



The Effect of Household Head Characteristics on Poverty and its Intensity in Rural Households of West Azerbaijan Province

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Abstract

Purpose- In the present study, the impact of the household head's features on poverty and its intensity in rural households was investigated using the data related to income cost of rural households of West Azerbaijan during 2014.

Design/methodology/approach- To this end, the relative poverty line of the rural households was first estimated in this study. Then, the effect of household characteristics on the intensity of poverty and its incidence was examined as well. The two-step Heckman model was used in this regard through which the impact of variables on household poverty was explored and the likelihood of household poverty was calculated. Afterward, assessing the poverty intensity of poor households, the effect of the study variables on the intensity of poverty of these households was investigated.

Findings- The results of the study showed that the age, marital status, employment, and literacy level of the household head had a significantly positive effect on decreasing the incidence of poverty of the households. In addition, being married, the higher level of education, and employment of the household head, and also increasing the number of employed members in the household alleviated the severity of poverty among rural households.

Research limitations/implications- The main limitation of this study was the lack of direct access to statistics and that extraction of data from micro-households was time-consuming.

Practical implications- Considering the high probability of poverty at the beginning of the young age and retirement, actions must be taken to minimize the negative consequences of poverty in these ages through appropriate social security systems. Furthermore, given that being married reduces the incidence of poverty, careful planning is required to increase employment opportunities, to develop the culture of marriage, and therefore, to reduce the level of divorce in the society.

Originality/value- In this article, an attempt has been made to study the influence of individual characteristics of the household head on poverty incidence and its severity in rural households of West Azerbaijan Province using the relative poverty line system. Moreover, based on the aim of the study, the severity of poverty and its incidence are to be separately investigated.

Key words- Intensity of poverty, personal characteristics of the household head, relative poverty line, Two-step Heckman model, West Azerbaijan Province.

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1. Introduction

Poverty is a dilemma which human communities have somehow been facing with during all time periods. This phenomenon is a sign of economic, social, and cultural underdevelopment that threatens political stability, social solidarity, and also mental and physical health of the nations. Besides, it leads to an increase in the rate of mortality, a decline in average life expectancy, and economic productivity. In addition, poverty results in the appearance of social diseases and corruption in the community. Therefore, poverty reduction is considered one of the most important discussions of development. A number of scholars in the field of economic development such as [Emwanu, Kanyerezi, Bwoogi & Muwonge \(1995\)](#) believe that combat against poverty is a prerequisite for growth. Nevertheless, anti-poverty programs depend on the identification of various aspects of poverty phenomenon and its causes and consequences in addition to policy-making efficiency and implementation of the programs. Accordingly, as stated by [Najafi and Shooshtarian \(2007\)](#), investigation and awareness of poverty status in a society is the first step in planning for combating the poverty and deprivation.

According to the [World Bank \(2005\)](#), poverty is not just a problem of low income, but it is a multi-dimensional phenomenon and problem which includes less accessibility to opportunities for human capital development and education. The [United Nations Development Program Reports \(1996\)](#) state that income poverty is only part of the problem and that poverty must be considered with regard to various dimensions and human poverty concept. [Singh et al. \(2013\)](#) indicates that the rate of human poverty is more than that of income poverty, depriving every individual of assets and opportunities s/he deserves to have.

Demographic and economic characteristics of the households are among the factors affecting the rate of poverty of the households. Population variables such as marital status and age of the household head and the size of the household along with other economic factors including the type of occupation and the source of household income, etc. are contributing factors to household poverty. Marital status of the household head can also be effective in alleviating the rate of poverty

