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RESEARCH PAPER

How Has the Multidimensional Poverty Map in Iran Changed During the Last Decade?

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Abstract

This paper measures the multidimensional poverty index (MPI) in both urban and rural areas of the 31 Iranian provinces from 2005 to 2019 using Alkire & Foster's method. The study draws different maps of Iran's MPI during critical events such as the fourth development plan, the Iranian subsidy reform plan, nuclear sanctions, the JCPOA agreement, and the US withdrawal from JCPOA to show changes in poverty. Also, we have examined the effect of macroeconomic variables on MPI using a dynamic panel data model. The results indicate that rural poverty was higher than urban poverty throughout the years under investigation. The study also finds that after imposing severe sanctions on Iran's nuclear program, MPI increased by about 1.4% and 2.4% in urban and rural areas, respectively. One year after the JCPOA agreement, both urban and rural MPI decreased significantly, especially in rural areas where it decreased by 3%. After the US withdrawal from JCPOA, both urban and rural MPI increased by about 1.4%. Finally, the findings from the panel data model demonstrate that the previous period's MPI has a significant negative influence on current MPI. Moreover, government size, income inequality, and inflation exhibit a nonlinear effect on MPI. Lastly, per capita income has a significant positive effect on MPI, indicating an anti-poor growth pattern in Iran during the last decade.

Keywords: Alkire & Foster's Method, Iran, Multidimensional Poverty, Sanction, Subsidy Reform Plan.

JEL Classification: I32, O53, R10.

1. Introduction

Reducing poverty is a key objective of sustainable development, and the initial step in policymaking to achieve this goal is to understand the extent and trends of poverty over time. However, measuring poverty is a complex issue in economics. In earlier studies, income poverty was used as a measure of poverty, but this approach has been criticized by scholars such as Sen (1985), who introduced the capability approach that considers poverty as not only income deprivation but also includes other forms of deprivation such as social, educational, health, and other dimensions. Due to the multidimensionality of poverty, various multidimensional poverty indexes have been proposed using different methods including fuzzy sets, composite index, Venn diagrams, dashboard, dominance, counting, and statistical approaches (Alkire et al., 2015). In this study, we have employed Alkire & Foster's (2011) method to measure multidimensional poverty in Iranian provinces. This method is widely used and counts the number of indicators in three dimensions: education, health and living facilities. A family is considered poor if they are deprived of more than one-third of these indicators. The Alkire & Foster's poverty index is then calculated using conventional aggregation functions with adjustments.

Although there have been some studies on poverty measurement in Iran, the majority of them have focused solely on income. For instance, Mahoozi (2015) conducted a study that measured the MPI for Iranian provinces for only one year. Additionally, the Global Multidimensional Poverty Index has not been utilized to measure poverty in Iran. As a result, researchers and policymakers have limited access to multidimensional poverty data in Iran, which has obscured the true extent of poverty in the country. To address this issue, this article aims to provide policymakers and researchers with a more comprehensive understanding of poverty in Iran by calculating the MPI for 31 provinces over a period of 15 years (2005-2019). Furthermore, we have examined the effects of macroeconomic variables on MPI at both urban and rural levels, with a focus on their nonlinear impacts. This aspect is particularly novel as previous studies have paid less attention to the nonlinear relationship between macroeconomic variables and poverty in Iran.

This article is important for policymakers because it provides valuable insights into the relationship between macroeconomic variables and the Multidimensional Poverty Index (MPI) in Iran. By calculating the MPI for 31 Iranian provinces over a period of 15 years, policymakers can gain a comprehensive understanding of poverty levels and trends across different regions. The study's emphasis on examining the effects of macroeconomic variables on MPI at both urban and rural levels is particularly significant. By considering the nonlinearity effects of these variables, policymakers can better understand how different economic factors impact poverty in different contexts. This knowledge can inform targeted policy interventions to address poverty effectively. Furthermore, this study contributes to our overall understanding of the macroeconomic effect on poverty. By shedding light on the nonlinear effects of macroeconomic variables, it provides a more nuanced perspective on how economic factors influence poverty levels. This understanding can help policymakers design more effective strategies to alleviate poverty and promote inclusive economic growth.

This article is structured into five sections. The subsequent section provides a literature review. The third section presents the research methodology and data used. In section four, we analyze the MPI for urban and rural areas and present empirical results of how macroeconomic factors affect poverty using a dynamic panel data approach. Finally, we conclude our study.

2. Review of Literature

2.1 Measuring Poverty in Iran

Previous research on poverty in Iran has primarily focused on income poverty, neglecting a multidimensional approach. Pajooyan (1994) introduced a technique for determining a support criterion or poverty line based on Engel's Law and domestic nutritional values. He discovered that individuals who spend less than 108,000 Rials per year in urban areas are considered to be below the poverty line for the year 1989. Additionally, he argued that providing food rather than money to the poor is more beneficial, as it ensures appropriate utilization and prevents potential misuse. Asgari (2001) utilized spatial analysis methods, specifically spatial autoregressive models, to examine the influence of geographical location on the human poverty index (HPI). His findings indicate a significant spatial relationship between HPI and the provinces in Iran. This implies that the geographical location of provinces contributes to variations in HPI across the country. Ultimately, his results demonstrate that space plays a partial role in explaining poverty disparities.

Assadzadeh and Paul (2004) examined poverty changes in rural and urban areas using household data from 1983, 1988, and 1993, finding that rural poverty decreased while urban poverty increased. Salehi-Isfahani (2009) measured poverty and inequality from 1984 to 2005, revealing a significant decline in poverty but constant inequality. Mahmoudi (2011) measured a poverty index during the four development plans from 1995 to 2007, discovering higher levels of poverty in rural areas than urban areas. Salehi-Isfahani and Majbouri (2013) investigated both poverty and inequality during the 1992-1995 period, finding higher chronic poverty in urban areas than rural areas but more equally distributed transient poverty. Finally, Einian and Souri (2018) measured the poverty headcount ratio for both urban and rural areas of Iran in 2014 across 397 counties. However, some studies have utilized a multidimensional approach to measure poverty in Iran. Maasoumi and Mahmoudi (2013) used a nonparametric approach to decompose change in poverty into growth and redistribution components from 2000 to 2009, finding that both components significantly impacted changes in poverty. Mahoozi (2015) measured the MPI using Alkire-Foster's method for Iranian provinces only for the year 2008, identifying severe deprivation among female-headed households and rural households compared to male-headed and urban households.

Fotros and Ghodsi (2017) utilized Alkire-Foster's approach to gauge the MPI for Iran's economy as a whole in both rural and urban areas during the commencement and conclusion of development programs from 1989 to 2014. Their findings indicated that development programs in Iran reduced the MPI in both rural and urban areas, but they did not measure the MPI for Iranian provinces. Dadgar et al. (2020) conducted a similar study, measuring the MPI for Iran's economy from 2006 to 2018 and calculating the MPI for Iranian provinces only in 2018. Mohaqeqi Kamal et al. (2019) computed a multidimensional child poverty index (MCPI) using ten indicators across three dimensions of education, health, and living standards for Iranian provinces in 2015, revealing that child poverty is higher in border provinces than central ones. Kamal et al. (2022) measured the MPI for Tehran's elderly population in 2019, discovering that multidimensional poverty among Tehran's elderly is at 59%.

Therefore, this study is unique as it calculates the MPI for Iranian provinces over a lengthy period of fifteen years, providing valuable insights for policymakers and researchers.

2.2 Macroeconomic Variables and Poverty in Iran

Piraee (2004) examined the correlation between growth and poverty in Iran during the first five-year plan. He used a measure of pro poor growth to assess how much the economic growth in Iran benefited or harmed poor individuals. His findings revealed that poverty decreased in Iran from 1988 to 1993. The analysis of changes in poverty, separating them into the effects of pure growth and pure inequality, demonstrated that the former had a negative impact while the latter had a positive impact in both urban and rural areas. The pro poor growth index, measured by various poverty indicators such as headcount ratio, poverty gap ratio, and Foster-

Greer-Thorbecke index, indicated that economic growth was beneficial for both urban and rural areas in Iran. Therefore, based on his results, economic growth helps alleviate poverty.

