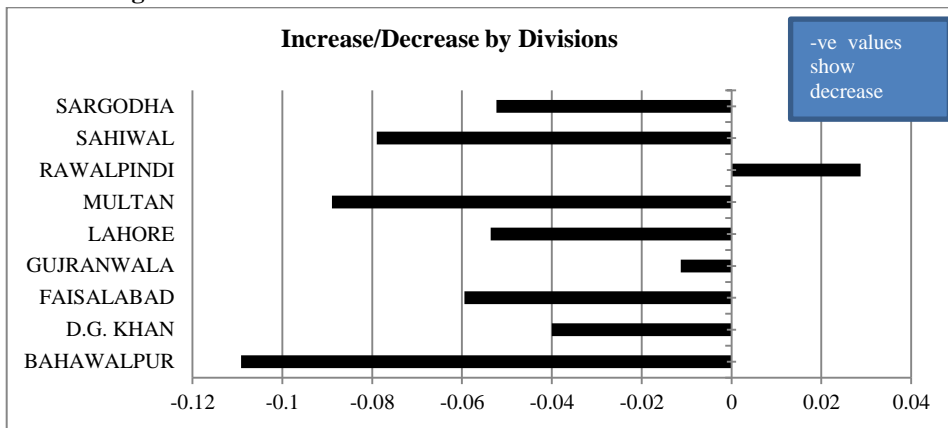

Fig. 9. Division-wise Increase/Decrease of MPI 2007 vs. MPI 2011

In conclusion, the corresponding decrease in the poverty has pushed some divisions out of their ranked band of poverty. Particularising for each, it is detected that Lahore division which was falling under the medium poverty band during 2007 has decreased the poverty and now, under the low poverty band for the year 2011. On the same lines Multan, Sahiwal and Sargodha divisions have revealed progress and are in medium band of poverty in 2011 as compared to 2007 when these were tumbling under high poverty band.

The graphical demonstration of comparisons is given in Figure 8, the corresponding increase or decrease in each division is given in Figure 9.

District-wise Comparison of MPI

The side by side comparisons of district-wise results for MPI for the periods 2007 and 2011 are given in Table 8. Bold figures in Table 8 show the rise in the poverty. The decrease in poverty is shown in districts Vehari of 30 percent, Multan of 25 percent, T.T Singh of 24 percent, Pakpattan of 22 percent, Sailkot of 15 percent, Narowal of 16 percent, Khanewal of 15 percent and Rawalpindi of 14 percent. The increase in the poverty has observed by 23 percent in R.Y.Khan, 12 percent in Rajanpur, 10 in percent Muzaffergarh, 8.5 percent in Sheikhupura, 7.5 percent in Mianwali and 1 percent in Sargodha. The district-wise comparisons of MPIs are shown in Figure 10, while increases/decreases in poverty are shown in Figure 11.