and increasing the rate of income. This is accomplished by providing a soothing environment for living and enhancing productivity by increasing the concentration on job-related issues. Besides, the age of the household head can have an impact on the living standards of the household in two ways. First, according to the life cycle hypothesis of Modigliani, individuals enjoy better productivity and efficiency in young and middle ages. Second, in middle age, people can have better occupations and further access to higher positions by increasing their skills and expertise ([Mohammadzadeh, Motefakerzade, Sadeghi, & Hekmati Farid, 2012, p. 8](#)). As mentioned by [Balazadeh \(2006\)](#), human capital is an accumulation of knowledge which is non-physically embedded in the workforce. This capital includes a set of personal skills and abilities that each individual brings to the work market and increases the potential capacity of the household income generation and alleviates the likelihood of poverty through efficiency and productivity. Being aware of the extent of the ruling poverty in society and its effective causes, is regarded as the most significant issue in designing the programs for poverty alleviation. Given the importance of this issue, in the present study, attempts are made to evaluate the effect of individual characteristics of the household head on poverty occurrence and its intensity among the households of West Azerbaijan Province employing micro-data.

2. Research Theoretical Literature

2.1. Poverty line

One of the most controversial issues in welfare economics is probably measuring poverty and minimum livelihood. The expansiveness of the concept of poverty and its different perceptions have an influence on the development and selection of poverty indicators. It can be considered in three types of the absolute, relative, and subjective poverty line.

According to [Bagheri, Daneshparvar, & Kavand \(2007\)](#), absolute poverty line is defined as the amount of income that is required considering the cultural, social, economic, etc. contexts of the community under investigation in order to meet the minimum needs of the individuals (such as food, clothing, housing, etc.), or providing the least conditions (like minimum amount of income,

education, housing, etc.) the lack of which cause the person under study to be considered as poor. In addition, relative poverty line, as mentioned by [Khodadad Kashi, Heidari, & Bagheri \(2005\)](#), is generally considered as a certain percentage of the median (average) distribution of the income (cost) of community, and those whose income (cost) is lower than this threshold are regarded as poor. According to them, the poverty line, based on the relative concept, can be measured by calculating the average of the households' expenditures and determining a percentage of it as the poverty line. Of course, in this method, although the concept of relative poverty is emphasized, there is no reasonable viewpoint to determine the desired percentage. Besides, as they pointed out, determination of 50% or 66% is, in fact, optional and empirical and every researcher can calculate it for himself. In this method, the average of the households' expenditures is first calculated, and then at the next stage, 50 or 66 percent of the average expenditures are considered as the poverty line.

Various factors affect the likelihood of poverty including the age, marital and employment status as well as the literacy level of the household head which will be briefly discussed in the following sections.

2.2. Poverty and age of the household head

As the age of the head of household increases, at first, the household income increases whereas poverty decreases, but during the time and after reaching a stage, the household incomes are reduced and the incidence of poverty increases. This confirms the life cycle hypothesis of Modigliani. According to this hypothesis, people are more efficient during middle age. However, their efficiency and income gradually decrease as they become older and reach the age of retirement ([Anyanwu, 2013, p. 11](#)).

2.3. Poverty and activity status of the household head

[Mohammadzadeh et al. \(2012\)](#) found that the following issues can affect the household poverty through productivity or income rate of each sector: the type of household occupation regarding the employment in industry, agricultural, and services sectors in addition to the household income sources respecting that the household income is obtained either from a public/private

salaried sector or a self-employed agricultural or a non-agricultural site.

2.4. Poverty and literacy level of the household head

Increasing the literacy level of the household head reduces poverty in two ways: a) innate and individual abilities, and b) behaviors and decisions that increase the probability of success in achieving different basic needs. Schultz and Becker who are the pioneers of human capital literature claim that education is considered as an investment on the existing resources (cost of time opportunity and direct costs) to obtain future returns. Schultz believes that acquiring knowledge either through formal education or in-service training is regarded as an investment on human beings. In his viewpoint, education and health, in other words, human acquired abilities are the most important source of growth for economic development in recent years. In addition, Becker indicated that human capital is acquired not only through the accumulation of educational capital, but also through unlimited ways. [Zuluaga \(2007\)](#) also considers human capital and skill training as a form of investment which leads to higher profitability as obtaining more income. Furthermore, Sen thinks that education affects individuals' attitudes, inherent competence, behavioral tendencies, and their acquired opportunities. Besides, according to [Zuluaga](#), through education not only individuals are able to earn more financial income but also their decisions and attitudes are affected by it, increasing the likelihood of being successful in meeting the primary needs, which both lead to a decline in the rate of poverty.