Khodadad Kashi and Shahiki Tash (2010) investigated how macroeconomic variables influence the level of poverty in Iranian society. Their findings suggested that economic growth did not have a significant effect on poverty intensity in Iran. Furthermore, they found a negative relationship between poverty and growth, meaning that an increase in the growth rate led to a reduction in poverty. Their results also indicated that unemployment and inflation had positive effects on poverty, while social security expenditure relative to government expenditure did not have any meaningful impact on poverty.

Karami and Mardani (2010) examined the relationship between macroeconomic variables such as inequality and economic growth on poverty from 2000 to 2010. Their study revealed a slight decrease in both poverty and income inequality during this period. They found that due to increasing inequality and economic participation, the percentage of poor families increased; however, an increase in savings contributed to a decline in absolute poverty.

Farahmand et al. (2013) conducted a study on poverty and welfare in Iranian households from 2000 to 2007. They included variables for human education and health as control variables in their model, which was estimated using GMM. The results showed that while overall welfare increased with economic growth, there was also an increase in inequality among households in most provinces of the country. Additionally, the service sector experienced higher average growth compared to the agricultural and industrial sectors. The study also found that human education and health had a clear positive impact on prosperity and reducing poverty.

Mostafaei et al. (2020) focused on factors influencing poverty with an emphasis on industrial development in Iranian provinces from 2004 to 2015 using spatial panel econometric models. They used two scenarios: one using the concentration index and another using the relative regional advantage index. Both scenarios revealed that inequality, inflation, and concentration ratio had a positive effect on poverty, while industry per capita value added, depth of industrial activities, and relative advantage based on employment had a negative impact on poverty.

Heshmati Dayari et al. (2022) used the Log-Normal curve approach developed by Bourguignon to analyze the impact of economic growth on poverty in urban households in Iran from 2013 to 2019. They estimated the effects of growth and distribution on poverty. The results indicated that only during the one-year period of 2015-2016, all the necessary conditions for pro-poor growth were met, resulting in a successful combination of poverty reduction, growth, and reduced inequality.

3. Research Methodology and Data

3.1 Measuring Multidimensional Poverty Index (MPI)

Suppose poverty is established based on d dimensions. We regard an individual's position in one dimension as a success and posit that each dimension's accomplishments can be expressed through a non-negative quantitative indicator. Person i's accomplishment in dimension j is denoted by x_{ij} for all i=1,...,n and j=1,...,d. The accomplishments of all community members are depicted by the n × d achievement matrix X.

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1d} \\ \vdots & \ddots & \vdots \\ x_{n1} & \cdots & x_{nd} \end{bmatrix} \quad (1)$$

What is done to measure multidimensional poverty is to convert the achievement matrix into a scalar. By having the achievement matrix X and the deprivation limit vector Z, it is possible to determine whether each person is deprived or not, and the deprivation matrix g^0 can be obtained. Deprivation matrix elements for all individuals (i = 1,, n) and dimensions (j = 1,…, d) when $x_{ij} < z_j$, is $g_{ij}^0 = 1$, otherwise, $g_{ij}^0 = 0$. In other words, if the person i is deprived in dimension j, then the value of 1 is assigned to their deprivation status, and otherwise the deprivation status of the person is zero. Therefore, the matrix $g^0(X)$ shows the deprivation status of all n individuals in all j dimensions of the X matrix. The vector g_i^0 indicates the deprivation status of person i in all dimensions and the vector g_j^0 indicates the deprivation status of all individuals in dimension j. According to the matrix g^0, the degree of deprivation c_i for the person i can be obtained as $c_i = \sum_{j=1}^{d} w_i g_{ij}^0$. c_i represents the weighted sum of the deprivations that the person i suffers from them.

Also, we name the identification function with ρ, so that $\rho(.) = 1$ identifies person i as poor and $\rho(.) = 0$ identifies person i as non-poor. There are numerous methods for identifying poverty within a multidimensional framework. Two possible approaches to specify the identification function are "the aggregate achievement approach" and "the censored achievement approach." The former involves combining an individual's achievements across various dimensions using an aggregation function, and comparing this to an aggregate poverty line derived from deprivation limits in each dimension. If an individual's overall achievement falls below this line, they are considered poor. In contrast, the censored achievement approach first determines whether a person is deprived in any dimension by applying deprivation limits, and then assesses their status based only on their achievements in those dimensions where they are deprived. (Alkire et al., 2015).

Consider a society with n members (household) and d dimension as dimensions of multidimensional poverty. Given the n × d matrix of the achievements of X and a deprivation vector Z, the deprivation matrix associated with X is obtained as $g^0 = [g_{ij}^0]$, in which the sample element g_{ij}^0 when $x_{ij} < z_j$ is $g_{ij}^0 = w_j$ and otherwise $(x_{ij} \geq z_j)$ is $g_{ij}^0 = 0$. The matrix g^0 is an n × d matrix that element ij equals w_j when the person i is deprived in dimension j, and is equal to zero when the person is not deprived in that dimension. The sum of the weights for each dimension ($\sum w_j$) is equal to one. The line vector i of the matrix g^0, denoted by g_i^0, is the deprivation vector of person i. Also, the column vector j of the matrix g^0, which we represent as g_j^0, shows the distribution of deprivation in the jth dimension among the community. From the matrix g^0, a column vector c can be made, which is the degree of weight deprivation of individuals, and in which the i-th member, $c_i = g_i^0$, shows the weighted sum of the dimensions in which the person i is deprived.

In Alkire and Foster's method, a second limit (k) is also used to identify the poor. For $0 < k \leq 1$, we consider the ρ_k function as an identification function, which is defined as follows:

$$\begin{cases} \rho_k(x_i, z) = 1 & if \quad c_i \geq k \\ \rho_k(x_i, z) = 0 & if \quad c_i < k \end{cases} \tag{2}$$

In other words, ρ_k identifies person i as poor if their degree of deprivation is at least equal to k; Otherwise, they will not be considered poor.

We obtain the matrix $g^0(k)$ from the matrix g^0 by substituting the zero vector instead of its i-th row, when $\rho_k(x_i, z) = 0$. It is clear that $g_{ij}^0(k) = g_{ij}^0 \rho_k(x_i, z)$. We also define the censored vector of degrees of deprivation $c(k)$ for all i = 1, ..., n as $c_i(k) = \rho_k(x_i; z) c_i$.

Finally, as an aggregation step, the adjusted headcount ratio (M_0) is:

$$M_0 = d[\mu(g^0(k))] = \mu(c(k)) = \frac{1}{n}\sum_{i=1}^{n} c_i(k) = \frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{d} w_j g_{ij}^0 \qquad (3)$$

The process of applying a multidimensional approach to poverty is complex and involves various challenges. One such challenge is determining a comprehensive list of related features that must be taken into account, along with deciding on the weightage assigned to each feature. Additionally, it is crucial to consider the relationships and interactions between these attributes, as they may either complement or substitute each other. If the dimensions of poverty are substitutes, then an individual can maintain their well-being by adjusting one attribute over others. Conversely, if the attributes are complementary, then the addition of one attribute enhances the utility of another. Defining poverty or its meaning is a prerequisite for measuring it; however, broader definitions make it harder to measure accurately. The limitations of measuring poverty in a multidimensional way impose restrictions on the number and type of attributes that constitute poverty. Therefore, defining these attributes and features associated with poverty becomes a critical task. This paper follows the Global Multidimensional Poverty Index (MPI) approach to determine these attributes and their weights.

However, due to limitations in statistical data collection, adjustments have been made to the dimensions, weights, and limits of deprivation in MPI Global as shown in Table 1.