Table 8

MPIs 2007 vs. MPIs 2011by Districts

District	M0 (2007)	M0 (2011)	Inc/Dec	District	M0 (2007)	M0 (2011)	Inc/Dec
Attock	0.222	0.206	–0.015	Lodhran	0.379	0.337	–0.042
Bahawalnagar	0.494	0.376	–0.118	Mandi Bahaudin	0.257	0.258	**0.001**
Bahawalpur	0.471	0.368	–0.103	Mianwali	0.275	0.350	**0.075**
Bhakkar	0.442	0.417	–0.025	Multan	0.523	0.272	**–0.251**
Chakwal	0.212	0.208	–0.005	Muzaffar Garh	0.361	0.465	**0.104**
Chiniot	0.422	0.399	–0.023	Nankana Sahib	0.323	0.301	–0.022
D.G. Khan	0.510	0.470	–0.040	Narowal	0.431	0.275	–0.156
Faisalabad	0.225	0.155	–0.069	Okara	0.383	0.338	–0.045
Gujranwala	0.138	0.142	**0.004**	Pakpattan	0.573	0.354	–0.219
Gujrat	0.121	0.105	–0.016	R.Y. Khan	0.138	0.365	**0.227**
Hafizabad	0.366	0.305	–0.061	Rajanpur	0.468	0.584	**0.116**
Jhang	0.497	0.433	–0.064	Rawalpindi	0.372	0.233	–0.140
Jhelum	0.177	0.152	–0.025	Sahiwal	0.351	0.271	–0.080
Kasur	0.373	0.304	–0.069	Sargodha	0.288	0.298	**0.010**
Khanewal	0.435	0.288	–0.147	Sheikhupura	0.135	0.220	**0.085**
Khushab	0.446	0.369	–0.077	Sialkot	0.299	0.147	–0.152
Lahore	0.056	0.055	–0.002	T.T. Singh	0.449	0.208	**–0.241**
Layyah	0.507	0.461	–0.046	Vehari	0.586	0.284	**–0.302**