2.5. Poverty and marital status of the household head

In some studies, it has been demonstrated that marriage had a great effect on reducing the incidence of poverty. They discussed that the occurrence of poverty was higher in single people and single-child families as compared to married people ([Blank, 1997](#); [Furstenberg, 1990](#); [Garfinkel & McLanahan, 1986](#); [White & Rogers, 2000](#)). Being married, as mentioned by [Mohammadzadeh et al. \(2012\)](#), can provide a comforting environment for living and increase productivity by enhancing the focus on occupational issues. Therefore, it can be effective

in increasing income and reducing the rate of poverty.

According to Anyanwu (2013), marriage has significant features which increase the accumulation of wealth. One of these features is that it yields long-term commitments that enhance the productivity and efficiency of the family through the specialization of the couple in their specific skills and duties. Second, marital expectations and obligations encourage people to purchase a house, save up for the child education, acquiring a car and other assets. Third, the economic scale of consumption demonstrates that married people as compared to the single ones can meet their needs at a lower cost. Fourth, married individuals may have access to various benefits including health and life insurance which are offered by their employment opportunities. Fifth, studies indicate that married people have more income than single ones. Eventually, marriage expands the social network and support which often includes opportunities and benefits that lead to savings.

2.6. Poverty measurement indicators

As stated by Mohammadzadeh et al. (2010), the number of poor people and the poverty line cannot describe the pattern of poverty per se since poverty intensity can vary depending on the poverty line and a similar number of poor people in two or more societies. Therefore, to understand the rate of poverty in every society, there exist some indicators showing the severity of poverty. According to them, rate of income inequality among poor people, average income of poor people, rate of poverty line, total number of the poor, and total number of people of the community are among the factors affecting the severity of poverty, and the difference in each of them results in diversity in poverty intensity. Some of these indicators are focused on in this section.

Poverty gap index- The reason for employing this indicator is that it is based on the total distance of the poor from the poverty line, which reflects the depth of poverty. In other words, it is an indicator of the average poverty gap in the society, in which the poverty gap is equal to zero for those who are not poor. Using the index function, it can be written as:

$$G_i = (Z - Y_i) \cdot I(Y_i < Z) \quad (1)$$

Where G_i and denote the poverty gap and Y_i expenses of the individual i . As a result, the poverty gap index of P_1 can be defined as follows:

$$P_1 = \frac{1}{N_p} \sum_{i=1}^{N_p} \frac{G_i}{Z} \quad (2)$$

This index, according to World Bank (2005), is an indicator of the extent of poverty but ignores inequality of income among poor people.

This indicator can be expressed as follows:

$$P_1 = \frac{1}{N_p} \times \frac{G}{Z} \quad (3)$$

in which G is referred to as the sum of the poverty gap and is defined as follows:

$$G = \sum_{i=1}^N G_i = \sum (Z - Y_i) \quad (4)$$

The intensity of the poverty index (the square of poverty gap)- This indicator not only considers the distance of poor people to the poverty line (poverty gap) but also calculates the inequality among the poor. That is, a higher coefficient is assigned to those households that are away from the poverty line. Similar to the poverty gap, the application of this indicator faces a limitation regarding some non-monetary indicators (World Bank, 2005, p. 70-71). This index can be written as follows:

$$P_2 = \frac{1}{N_p} \sum_{i=1}^{N_p} \left(\frac{G_i}{Z} \right)^2 \quad (5)$$

2.7. Theoretical background

In this regard, many studies have been conducted inside and outside of the state some of which are briefly discussed in this section. Merz and Rathjen (2011) investigated the determinants of poverty intensity using cross-sectional data of German households during 1992-2002. In this study, estimating time and income poverty line, the researchers attempted to calculate the intensity of poverty, and then to examine the determinants of poverty intensity using the two-step Heckman model. The effect of gender, age, marital status, education level, occupation, and household head's type of activity on the incidence of poverty and its intensity were also explored.