Table 1. Dimensions, Indicators, Weights, and Limits of Deprivation Used in Measuring Iran's Multidimensional Poverty

Dimension (Weight)	**Index (Weight)**	**z_j: Deprivation limit**
Education ($\frac{1}{3}$)	Years of study ($\frac{1}{6}$)	The head of the household has less education than in middle school.
	Children's education ($\frac{1}{6}$)	There should be at least one school-age child (6 to 16 years old) in the household who is not studying.
Health ($\frac{1}{3}$)	Existence of disability ($\frac{1}{6}$)	Existence of a specific disability or patient in the family
	Get proper nutrition ($\frac{1}{6}$)	The per capita caloric intake of households should be less than 2300 calories per day.
Living Facilities ($\frac{1}{3}$)	Access to electricity ($\frac{1}{21}$)	Do not have access to electricity at home.
	Existence of a bathroom in the house ($\frac{1}{21}$)	No bathroom at home

	Cooking fuel ($\frac{1}{21}$)	Household cooking fuel is wood, charcoal, or animal manure.
	Access to safe water ($\frac{1}{21}$)	The household does not have access to tap water.
	Living Location status ($\frac{1}{21}$)	The per capita area of the household is less than 10 square meters.
	Possession of durable goods ($\frac{1}{21}$)	The household owns at most one the goods refrigerators, televisions, telephones, washing machines, and vehicles (cars or motorcycles).
	Generate heat and provide hot water ($\frac{1}{21}$)	Create heat with firewood, animal manure and coal.

Source: MPI Dimensions with own adjustments due to limitations in statistical data.

Table 1 provides a summary of the dimensions, weights, and deprivation limits utilized in calculating the MPI for Iranian provinces. To compute the MPI using Alkire and Foster's approach, it is necessary to determine another quantity known as the second limit (k), which we previously referred to. Consistent with the global MPI, we have adopted a value of one-third for k or k=0.33. This implies that an individual is considered impoverished and deprived if they lack more than one-third of the weighted indicators.

3.2 Econometric Modeling of Poverty

In this section, we have modeled poverty using the most important macroeconomic variables. Therefore, according to the poverty literature, we have used the following model:

$$MPI_{it} = \beta_0 + \beta_1 MPI_{it-1} + \beta_2 GS_{it} + \beta_3 GS_{it}^2 + \beta_4 Gini_{it} + \beta_5 Gini_{it}^2 + \beta_6 Inf_{it} + \beta_7 Inf_{it}^2 + \beta_8 Y_{it} + \varepsilon_{it} \quad (4)$$

The multidimensional poverty index (MPI) is denoted as MPI_{it}, and the first lag of the multidimensional poverty index is denoted as MPI_{it-1}. We applied a dynamic model for poverty because when individuals or communities experience poverty in multiple dimensions over time, it creates a cumulative disadvantage. For example, if a person grows up in a poor household with limited access to education and healthcare, they are more likely to face difficulties in finding employment and breaking out of the cycle of poverty. We use both urban and rural poverty indexes to examine how macroeconomic variables affect poverty in urban and rural areas.

The government size (GS) is denoted as GS_{it}, and the square of government size is denoted as GS_{it}^2. For government size, we have used the share of consumption government expenditure in GDP. We have applied a quadratic form of government size to capture the nonlinearities of government size on poverty. According to Yusoff et al (2023), government expenditure could have a nonlinear impact on the level of poverty.

The Gini coefficient (Gini) is denoted as $Gini_{it}$, and the square of the Gini coefficient is denoted as $Gini_{it}^2$. We have applied a quadratic form of the Gini coefficient to capture the nonlinearities of income inequality on poverty. According to Zaman & Shamsuddin (2018), there is a possible nonlinear relationship between inequality and poverty.

The inflation rate (Inf) is denoted as Inf_{it}, and the square of inflation rate is denoted as Inf_{it}^2. For measuring inflation rate, we have used the growth rate of consumer price index (CPI). Meo et al (2018) suggest that there could be a nonlinear or asymmetric relationship between inflation and poverty.

Y_{it} represents the logarithm of per capita income, and ε_{it} represents the error term. Finally, for estimating equation 4, we have applied the GMM method.

3.3 Data

The data used in this study pertains to household expenditure and income and is gathered annually through extensive field surveys and detailed questionnaires from various households across Iran. To account for rural areas, we have utilized data from the Statistics Center of Iran, which has revised its household expenditure and income survey questionnaire since 2004 based on COICOP classifications. Due to this data limitation, we have measured the MPI between 2005-2019.

4. Empirical Results

4.1 Analyzing MPI

Tables A1-A4 in appendix present the MPI values for Iranian provinces and the country as a whole in both urban and rural areas from 2005 to 2019. Additionally, descriptive statistics are provided below these tables.

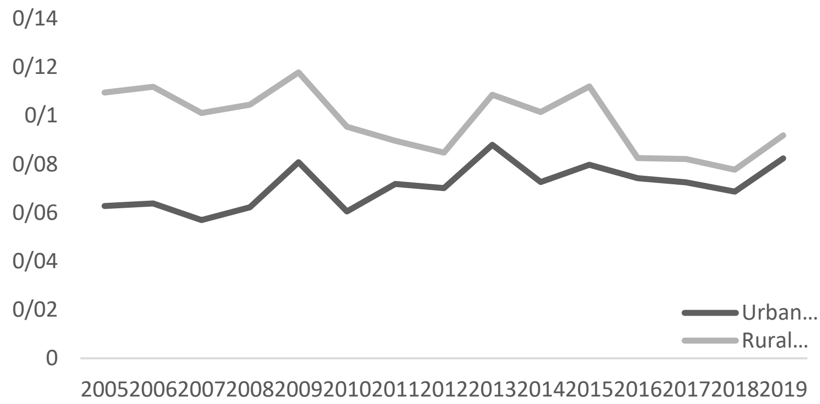

Figure 1. Urban and Rural MPI in Iran
Source: Research finding.

The findings from the multidimensional poverty assessment conducted in urban areas indicate that, with the exception of 2006 (when North Khorasan province had the highest poverty) and 2012-2013 (when Qom province had the highest poverty), Sistan & Baluchestan province consistently had the highest levels of multidimensional poverty. Conversely, the province with the lowest MPI varied across different years, with Bushehr province having the lowest MPI in 2005 and 2009, Zanjan province in 2006, Chaharmahal province in 2007-2008 and 2015, Khozestan province in 2010, Alborz province in 2011 and 2019, South Khorasan province in 2012-2014, Tehran province in 2016, and Mazandaran province in 2017-2018.

In rural areas of Iran, Sistan & Baluchestan province consistently had the highest MPI between 2005 and 2019. On the other hand, Bushehr province had the lowest MPI in rural areas during 2005 and between 2007-2009. Rural areas of Mazandaran had the longest period of low MPI between 2006 and from 2010 to 2015-17. Alborz province had the lowest MPI in rural areas during 2011, as well as in both years of 2018 and 2019. Zanjan Province held this distinction for rural areas during only one year - that being in year of 2012 - while South Khorasan held it for two years - those being in years of 2013 and of 2104.

According to figure 1, findings from the multidimensional poverty assessment of Iran's urban and rural areas indicate that rural poverty was more prevalent than urban poverty throughout the years studied. However, there was an improvement in poverty levels in both sectors one year after the fourth development plan was completed. A comparison of the multidimensional poverty maps from 2005 (Figure 2) and 2010 (Figure 3) revealed a reduction in poverty, albeit at a slow pace. Nevertheless, the fourth development plan failed to address rural poverty in border provinces, particularly in the eastern regions where conditions were worse than other border provinces. The provinces of Sistan & Baluchistan and Qom remained among the highest in urban poverty, with Sistan & Baluchistan being the poorest province overall in both urban and rural areas during this period (2005-2010). Rural poverty rates were significantly higher in this province compared to other provinces across Iran.