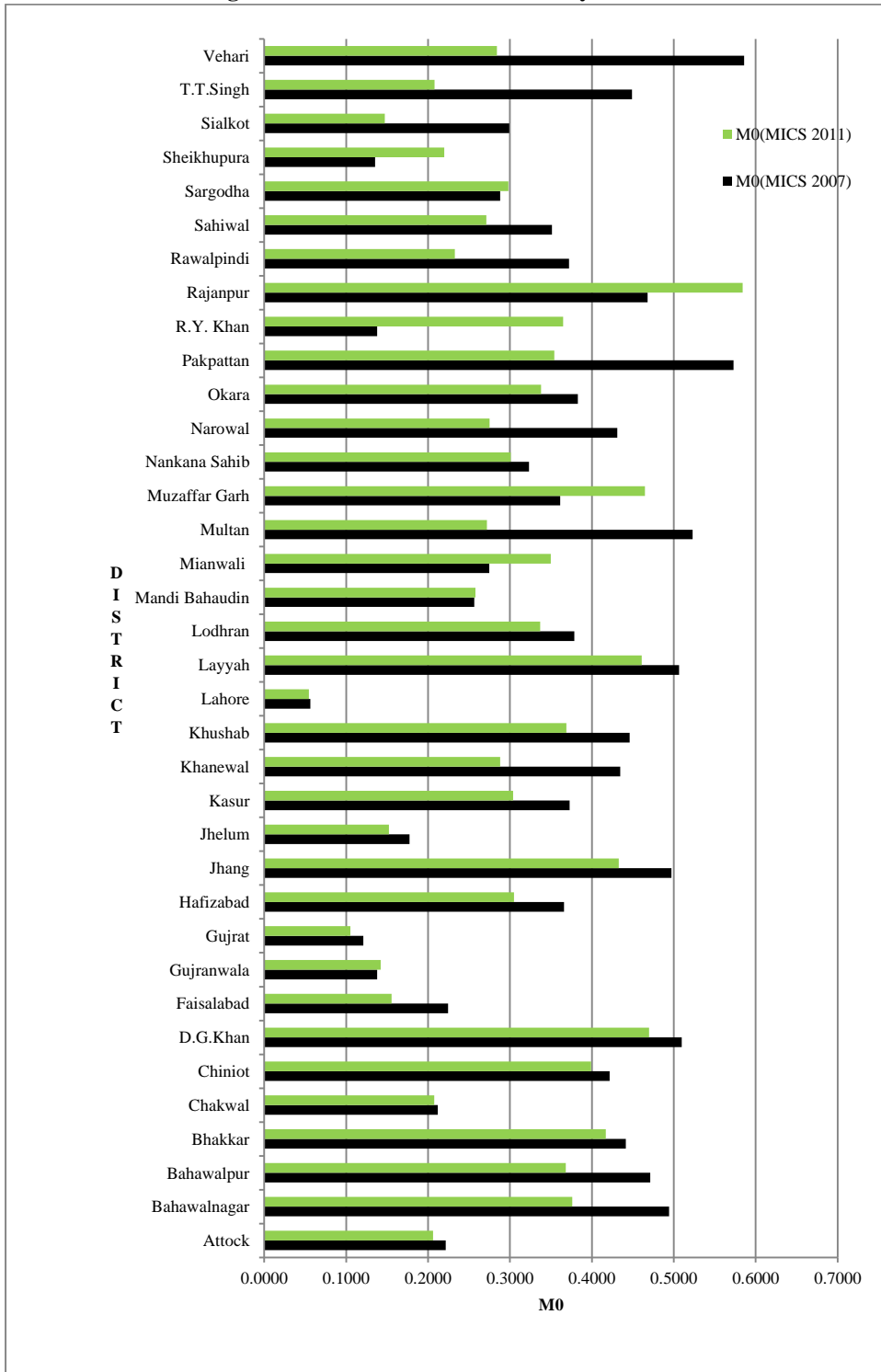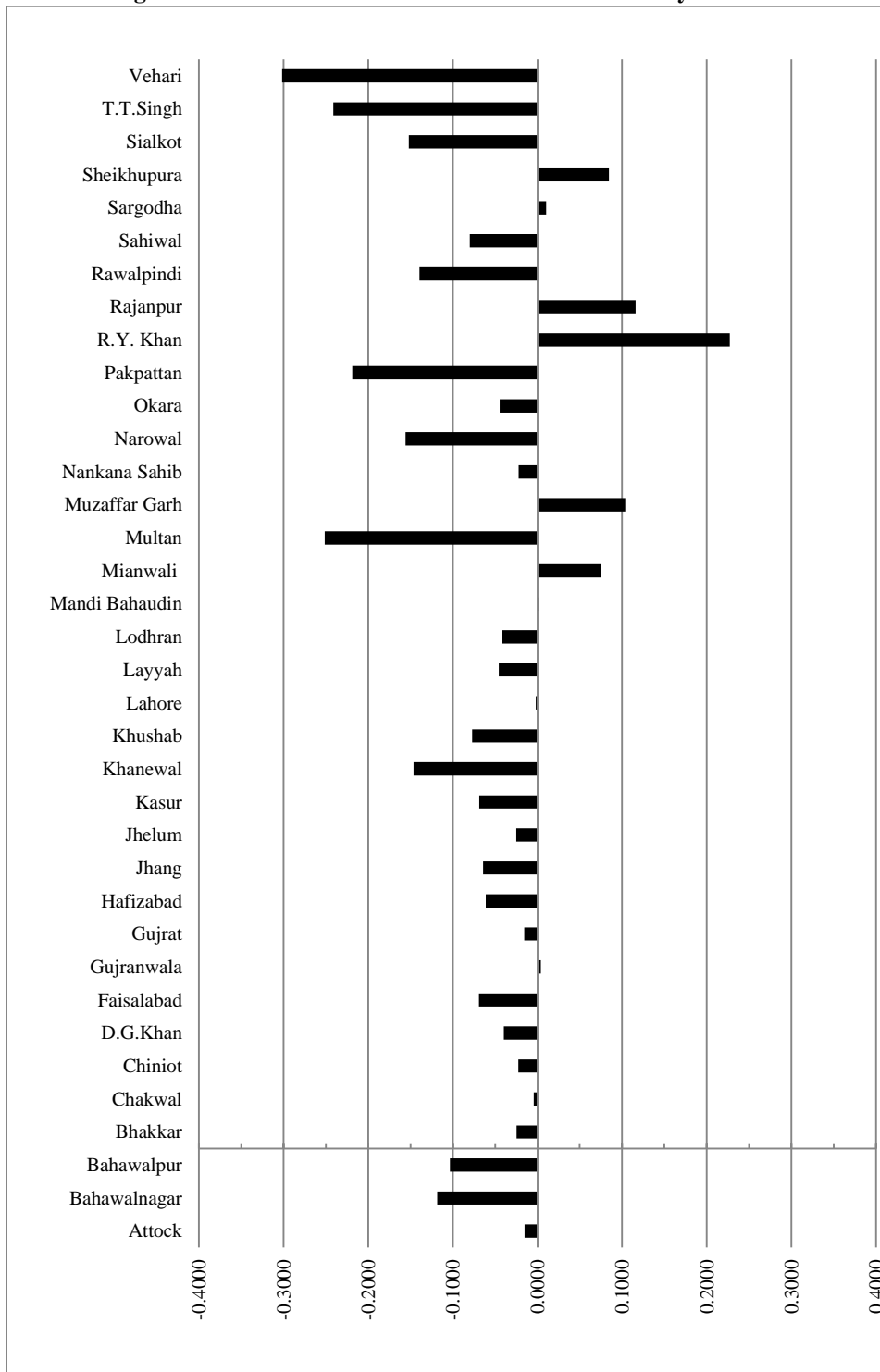**Fig. 10. MPIs 2007 vs. MPIs 2011 by Districts**