Similarly, Singh et al. (2013) in their study tried to examine the factors contributing to rural poverty in India. In this study, to explore the determinants of poverty and also poverty line, socio-economic indicators and the \$2 per day

method were used, respectively. In addition, to identify factors affecting poverty, the Probit model was undertaken. The results indicated that the length of education years of the household head had a significantly positive influence on poverty alleviation. Besides, household size, dependency burden, and employment in the agricultural sector had an impact on poverty.

In the same vein, [Anigbogu, Onwuteaka, Anyanwu, & Okoli \(2014\)](#) in an article studied the impact of household composition and anti-poverty programs on household welfare applying the ANCOVA-regression model and survey data obtained from two socio-cultural and economic communities in northern and eastern rural districts of Nigeria. The results demonstrated that the effect of household composition on welfare was dependent on geographical, socio-cultural, and economic characteristics of the area and that anti-poverty programs had a significant impact on welfare in one of the areas. However, no effect was found on other areas in this respect. Therefore, policies regarding the elimination of poverty should recognize the particularities of the area.

In another paper by [Salman and Ekong \(2015\)](#), the determinants of poverty were explored among fishing households of Akwalbom state in Nigeria employing questionnaires and descriptive statistics. To this end, the two-stage least square (2SLS) model was used to analyze the data. The results showed that the average age of the household head was 41.9 years (7 persons per household). It was also found that the household belonged to at most two communities among which fishing was one of the most important associations with 52.6% participation index in decision making.

[Siwar et al. \(2016\)](#) also attempted to examine and assess the relationship between poverty and socio-demographic characteristics of the households in Malaysia using the Implementation and Coordination Unit (ICU) data obtained from the household survey in 10 districts of Kelantan during 2008-2011. The results demonstrated that the majority of the households of every district were experiencing poverty. The findings also revealed that most of the households (55% on average) of various ethnics were exposed to poverty. Similarly, the highest number of households in every occupation group were susceptible to poverty.

In addition, [Sissons, Green, & Lee \(2017\)](#) investigated the connection between the employment structure and household poverty in the United Kingdom using the data obtained from the Family Resources Survey (FRS) and income-expenditure data of 20,000 households per year (during 2009-2012). To this end, this research proposed distinct patterns regarding the effect of the employment sector and other factors on poverty. The findings indicated that the household head's characteristics particularly the employment of the individual strongly alleviated the rate of poverty.

[Mohammadzadeh, Falahi, & Hekmati Farid. \(2010\)](#), using the data obtained from the income-expenditure pattern of the urban households of the state and employing the linear expenditure system (LES), sought to estimate and calculate poverty line and poverty measurement indicators, respectively. In addition, they investigated the determinants of poverty at the micro level. The effect of the household characteristics on the incidence of poverty was also explored through the Probit model in 2008. The results revealed that the highest rate of poverty incidence reduction of urban households belonged to the age and education level of the household head. Moreover, the age of the household head, the ratio of the number of household members earning income, and the household size were influential in decreasing the incidence of poverty in the households.

Furthermore, in another study, [Mohammadzadeh et al. \(2012\)](#) investigated the poverty gap determinants of urban and rural households of the state. In this respect, poor rural and urban households were first identified according to an implicitly directly additive demand system (AIDADS), and then the determinants of poverty and poverty gap incidence were explored employing the two-stage Heckman model. The results indicated that age, level of education and the main activity of the household head along with the literacy rate of the household and also having a computer and Internet line were among the most important factors affecting the occurrence of poverty. In addition, gender and education level of the household head in addition to literacy rate of the household, the number of employed members of the household, and the type of household income source were considered as the

determinants of poverty gap among urban and rural households of the country.