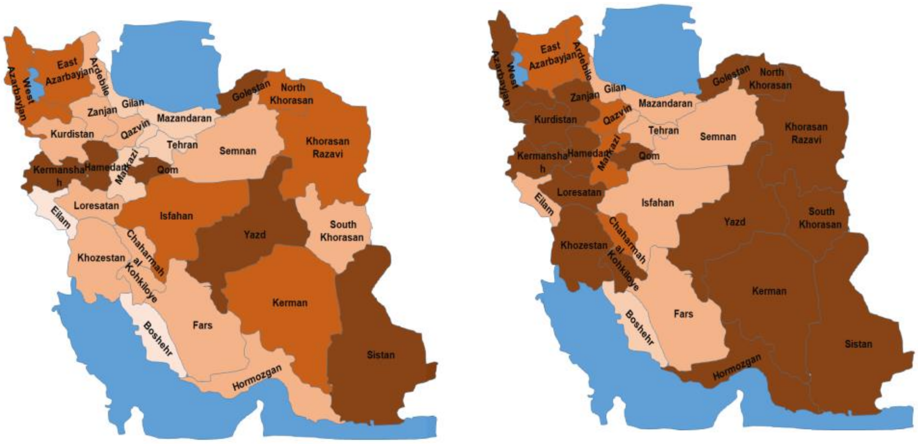

Figure 2. Multidimensional Poverty Map in Urban (Left Map) and Rural (Right Map) Areas in the 2005 year

Source: Research finding.

Poverty Range	Color
Very Low ($MPI < 3\%$)	
Low ($3\% \leq MPI < 4\%$)	
Medium($4\% \leq MPI < 7\%$)	
High ($7\% \leq MPI < 9\%$)	
Very High ($MPI \geq 9\%$)	

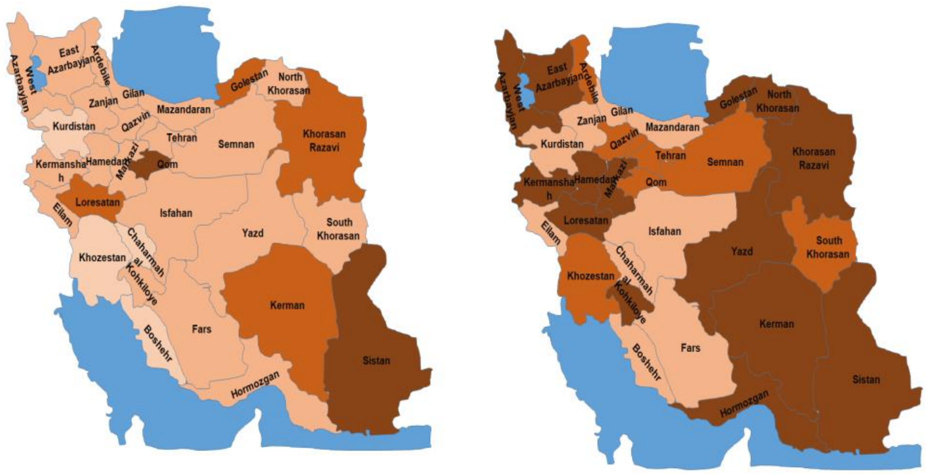

Figure 3. Multidimensional Poverty Map in Urban (Left Map) and Rural (Right Map) Areas in the 2010 year
Source: Research finding.

The Iranian government implemented the subsidy reform plan at the end of 2010, which aimed to liberalize energy prices and provide direct cash subsidies to citizens. One year later, in 2011, calculations showed that the multidimensional poverty index in urban areas had increased by approximately 1%, while rural areas experienced a decrease of about half a percent.

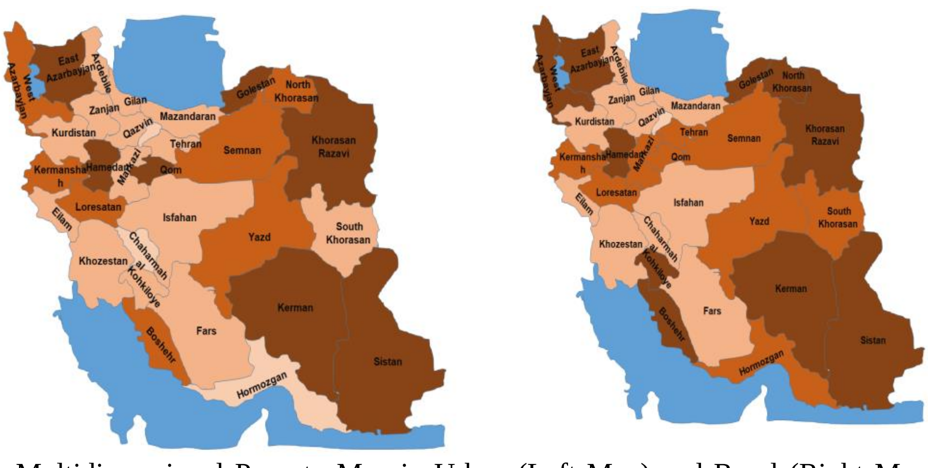

Figure 4. Multidimensional Poverty Map in Urban (Left Map) and Rural (Right Map) Areas in the 2011 year
Source: Research finding.

Poverty Range	**Color**
Very Low ($MPI < 3\%$)	
Low ($3\% \leq MPI < 4\%$)	
Medium($4\% \leq MPI < 7\%$)	
High ($7\% \leq MPI < 9\%$)	
Very High ($MPI \geq 9\%$)	

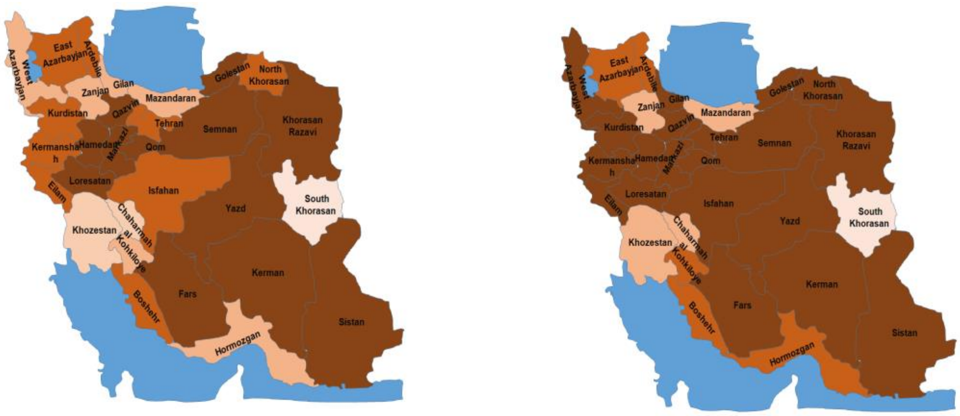

Figure 5. Multidimensional Poverty Map in Urban (Left Map) and Rural (Right Map) Areas in the 2013 year
Source: Research finding.

In early 2012, the United States imposed severe sanctions on Iran's nuclear program, including central bank sanctions, swift sanctions, oil exports sanctions, and shipping insurance sanctions. Figure 4 illustrates the multidimensional poverty map one year after these sanctions were imposed. By the end of 2013, calculations revealed that both urban and rural areas experienced an increase in multidimensional poverty index by about 1.4% and 2.4%, respectively. The poverty map was noticeably darker compared to the previous year before the sanctions were imposed. After Iran's elections in 2013, negotiations with P5 + 1+EU (permanent members of UN Security Council plus Germany and European Union) continued regarding Iran's nuclear program. On July 14, 2015, Iran signed the Joint Comprehensive Plan of Action (JCPOA), which restricted its nuclear program in exchange for lifted sanctions.

Figure 6. Multidimensional Poverty Map in Urban (Left Map) and Rural (Right Map) Areas in the 2016 year

Source: Research finding.