Fig. 11. MPIs 2007 *vs.* MPIs 2011 Increase/Decrease by Districts

V. CONCLUSION AND RECOMMENDATIONS

Conclusion

The purpose of the study is to assess multidimensional poverty using Alkire and Foster (AF) method for the periods 2007 and 2011 in province Punjab-Pakistan, using primary data from Multiple Indicator Cluster Survey (MICS). The results are bifurcated for geographical split-ups of the Punjab to further explore over time status of poverty and monitor the disparities among different regions of the Punjab. The calculated figures of MPI (multidimensional poverty index) for the Punjab province at different k-cutoffs and detailed results for particular poverty cutoff of 33 percent indicated that the overall condition of Punjab province of Pakistan concerning to the deprivation in the economic barometers of living standards is at the moderate level of poverty. But the disparities and issues are evident when results are bifurcated area, division and district wise. The rural area of the Punjab has almost MPI at 0.40 in 2011 which means 40 percent of the rural population is MD poor and having deprivation in the living standards. Furthermore, the nine different divisions of the province are found to be have isolated thresholds of MPI. D.G. Khan, Bahawalpur and Sargodha divisions have been found to have the high values of MPI, whereas Gujranwala, Rawalpindi and Lahore divisions are having comparatively low values of MPI. Additionally, going shallow into district level results the circumstances get inferior and inferior. There are gigantic slits between different districts of the province Punjab. In Rajanpur, D.G. Khan, Muzaffargarh, Layyah, Jhang and Bhakkar more than 40 percent of the population is MD poor and having deprivations. There is dissimilarity ranging from 20 to 35 percent shown by the MPIs results of Gujranwala, Lahore, Gujrat, Faisalabad, and Jhelum districts when paralleled with the MPIs of Rajanpur, D.G. Khan, Muzaffargarh, Layyah, Jhang, and Bhakkar districts.

Recommendations

On the basis of the results of individual time periods and chronological comparative findings of the study, the following suggestion and recommendation is being depicted.

- It is clear that all the regional split-ups of the Punjab province are not having similar standing, so the similar policies for all over the province will not prove its worth. To allocate the resources, there is dire need to focus on the different bands of poverty and allocation should be made accordingly, for instance D.G. Khan, Bhawalpur, Sargodha divisions need more care and attention as compared to Gujranwala, Lahore and Rawalpindi divisions.
- As we have identify the divisions which are under different bands of poverty, then utilising it as a base line we should carefully observed the status of the poverty in the particular district of the respective division to see which of the district should be focused first e.g., considering D.G. Khan division having M_0 (2007) = 0.5299 and M_0 (2011) = 0.4899, this division consists of four districts *i.e.,* D.G. Khan, Layyah, Muzaffargarh, and Rajanpur having MPI in the order at 0.50, 0.50, 0.36 and 0.46 for year 2007 and 0.47, 0.46, 0.46, 0.58 for year 2011, respectively. From this comparative analysis of the MPI it is perceived that the D.G. Khan and Layyah districts were having uppermost MPI value in 2007 and 2011. They have lessened their poverty level by 4 percent each. Whereas,