In the same vein, [Grivani, Ahmadi Shadmehri, & Fallahi. \(2013\)](#) examined the characteristics of rural households in North Khorasan Province. In this study, data obtained from the household income and expenditure plan of Statistics Center (2010) regarding 679 households were used. Besides, the Tobit model was employed in order to explore the effect of variables like dependency burden, gender, age, expenditures on education and health, and being a farmer and non-farmer household on the probability of becoming poor. The results of the model showed that the variables of the dependency burden, age, and gender of the household head had a direct correlation whereas other variables demonstrated a reverse relation with the likelihood of becoming poor.

Investigation and identification of factors affecting the multi-dimensional poverty in rural areas of Iran were also conducted by [Yousefi, Mehdiyan, & Khalaj \(2015\)](#) in three groups of regional, relational, communal (social), and economic characteristics of the households. The statistical population of this research included all the households residing in rural areas of the country. To this end, population and housing census raw data of Statistic Center (2006) were applied. The results of this investigation indicated that 21.4% of the rural households were poor and the average deprivation of poor households was 31.5%. Moreover, investigation of influential factors in households poverty using logistic regression revealed that literacy, gender, education, marital status, occupation and age of the household head, the source of drinking water supply, sewage disposal system, the ownership of the residential unit, the number of children, dependency burden, the number of literate members of the household, geographical location, and the type of household nationality had a significant impact on poverty rate of rural households.

Similarly, [Salmani Moghadam, Zanganeh, & Bani Assad \(2017\)](#) tried to study the factors that had an effect on poverty in urban areas of Iran employing a library method during 1974-2015. The results of this research demonstrated the impact of various social, economic, physical, and cultural factors on poverty. Based on the income ranking obtained from 173 countries, Iran ranked 96th and was far from the top rankings of other countries. In

addition, the results showed that the relation between income and the cost of urban household in Iran was negative during the years 1974-2015. This implies that the purchasing power of people decreased and more people living in urban areas of Iran were at the risk of relative poverty. However, the relationship between income and expenditure was positive during 2014-15. Investigation of previous studies in this regard indicated that in the majority of them the estimation of poverty line was followed by exploring factors affecting the poverty. However, the impact of individual characteristics of the household head, through the relative poverty line system, on poverty and poverty intensity of rural households in West Azerbaijan Province has not been explored in these studies. Besides, in most of the studies, the likelihood of poverty incidence has not been addressed separately, which will be focused on in the present study.

3. Research Methodology

3.1 Geographical Scope of the Research

Data available in the cost and income plan of West Azerbaijan Province (2014) was collected from a sample of 638 rural households. The obtained data was related to the cost information in addition to other household information such as age, level of education, and also activity and marital status of the household head. In this study, poverty was defined as a virtual variable that took two values. If the household expenditure was below (that is, the household was poor) or above the poverty line, this virtual variable would be set as 1 or 0, respectively. Before estimating the Heckman model, the relative poverty line was determined.

3.2. Methodology

This was an applied study in which the data were collected using library and documentary methods. The data were applied to determine the poverty line including questionnaire survey data of the rural households' cost and income plan of West Azerbaijan in 2014. In this research, following extracting the relative poverty line, the households below the poverty line were identified. To determine the relative poverty line, 50 percent of the household average cost was used. Several studies also employed this method ([Elmi & Alitabar, 2012](#); [Khalidi & Permeh, 2005](#); [Mahmudi, 2013](#); [Makiyan & Saadaatkah, 2011](#)).

3.3. The Two-stage Heckman estimation method

Direct single-equation methods, among the econometric methods, are very useful for the ease of application. In terms of econometric methodology, two types of estimation errors are possible when using these models. First, the error which is due to the non-accidental nature of the samples and the second one which is related to the same assumption taking of the factors affecting the occurrence of poverty and poverty gap. Non-random sample selection means that the statistical sample only includes the households below the poverty line and people who are above the poverty line are excluded from the statistical sample. The concept of the second-type error is that factors that have an impact on the reduction of poverty incidence are not necessarily the same as those factors that determine the rate of poverty gap, but they can be as two different sets of variables.