Poverty Range	Color
Very Low ($MPI < 3\%$)	
Low ($3\% \leq MPI < 4\%$)	
Medium($4\% \leq MPI < 7\%$)	
High ($7\% \leq MPI < 9\%$)	
Very High ($MPI \geq 9\%$)	

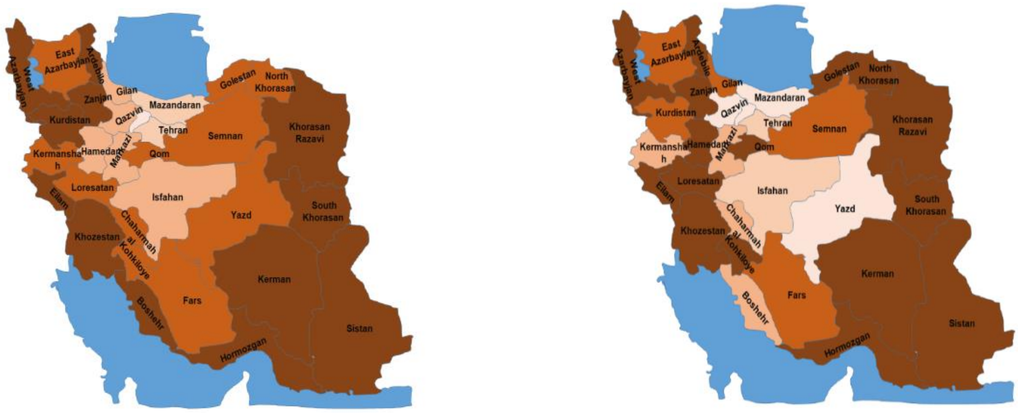

Figure 7. Multidimensional Poverty Map in Urban (Left Map) and Rural (Right Map) Areas in the 2019 year

Source: Research finding.

Figure 6 illustrates the poverty map one year after the JACOPA agreement, which indicates a decrease in multidimensional poverty in both urban and rural areas. The reduction in rural poverty has been particularly significant, with a 3% decrease in multidimensional poverty compared to 2015. In the same period, urban multidimensional poverty decreased by half a percent.

The US-elected government of 2017 did not have faith in the JACOPA agreement and subsequently withdrew from it in May 2018. As a result, all US government sanctions against Iran were reinstated. Figure 7 displays a multidimensional poverty map for urban and rural areas one year after the US withdrawal from the JACOPA agreement. The statistics reveal an increase of approximately 1.4% in multidimensional poverty in both urban and rural areas at the end of 2019 compared to 2018.

4.2 Empirical Results of Econometric Model

Before estimating the model, we should examine the stationarity of the variables to avoid the problem of spurious regression. Table 9 presents the results of the Levin, Lin, & Chu test.

Table 9. Unit Root Test (Levin, Lin, & Chu Test)

Variable	Test Type	Statistic	P-value
MPI_{it}(Urban)	With Intercept	-5.16	0.00
MPI_{it-1}(Urban)	With Intercept	-5.80	0.00
MPI_{it}(Rural)	With Intercept	-5.12	0.00
MPI_{it-1}(Rural)	With Intercept	-5.26	0.00
GS_{it}	With Intercept	-38.54	0.00
GS_{it}^2	With Intercept	-959.86	0.00
$Gini_{it}$	With Intercept	-4.93	0.00
$Gini_{it}^2$	With Intercept	-5.62	0.00
Inf_{it}	With Intercept	-9.63	0.00
Inf_{it}^2	With Intercept	-9.62	0.00
Y_{it}	With Intercept	-4.26	0.00

Source: Research finding.

According to these results, all variables are stationary. Therefore, in the next step, we estimate the econometric models for poverty. Table 10 displays the estimation results for the urban poverty model.

Table 10. Estimation Results

	Urban Model	Rural Model
Variables	Coefficient (St.Dev)	Coefficient (St.Dev)
MPI_{it-1}	-0.15** (0.07)	-0.10*** (0.03)
GS_{it}	-0.22*** (0.04)	0.03 (0.08)
GS_{it}^2	0.54*** (0.15)	0.39** (0.17)
$Gini_{it}$	-2.87*** (1.02)	-2.54*** (0.38)
$Gini_{it}^2$	4.35*** (1.43)	4.18*** (0.55)
Inf_{it}	-0.002*** (0.0003)	-0.002*** (0.0006)
Inf_{it}^2	0.00006*** (0.000008)	0.00005*** (0.00001)
Y_{it}	0.016*** (0.004)	0.014*** (0.004)
J-Statistic (P-value)	21.31 (0.31)	21.27 (0.32)
AR (1)- Arellano-Bond Serial Correlation Test (P-value)	-2.87 (0.00)	-2.45 (0.01)
AR (2)- Arellano-Bond Serial Correlation Test (P-value)	-0.36 (0.71)	-0.85 (0.39)

Source: Research finding.

Based on these results, we can summarize as follows:

The first lag of MPI has a significant negative impact on current MPI in both urban and rural models. This is because during an economic downturn or recession, poverty rates tend to increase due to factors such as job losses, reduced income levels, and limited access to basic services. However, it takes some time for these changes to be fully reflected in the index due to the lag of MPI. For example, let's consider a hypothetical business cycle where an economy enters a recession. Initially, there may be a decrease in employment opportunities and income levels, leading to an increase in poverty rates across multiple dimensions. However, the lag of MPI means that this increase might not be immediately captured by the index. The index relies on data collection and analysis processes that take time to accurately reflect changes. Therefore, during the early stages of a recession, the current MPI might not fully capture the extent of poverty caused by economic downturns. As time progresses and data is collected and analyzed, this lag diminishes and eventually reflects the increased poverty rates resulting from the recession. This delayed reflection is influenced by factors such as data collection cycles, survey periods, and processing times.

Government size has a nonlinear impact on MPI in urban model. At lower levels of government intervention, there may be limited resources and inadequate social safety nets, resulting in higher levels of poverty. In such cases, an increase in government size and intervention can have a positive impact on reducing poverty. This can be achieved through policies such as increased public spending on education, healthcare, social welfare programs, and infrastructure development. However, as government size continues to increase beyond a certain point, it may lead to inefficiencies, corruption, and misallocation of resources. Excessive bureaucracy and red tape can hinder economic growth and discourage private sector investment. In such cases, the negative effects of a bloated government can outweigh its positive impact on poverty reduction.

Gini coefficient has a nonlinear impact on MPI. Inequality may have a minimal impact on poverty levels until it reaches a certain threshold. Below this threshold, the distribution of income may not significantly affect the MPI. However, once inequality surpasses this threshold, it can exacerbate poverty levels and lead to a U-shaped relationship. In other words, as income increases, the additional benefits derived from each additional unit of income tend to diminish. This means that the impact of income inequality on poverty reduction becomes less significant as incomes rise. However, beyond a certain point, when income disparities become extreme, the negative effects of inequality start to outweigh any positive impacts from increased incomes. Furthermore, high levels of income inequality can lead to social exclusion and deprivation among certain groups in society. This can result in limited access to education, healthcare, housing, and other essential services for those at the lower end of the income distribution. As a result, poverty levels may increase disproportionately among these marginalized groups. Finally, Nonlinear relationships between income inequality and MPI can also be influenced by political and institutional factors. In some cases, high levels of inequality may be associated with weak governance structures or policies that favor specific groups or elites. These factors can further exacerbate poverty levels among disadvantaged populations.

Inflation has a nonlinear impact on MPI. At low levels of inflation, an increase in inflation can be a positive force for producers. It encourages them to increase their sales and ultimately boost their profits. Additionally, it leads to an increase in the income of producers and employment levels. Consequently, a low level of inflation may have a positive impact on reducing poverty. However, in high levels of inflation, the situation changes. It causes a decrease in the real income of employers, which subsequently affects their ability to provide necessary goods and services. As a result, the poverty rate tends to increase. To summarize, while low levels of inflation can be beneficial for producers and help alleviate poverty, high levels of inflation have adverse effects on employers' income and contribute to an increase in poverty rates.

Per capita income has a significant positive impact on MPI. If the increase in per capita income is concentrated among a small portion of the population, while the majority of people continue to earn low incomes, it can exacerbate income inequality. This means that even though the average income may be higher, those at the bottom end of the spectrum may still remain in poverty. Secondly, an increase in per capita income does not necessarily mean that the cost of living decreases proportionally. If basic necessities such as housing, healthcare, education, and food become more expensive, people with low incomes may struggle to afford these essentials despite an overall increase in average income. If an increase in per capita income is accompanied by high inflation rates, it can erode purchasing power and make it difficult for individuals to afford basic goods and services. In some cases, certain marginalized groups or regions may not have equal access to resources and opportunities even when overall per capita income increases. This can perpetuate poverty within these communities despite improvements at a broader level.