Muzaffargarh and Rajanpur districts were at 0.36 and 0.47, respectively in 2007 but in period 2011 they have flown up to 0.46 and 0.58, respectively. This deductive technique of identifying the poorer of the poor with the periodic check provides guide lines to introduce interventions in the right direction. As in the case of D.G. Khan Division, there is a dire need to focus Rajanpur and Muzaffargarh districts alarmingly.

- Consider Bahawalpur division having M_0 (2007) = 0.48 and M_0 (2011) = 0.37, it shows 11 percent decline. This division consists of districts Bahawalnagar, Bahawalpur, R. Y. Khan, having MPI values at 0.49, 0.47 and 0.138 for 2007 and 0.38, 0.37 and 0.365 for 2011, respectively. Now it is evident that Bahawalpur and Bahawalnagar districts have shown decline in poverty whereas, the R.Y. Khan District has shown sharp rise in poverty. Here, policy makers need to focus R.Y. Khan at the first priority.

- Decomposition of the result by indicators may also helpful for having the particular direction for the allocation of resources.

- For the lovers of democracy, this paper may be used as evidence that even poor democratic regime *regarding living standards deprivations* is better in enhancing living standards in Punjab as compared to guided democracy guided by General Mushraf and especially of the dictatorship.

Future Avenues

- As MICS 2014 data collection and data entry process have not been yet completed and is in process. The findings of this study may be generalised using data of MICS 2007, 2011 and 2014 in the measurement of MPI.

- The sampling distribution of A and M_0 can be classified and test of goodness of fits can be performed in order to detect the underlying distributions of each of the measures.

- Based upon the findings and evidence of the distributions, the statistical inference and predictions can be made.

- A robust analysis of the MPI class of measures can be done. For example, association among class of measures, Gap Analysis, Standard Error (Precision and Accuracy) etc.

- Scientific method of assigning weights to different indicators and dimensions may be used.

- Exiting data sets does not allow us to include more and more indicators as the scopes of available data sets are either too narrow or too broad. In order to include further dimensions and indicators it is very necessary, to conduct a purpose based survey which includes all indicators and dimensions which are dynamic and internationally comparable in measuring MPI.

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Comments

This is a comprehensive research, based on huge data set. It covered all regions of Punjab and had a broader base as considered seven indicators of poverty. The paper is a good contribution literature on multidimensional poverty in Pakistan. Followings observations are noted in this paper:

(i) Last line of page 02 "Punjab the biggest province of Pakistan, having the same poverty indicators as of Pakistan". This statement seems to be wrong as many studies have reported that incidence of poverty is least in Punjab or authors should give evidence in favour of their statement.

(ii) In Review of Literature many important studies that worked out MPI for Pakistan are not given such as, Salahuddin and Asad Zamad (PIDE, 2012), Arif (SDPI, 2012) and Niazi and AttaUllah (PU, 2012)

(iii) What is rationale of considering these seven indicators (why education, Health, nutrition etc are not considered)

(iv) What is rationale of giving same weight to each indicator, when they are not of equal importance. For instance access to drinking water is more important than Main material of roof.

(v) An excellent District-wise comparison of MPI is give (Table 8), but reasons of differentials across districts and over time are not given

(vi) Last point of recommendations "this paper may be used as evidence that the worst type of democracy is even better than guided democracy, especially of dictatorship". This is a big claim merely on the basis of MPI, when key indicators education, health are not considered.

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