The Tobit model eliminates the first-type error or non-randomness of the sample using both groups (poor families and those who are not poor). However, the likelihood of the second-type error still persists. Heckman has proposed a two-stage method for estimating the Tobit model and also to solve the second problem. In Heckman's approach, the Tobit model is broken into the Probit and linear regression models in order to determine the effective factors in each of the two sets of variables mentioned above. Factors that can affect the probability of poverty and those affecting the poverty gap are included in the Probit and linear regression models as independent and independent variables, respectively. The dependent variable in the Probit pattern consists of a binomial variable with values of 1 and zero. That is, the dependent variable is a vector of 0 and 1, in which number 1 represents that the household is poor and 0 which denotes that the household is placed above the poverty line. To this end, in cases where the poverty gap value (Y_i) was greater than 0, the dependent variable of the Probit model (Z_i) was considered as 1. In cases where the poverty gap was equal to 0, the dependent variable of the Probit model was also considered 0. According to the above explanations, the two patterns obtained from the separation of the Tobit model are shown as follows:

The Probit model:

$$Z_i = B'W_i + V_i \quad ; i= 1,2,3,\dots,N \quad (6)$$

$$Y_i^* > 0 \quad \text{if} \quad Z_i = 1$$

$$Y_i^* \leq 0 \quad \text{if} \quad Z_i = 0$$

The linear regression model:

$$Y_i = B'X_i + \sigma\lambda_i + e_i \quad i=1,2,3,\dots,N \quad (7)$$

According to Heckman (1979), in the above models B' and σ are parameters of the model. Besides, W_i and X_i represent explanatory variables affecting the incidence of poverty and the poverty gap, respectively. In addition, e_i and V_i are error sentences in the above-mentioned patterns which are independent of explanatory variables and are based on the assumption of the normal distribution with a mean of 0 and a constant variance of δ^2 . Moreover, λ_i shows inverse Mills ratio which is calculated using the estimated parameters of the Probit model for all observations $Y_i > 0$ through the equation

$\lambda_i = \frac{\phi(\beta'W_i)}{\Phi(\beta'W_i)}$. In this equation, $\phi(\beta'W_i)$ and $\Phi(\beta'W_i)$ are density function and the cumulative distribution function of the random sentence, respectively.

To estimate the Probit model, the maximum likelihood estimation (MLE) method was used. The Probit pattern applies logistic and normal cumulative functions. For example, the cumulative distribution function of the randomized sentence ($\Phi(X'\beta)$) of the Probit model has a normal distribution. Therefore, the probability of (p_i) choosing the option 1 versus 0 is expressed as the following equation:

$$(8) \quad p_i = \text{prob}[Y_i=1 | X] = \int_{-\infty}^{x'\beta} (2\pi)^{-\frac{1}{2}} \exp(-\frac{t^2}{2}) dt = \theta(X'\beta)$$

$$\frac{\partial p_i}{\partial x_{ik}} = \phi(X'\beta) \beta_k$$

where Y_i and X demonstrate the dependent variable and a vector of explanatory variables that includes the properties of the studied households. Besides, β is the vector of the model parameters that should be estimated. The relationship between a particular explanatory variable and the possible consequences of choosing the desired option or $P(Y_i=1)$, is interpreted by means of the final effect, which is defined as a minor change in

the probability of choosing the value of 1 depending on the change in the intended explanatory variable. In other words, the final effect is the derivative of the estimated function relative to each of the explanatory variables at a given point. The final effect of the continuous explanatory variable on the probability of an option occurring under the condition of the stability of other variables is obtained from the following equation. In other words, the final effect is the derivation of the estimated function relative to each of the explanatory variables at a given point. The final effect of the continuous explanatory variable x_k on the probability of occurring the option $Y_i=1$ under the condition of the stability of other variables is obtained through the following equation:

$$\phi(X'\beta) = \frac{1}{\sqrt{2\pi}} \exp\left[-\frac{1}{2}(X'\beta)^2\right]$$