The Sargan test indicates no correlation between instrumental variables and error terms. Additionally, the Arellano-Bond serial correlation test confirms the relevance of the GMM method.

5. Discussion

Our results show that both urban and rural poverty rates have fluctuated over the years. However, it is important to note that rural poverty rates tend to be higher than urban poverty rates in most years. Based on our calculations, the average urban poverty rate is approximately 6.85% while the average rural poverty rate is around 10.29%. This finding is consistent with studies of Mahmoudi (2011) and Mahoozi (2015).

The nonlinear impact of government size on poverty is consistent with Zare and Zare (2018). The U-shaped relationship suggests that both excessive and insufficient government intervention can contribute to higher poverty rates.

Therefore, policymakers should strive to find the optimal level of government involvement in addressing poverty. This could involve targeted social welfare programs and policies that aim to reduce income inequality while avoiding excessive bureaucracy. The findings indicate that a certain level of government intervention is necessary to alleviate poverty. However, it is important to strike a balance between providing social welfare programs and ensuring fiscal sustainability. Policymakers should focus on designing effective and efficient social safety nets that target the most vulnerable populations while also promoting economic growth. Furthermore, excessive government intervention can lead to corruption, which can exacerbate poverty levels. To address this issue, policymakers should prioritize anti-corruption measures and promote transparency in governance. Strengthening institutions responsible for monitoring and combating corruption can help ensure that resources are allocated efficiently and effectively towards poverty reduction efforts. Also, The U-shaped relationship suggests that there may be an optimal level of government size beyond which it becomes detrimental to poverty reduction efforts. Therefore, policymakers should focus on creating an enabling environment for economic growth by implementing pro-growth policies such as investment in infrastructure, education, and innovation. Economic growth can help create job opportunities and increase incomes, thereby reducing poverty levels. Finally, it is important to recognize regional variations within Iran when formulating policies aimed at reducing poverty. Different regions may require different approaches based on their unique socio-economic characteristics and needs. Policymakers should consider implementing region-specific policies that address the specific challenges faced by each area.

The effect of income inequality and inflation on MPI is not consistent with previous research, which found a positive relationship between inequality and poverty, as well as between inflation and poverty. Since high inflation rates contribute to higher poverty levels, it is important for the Iranian government to adopt effective monetary policies to manage inflation. This can be done by controlling the money supply, interest rates, and practicing fiscal discipline. Additionally, reducing income inequality is crucial in order to decrease poverty rates. The government should concentrate on implementing policies that encourage fair distribution of income, such as progressive taxation, social welfare programs, and targeted subsidies for low-income individuals and households.

The positive impact of per capita income on the Multidimensional Poverty Index (MPI) reflects a growth pattern that is not beneficial for the poor, which contrasts with a growth pattern that is beneficial for the poor. The focus should be on creating more job opportunities and promoting programs that develop skills to improve the employability of those in poverty. This can be achieved by investing in sectors with high potential for labor-intensive work, implementing vocational training programs, and providing support for entrepreneurship. It is also important to prioritize initiatives for rural development in order to reduce poverty rates in rural areas, where poverty tends to be more prevalent. This may involve investing in infrastructure development, modernizing agriculture, providing access to credit for farmers, and improving basic services such as healthcare and education. Additionally, it is crucial to improve access to quality healthcare and education for all individuals, regardless of their socio-economic background. This can be done by increasing public spending on these sectors, expanding coverage of health insurance programs, reducing out-of-pocket expenses for essential services, and enhancing the quality of education in low-income areas. Lastly, it is essential to ensure that economic policies are designed with inclusivity in mind by considering their impact on different segments of society. Encouraging investment in sectors that have a high potential for job creation and income generation for those living in poverty is key.

6. Conclusion

The purpose of this article is to gain a comprehensive understanding of multidimensional poverty in the Iranian economy in recent years. The Alkire & Foster method was used to calculate the multidimensional poverty index for urban and rural areas in all 31 provinces of Iran from 2005 to 2019. The findings indicate that rural poverty has consistently been higher than urban poverty during this period. Additionally, the border provinces, particularly those in the eastern region, experience higher levels of multidimensional poverty compared to other regions, particularly central regions. For instance, Sistan & Baluchestan province had the highest rate of rural multidimensional poverty throughout the study period. The results also reveal that multidimensional poverty has increased since the imposition of U.S sanctions, while there was a reduction in multidimensional poverty following the JACOPA agreement. However, one year after the United States withdrew from this agreement, multidimensional poverty increased again. Therefore, this study suggests that Iran's return to the JACOPA agreement could help curb the rising trend of multidimensional poverty in Iran.

Additionally, our study conducted a dynamic panel data analysis to assess the influence of macroeconomic variables on MPI. The findings indicate that the preceding period's MPI has a noteworthy detrimental effect on the present MPI in both urban and rural models. Moreover, government size, income inequality, and inflation exhibit a nonlinear relationship with MPI. Lastly, per capita income demonstrates a substantial positive association with MPI, reflecting a pattern of growth that disproportionately affects the poor in Iran. Based on these results, we can present some policy implications for reducing poverty in Iran:

Given that government size has a nonlinear impact on MPI with a U-shaped relationship, policymakers need to find an optimal balance in terms of government intervention and regulation. It is crucial to ensure that government policies and programs effectively target poverty reduction and social welfare, while avoiding excessive bureaucracy and inefficiencies that could hinder economic growth and exacerbate income inequality.

The finding that income inequality has a U-shaped impact on MPI suggests that both extreme inequality and extreme equality can be detrimental to poverty reduction efforts. Policymakers should aim to address income disparities by implementing progressive taxation, redistributive policies, and social safety nets. This may involve initiatives such as targeted cash transfer programs, skills development programs, and policies that promote inclusive economic growth and job creation.

Given the nonlinear impact of inflation on MPI, policymakers should strive to maintain price stability and manage inflation effectively. High or volatile inflation can erode the purchasing power of low-income households, making it more difficult for them to escape poverty. Implementing sound monetary policies, fiscal discipline, and targeted social protection programs can help mitigate the adverse effects of inflation on poverty.

The finding that per capita income has a significant positive impact on MPI reflects anti-poor growth in Iran. To address this, policymakers should focus on implementing policies that promote inclusive economic growth, job creation, and income generation for the poor. This could involve investments in sectors with high poverty reduction potential, promoting entrepreneurship and small business development, and ensuring equitable access to economic opportunities and resources.

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Appendix

Table A1. The MPI in Urban Areas during 2005-2012

	2005	2006	2007	2008	2009	2010	2011	2012
East Azarbayjan	0.074026	0.083333	0.105556	0.083193	0.079762	0.059171	0.091036	0.070019
West Azarbayjan	0.066502	0.060224	0.069824	0.070518	0.089018	0.062514	0.077741	0.070184
Ardebile	0.053894	0.062571	0.030864	0.063161	0.057307	0.045102	0.048404	0.058986
Isfahan	0.067296	0.051797	0.04925	0.064152	0.065756	0.056252	0.057475	0.067138
Alborz	-	-	-	-	-	-	0.034627	0.057616
Eilam	0.033772	0.035238	0.036791	0.046985	0.05251	0.047974	0.052418	0.071171
Boshehr	0.028734	0.036934	0.022381	0.020343	0.05095	0.036878	0.080968	0.089364
Tehran	0.034566	0.043123	0.034524	0.041203	0.069482	0.044874	0.050294	0.053885
Chaharmahal	0.046788	0.036384	0.012355	0.020315	0.063128	0.03877	0.038491	0.034601
South Khorasan	0.060544	0.052381	0.050595	0.065939	0.083144	0.065576	0.060274	0.018681
Khorasan Razavi	0.083378	0.084524	0.055696	0.061615	0.086139	0.063027	0.080012	0.063421
North Khorasan	0.093333	0.129286	0.09949	0.08583	0.087108	0.078435	0.095406	0.087503
Khozestan	0.042857	0.068824	0.067489	0.037826	0.067054	0.036064	0.046218	0.037964
Zanjan	0.061968	0.034226	0.047738	0.041013	0.066864	0.051342	0.041118	0.038103
Semnan	0.052765	0.065382	0.038844	0.052629	0.062945	0.055008	0.070437	0.074327
Sistan & Balouchestan	0.132804	0.124431	0.145623	0.133589	0.177696	0.12516	0.138525	0.122354
Fars	0.050818	0.062093	0.06539	0.054762	0.074908	0.047098	0.061404	0.06472
Qazvin	0.049524	0.04756	0.040408	0.034791	0.064172	0.054185	0.058776	0.05842
Qom	0.093773	0.103242	0.083694	0.10532	0.128519	0.105217	0.129664	0.164245
Kurdistan	0.06	0.066726	0.043484	0.059576	0.073731	0.036614	0.048766	0.067247
Kerman	0.078804	0.069048	0.052934	0.059627	0.087376	0.084456	0.111936	0.107758
Kermanshah	0.111172	0.082978	0.053324	0.073366	0.076339	0.06863	0.074108	0.07374
Kohkiloye	0.049048	0.068231	0.050794	0.072408	0.089173	0.054942	0.069133	0.060602
Golestan	0.097889	0.081688	0.085927	0.085614	0.118281	0.087844	0.106745	0.100158
Gilan	0.034709	0.039002	0.032412	0.037282	0.05372	0.04276	0.052455	0.047992
Lorestan	0.060534	0.052143	0.042517	0.047852	0.069947	0.081413	0.07656	0.093224
Mazandaran	0.036585	0.045714	0.02719	0.034952	0.055432	0.042604	0.063873	0.063346
Markazi	0.037128	0.046429	0.056019	0.075304	0.076652	0.067621	0.05716	0.062721
Hormozgan	0.050331	0.067914	0.062681	0.070605	0.061745	0.048005	0.039695	0.034512
Hamedan	0.092043	0.083333	0.081755	0.051002	0.098719	0.063025	0.108202	0.099615
Yazd	0.11	0.076771	0.066071	0.093725	0.097216	0.060145	0.076512	0.062939
Country as a Whole	0.062754	0.06383	0.056995	0.062212	0.080918	0.060595	0.071919	0.070116
Mean	0.064853	0.065384	0.057054	0.061483	0.079493	0.060357	0.070917	0.070211
Median	0.060267	0.0639765	0.051864	0.060621	0.0743195	0.05563	0.063873	0.06472
St. Dev	0.026660	0.0242972	0.0276527	0.024822	0.0260859	0.0207043	0.0267131	0.0287249
Max	0.132804	0.129286	0.145623	0.133589	0.177696	0.12516	0.138525	0.164245
Min	0.028734	0.034226	0.012355	0.020315	0.05095	0.036064	0.034627	0.018681

Source: Research finding.

Table A2. The MPI in Urban Areas during 2013-2019

	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
East Azarbayjan	0.082402	0.074713	0.097045	0.069767	0.061044	0.069332	0.088905
West Azarbayjan	0.065079	0.074672	0.090599	0.117155	0.11305	0.093838	0.112558
Ardebile	0.081057	0.065769	0.08221	0.079337	0.074145	0.089144	0.115596
Isfahan	0.082266	0.059724	0.083468	0.05819	0.047721	0.046611	0.047272
Alborz	0.07627	0.035845	0.035597	0.035444	0.027111	0.028527	0.027845
Eilam	0.084547	0.090636	0.109189	0.100907	0.089891	0.083034	0.10865
Boshehr	0.071986	0.056639	0.09316	0.086046	0.06649	0.074748	0.096458
Tehran	0.083965	0.043713	0.047993	0.02569	0.031227	0.029501	0.031133
Chaharmahal	0.030312	0.025445	0.030821	0.038054	0.056346	0.054266	0.074772
South Khorasan	0.007937	0.016991	0.051474	0.09293	0.103425	0.100696	0.108649
Khorasan Razavi	0.080851	0.056263	0.072719	0.070318	0.063568	0.066013	0.074944
North Khorasan	0.115578	0.106633	0.091886	0.092959	0.091701	0.089821	0.099012
Khozestan	0.033877	0.051189	0.062045	0.101347	0.097403	0.076995	0.098887
Zanjan	0.052897	0.084041	0.094028	0.084591	0.088805	0.071155	0.098495
Semnan	0.097434	0.079316	0.072462	0.066677	0.063792	0.056448	0.078217
Sistan & Balouchestan	0.140231	0.135721	0.145363	0.161329	0.15111	0.152346	0.162901
Fars	0.104267	0.089304	0.080357	0.05989	0.063582	0.054525	0.073058
Qazvin	0.098615	0.084316	0.081985	0.05043	0.044388	0.055612	0.061565
Qom	0.187468	0.123101	0.120316	0.06796	0.061645	0.0652	0.088835
Kurdistan	0.083277	0.074243	0.062749	0.086845	0.095878	0.077275	0.0938
Kerman	0.130558	0.119048	0.116504	0.103091	0.109671	0.114064	0.13813
Kermanshah	0.08419	0.07749	0.081522	0.070871	0.071297	0.061905	0.084162
Kohkiloye	0.043783	0.027697	0.057994	0.065521	0.064854	0.049828	0.071869
Golestan	0.155064	0.127785	0.131678	0.117404	0.096898	0.076377	0.086615
Gilan	0.050965	0.047972	0.062302	0.049815	0.05087	0.043598	0.054259
Lorestan	0.106333	0.077846	0.090339	0.083849	0.089482	0.069717	0.084028
Mazandaran	0.063276	0.046718	0.043093	0.033087	0.024616	0.024821	0.032309
Markazi	0.111575	0.07483	0.070035	0.065069	0.06169	0.052744	0.061767
Hormozgan	0.054263	0.090632	0.082992	0.108301	0.095591	0.079649	0.099267
Hamedan	0.150406	0.07892	0.085744	0.055076	0.075712	0.088224	0.06608
Yazd	0.098982	0.07527	0.062564	0.047146	0.048714	0.051712	0.07612
Country as a Whole	0.088027	0.072617	0.079824	0.074292	0.072498	0.068774	0.08238
Mean	0.08741	0.073306	0.08033	0.075648	0.073604	0.069281	0.083747
Median	0.083277	0.07483	0.081985	0.070318	0.06649	0.069332	0.084162
St. Dev	0.038806	0.029566	0.026681	0.029318	0.027755	0.02608	0.029485
Max	0.187468	0.135721	0.145363	0.161329	0.15111	0.152346	0.162901
Min	0.007937	0.016991	0.030821	0.02569	0.024616	0.024821	0.027845

Source: Research finding.