in which ϕ denotes the density function of the standard, normal, and random variable probability and is as follows:

$$\frac{\partial p_i}{\partial x_{ik}} = \phi(X'\beta) \beta_k \quad (10)$$

The symbol of the final effect is dependent on the symbol β_k and its size varies by $\phi(X'\beta) \beta_k$. As a result, the size of the final effect depends on the levels of all the variables available in the explanatory variables matrix. As stated by Greene (2008), various values of the independent variables provide different estimates of the final effects, but it is better to estimate the final effects in the mean value of the independent variables. If the explanatory variables are virtually defined as 0 or 1, the final effect is interpreted as a minor change in the probability of choosing the value of 1 depending on the change in the virtual explanatory variable of 0.

In the second step, the linear regression model (Model 2) is used for the observations that their Y_i is higher than 0. As equation 7 shows, at this stage, the inverse variable of the Mills ratio λ_i is added to the independent variables set in the regression model. The coefficient of this variable specifies the error caused by the sample selection. If this coefficient is statistically significant, deleting the zero observations from the observations set leads to the skewness of the

estimated parameters of the model. However, if such a coefficient is statistically equal to zero then, although deletion of the zero observations does not lead to the skewness of the estimated parameters, it results in the loss of the estimated efficiency. In addition, the presence of a reverse variable of the Mills ratio in the linear regression model eliminates the existence of heteroscedasticity in the original pattern and allows the application of the OLS (ordinary least squares) estimator (Greene, 1993).

In the MLE method, the likelihood function or its logarithm is employed, and thus a criterion called pseudo R^2 is used instead of R^2 which is as follows:

$$Pseudo - R^2 = 1 - \left(\frac{LLR}{LLUR}\right)^{\frac{2}{n}} \quad (11)$$

where $LLUR$ is the logarithm of the likelihood function for a model that contains explanatory variables plus the width from the origin. Besides, LLR denotes the logarithm of the likelihood function for a model that only contains the width from the origin. Since absolute magnitude $LLUR$ is smaller than absolute value LLR , therefore pseudo R^2 will be a value between 0 and 1. Note that since the value of the likelihood function is between zero and one, then its logarithm is negative.

3.4. Research variables and indices

In this study, age, level of education as well as activity and marital status of the household head were considered as the variables indicating the characteristics of the head of household. Besides, their effects on the probability of poverty reduction among rural households were investigated. To estimate this model among the rural households, the two-stage Heckman method as well as the MLE method and Stata software, were applied. The model used in this research was selected according to the theoretical principles of the subject and the experimental literature and using the data of the studies carried out by Merz and Rathjen (2011) and Njong (2010).

3.4.1 The first stage equation of the Heckman model

The regression equation of the Probit model (first stage of the Heckman model) is as follows:

In this model, the variables are defined as follows:

POV: The poverty variable for the households below or above the poverty line is 1 and 0, respectively (dependent variable).

AGE: The age group of the household heads according to their range: less than 20 years = 1; 20-30 (years)=2; 30-40 (years)=3; 40-50 (years)=4; 50-60 (years)=5; and 60-70 (years)=6. In addition, 70-80 (years)=7; and 80-90 (years)=8 (demographic variable).

AGES: The age square of the household head (demographic variable).

EDU: The education level of the household heads based on their classification: illiterate = 0; less than junior high school (third-grade) = 1; between junior high school (third-grade) and diploma=2; between diploma and BA=3; and between BA and higher=4 (human capital variable).

MAR: The marital status of the household head (having a spouse), where in case of not having a spouse (i.e., being single, divorced, or if the spouse is dead), it is 0 and if the person has a spouse (married) has a value of 1 (demographic variable).

FAL: Which indicates the activity status of the household head, where values 0 and 1 are indicators of the lack of employment or employment of the household head, respectively (demographic variable).