Table A3. The MPI in Rural Areas during 2005-2012

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
East Azarbayjan	0.089309	0.132833	0.117579	0.100229	0.109484	0.093585	0.120519206	0.051199427
West Azarbayjan	0.114723	0.117832	0.122262	0.110409	0.113076	0.093724	0.095131485	0.084192817
Ardebile	0.088839	0.093238	0.087192	0.081486	0.079762	0.073858	0.06474434	0.057592647
Isfahan	0.060187	0.066577	0.059558	0.058841	0.07562	0.064559	0.064880113	0.069571091
Alborz	-	-	-	-	-	-	0.035803127	0.078787879
Eilam	0.062759	0.078018	0.061341	0.069324	0.070902	0.058493	0.043994765	0.052946081
Boshehr	0.037472	0.046402	0.030213	0.026706	0.052941	0.050928	0.092121212	0.092879395
Tehran	0.057976	0.065591	0.060664	0.077989	0.095927	0.089643	0.078960155	0.092828224
Chaharmahal	0.087805	0.070093	0.049557	0.054266	0.068254	0.059033	0.064304462	0.050940219
South Khorasan	0.135868	0.109219	0.137623	0.150016	0.128692	0.079126	0.073533915	0.04977287
Khorasan Razavi	0.158251	0.133653	0.115806	0.124805	0.153314	0.12638	0.117382413	0.100175285
North Khorasan	0.195938	0.188095	0.18019	0.181881	0.149695	0.132162	0.156778175	0.12694901
Khozestan	0.137973	0.111015	0.131848	0.093074	0.101495	0.075437	0.061825637	0.047907211
Zanjan	0.121955	0.109091	0.108381	0.064268	0.079352	0.051351	0.046057767	0.029597474
Semnan	0.044583	0.091837	0.072063	0.070401	0.088084	0.075822	0.085811467	0.082417582
Sistan & Balouchestan	0.193463	0.211622	0.23623	0.240919	0.246192	0.259003	0.231507491	0.208518818
Fars	0.069333	0.078906	0.069762	0.074449	0.077778	0.050009	0.060185185	0.06260342
Qazvin	0.072506	0.084702	0.068466	0.071962	0.085578	0.079811	0.066831683	0.053807947
Qom	0.115449	0.106995	0.098547	0.121184	0.15121	0.086548	0.077872073	0.131375393
Kurdistan	0.104709	0.109107	0.088192	0.086222	0.091865	0.067238	0.062307988	0.077560602
Kerman	0.161806	0.131125	0.111839	0.121336	0.17189	0.119954	0.111068727	0.119014132
Kermanshah	0.122595	0.147291	0.098519	0.101867	0.122164	0.092646	0.078201369	0.083832335
Kohkiloye	0.144121	0.189453	0.096944	0.130412	0.139774	0.122109	0.11462585	0.123911565
Golestan	0.188571	0.154762	0.166735	0.176405	0.200035	0.162146	0.160434174	0.155204132
Gilan	0.065403	0.053934	0.059112	0.077372	0.074115	0.061158	0.064138476	0.055171918
Lorestan	0.132561	0.112514	0.057087	0.083785	0.11717	0.098481	0.072168764	0.100091256
Mazandaran	0.042328	0.045693	0.043269	0.052619	0.058856	0.042902	0.053848506	0.059011164
Markazi	0.084772	0.078664	0.095938	0.130952	0.135845	0.115916	0.076335656	0.082343695
Hormozgan	0.177174	0.161529	0.13159	0.155121	0.127613	0.101262	0.074132217	0.04375483
Hamedan	0.116035	0.126706	0.1132	0.073441	0.134654	0.108729	0.121586276	0.103482947
Yazd	0.107476	0.092399	0.10518	0.108318	0.122298	0.092824	0.086526538	0.069517544
Country as a Whole	0.109648	0.111969	0.101205	0.104563	0.117886	0.095417	0.089727946	0.084812874
Mean	0.1097313	0.109963	0.099162	0.102335	0.1141211	0.092827	0.0875361	0.0837728
Median	0.1110995	0.109099	0.097731	0.089648	0.11128	0.088095	0.07633565	0.07878787
St. Dev	0.0463079	0.042337	0.044007	0.045425	0.0433462	0.042146	0.0401488	0.0377443
Max	0.195938	0.211622	0.23623	0.240919	0.246192	0.259003	0.2315074	0.2085188
Min	0.037472	0.045693	0.030213	0.026706	0.052941	0.042902	0.0358031	0.0295974

Source: Research finding.

Table A4. The MPI in Rural Areas during 2013-2019

	2013	2014	2015	2016	2017	2018	2019
East Azarbayjan	0.089923469	0.105291005	0.123788297	0.064620811	0.078849265	0.071604158	0.089470352
West Azarbayjan	0.091857506	0.085348559	0.102459941	0.100232838	0.095801412	0.100609524	0.148951472
Ardebile	0.081221198	0.074280011	0.101596864	0.084195997	0.079133115	0.074378882	0.090674145
Isfahan	0.095723297	0.093923034	0.105780797	0.046522324	0.031611099	0.040519878	0.039405124
Alborz	0.090678825	0.061336828	0.068498803	0.024328062	0.028031071	0.01562636	0.018639456
Eilam	0.100848656	0.144371043	0.16753496	0.132568515	0.104183609	0.086073675	0.091396408
Boshehr	0.070835614	0.057881773	0.090429043	0.066386555	0.030580217	0.034045394	0.061757392
Tehran	0.15033165	0.09552964	0.105122212	0.028	0.033363033	0.032309476	0.036426117
Chaharmahal	0.054715219	0.05184559	0.054064454	0.033082198	0.047619048	0.045043732	0.064195298
South Khorasan	0.027239997	0.038466734	0.091309695	0.082750103	0.143817758	0.146870363	0.168591692
Khorasan Razavi	0.103043111	0.0821513	0.090047393	0.075231284	0.077731935	0.083672661	0.098593604
North Khorasan	0.160509031	0.163519431	0.138273125	0.106321839	0.106731165	0.100513875	0.119568995
Khozestan	0.056132139	0.070896515	0.095405297	0.081811418	0.095674659	0.089269226	0.101077558
Zanjan	0.064056777	0.080494505	0.102353585	0.069107955	0.076533927	0.058412081	0.093554121
Semnan	0.103317175	0.090785908	0.105782313	0.05593985	0.060956333	0.06809822	0.088717645
Sistan & Balouchestan	0.217467015	0.232624113	0.246884893	0.251823849	0.24587721	0.264756408	0.251680672
Fars	0.109871032	0.09662567	0.097374847	0.06876964	0.070238095	0.058706379	0.079828378
Qazvin	0.091660704	0.088163958	0.096245266	0.031692134	0.041768243	0.030696229	0.02997003
Qom	0.171031746	0.134737996	0.128193657	0.066815476	0.078581433	0.080769231	0.096642247
Kurdistan	0.099271137	0.095188075	0.078103208	0.065086297	0.064063761	0.065626884	0.089963834
Kerman	0.181160984	0.205525264	0.199971443	0.166593294	0.160950804	0.147378464	0.178825553
Kermanshah	0.100918367	0.079114573	0.102198332	0.05651341	0.053323029	0.040355125	0.048474275
Kohkiloye	0.072390572	0.039281706	0.081265558	0.080477799	0.068021485	0.052770342	0.110159817
Golestan	0.203259596	0.188872621	0.182225019	0.117124677	0.093253968	0.089673147	0.100981621
Gilan	0.093067122	0.093034826	0.098746867	0.045305716	0.058106576	0.065759637	0.074426808
Lorestan	0.122298066	0.073736638	0.10621118	0.130870561	0.11973952	0.100598355	0.105977356
Mazandaran	0.069383345	0.059642069	0.04781713	0.017886562	0.013008515	0.018626212	0.02950408
Markazi	0.109265194	0.080867347	0.092874029	0.07831123	0.0594115	0.047816754	0.049014582
Hormozgan	0.088992035	0.147665963	0.134304786	0.155052975	0.13706485	0.112042737	0.116866594
Hamedan	0.176649958	0.120954076	0.117094017	0.060792014	0.087354942	0.103319864	0.095800209
Yazd	0.107279246	0.072270709	0.079634767	0.031565069	0.026541764	0.022715671	0.025049223
Country as a Whole	0.108671684	0.101593851	0.112024295	0.082546	0.08214	0.077751	0.09195
Mean	0.108206445	0.100142822	0.110696509	0.079863886	0.07961043	0.075763192	0.090134989
Median	0.099271137	0.088163958	0.102198332	0.06876964	0.076533927	0.06809822	0.090674145
St. Dev	0.045021217	0.047013962	0.041320313	0.048979338	0.04725935	0.048775759	0.049520935
Max	0.217467015	0.232624113	0.246884893	0.251823849	0.24587721	0.264756408	0.251680672
Min	0.027239997	0.038466734	0.04781713	0.017886562	0.013008515	0.01562636	0.018639456

Source: Research finding.