3.4.2. The second stage equation of the Heckman model

The simple linear regression equation (second stage of the Heckman model) is as follows:

$$PGAP2_i = \beta_1 MAR_i + \beta_2 SHAG_i + \beta_3 EDU_i + \beta_4 FAL_i + V_i \quad (13)$$

In this model, the variables are defined as follows:

PGAP2: The severity of household poverty, which is defined as the square of poverty gap of the household (dependent variable).

SHAG: Number of employed members of the households (demographic variable).

3.5 Research hypotheses

The main aim of this research was to investigate the effect of individual characteristics of the household head on the incidence of poverty and its severity among households in West Azerbaijan province. Accordingly, the research hypotheses were proposed as follows:

- The ageing index of the household head decreases the poverty occurrence of urban and rural households before the retirement age. It also increases the incidence of poverty in rural households after the retirement age.
- The marriage index of the household head alleviates the likelihood and the severity of poverty of rural households.
- A higher level of education of the household head leads to a decrease in the probability of poverty and also its severity in rural households.
- Employment of the household head reduces the incidence and severity of poverty in rural households.
- An increase in the number of employed members of the household results in a decline in the rate of poverty in rural households.

4. Research Findings

4.1. Estimation of the relative poverty line

In this study, detailed data on the cost and income plan of rural households in the West Azerbaijan province (2014) were used in the experimental part. In this year, the data were collected from 638 rural households by the Iranian Statistics Center using questionnaires. The obtained data included information regarding the costs of the households and other data such as age, education level and also the activity and marital status of the household head as well as the number of employed members of the household. Prior to estimating the Heckman model, two steps were taken to determine the relative poverty line. The results of the relative poverty line estimation based on the 50 percent average cost of the rural households indicated that the relative poverty line of the rural households in West Azerbaijan province in the year 2014 was 80725171 Rials, according to which the households whose costs were below the poverty line were considered as the poor.

4.2. Model estimation

4.2.1 Results of the first stage of the Heckman's model

The estimation results of the research model demonstrated that the regression was generally significant among the rural households since the LR statistic was more than the critical values of the table. In rural households' community, all the coefficients of explanatory variables were significant at a level of $<.05$. It should be noted

that the reported coefficients in Table 2 were the values of β_k and only indicated the effect of independent variables on poverty reduction. The results showed that the likelihood of poverty in rural households was significantly affected by the variables of age, the square of age, education level, marital status, and employment of the household head.

The rate of Pseudo R^2 for rural households was estimated 0.1944. The reported coefficients in

Table 1 are the values of β_k . Examining the output coefficients in this table revealed that being married, the higher level of education, and also the employment of the household head decreased the incidence of poverty. Moreover, an increase in the age of the household head in the early stages decreased the incidence of poverty while increasing it at subsequent stages.

Table 1. Estimation results of the Probit model of rural households in West Azerbaijan Province through MLE method

(Source: Research Findings, 2014)

Row	variable	β_k	Z
1	Constant	1.5342*	3.97
2	the age of the household head	-0.5941*	-3.48
3	The age square of the household head	0.0216*	3.39
4	The education level of the household head	-0.0983*	-2.84
5	The marriage of the household head	-1.002*	-5.07
6	The head of the household was employed	-0.6086*	-3.56
7	Number of observations	638	-
8	Log likelihood	-243.6928	-
9	LR chi2	117.62	-
10	Pseudo R^2	0.1944	-
11	Prob	0.000	-

* Significant at a level of <.05

To determine the final effects of each of the explanatory variables on the probability of poverty in rural households, the likelihood density function of the standard, normal, and random variable $\phi(X'\beta)$ was used. Besides, the final effect of the change in the explanatory variable was obtained through the calculation of $\phi(X'\beta)\beta_k$. The obtained values are presented in Table 2.

The investigation of the final effects' results among the rural households showed that the probability of poverty decreased by 13.61% with an increase in the age of the household head, but at older ages, the incidence of poverty increased slightly (1.68%). The negativity of the age coefficient of the household head and positivity of this variable's square indicated that it followed the second-grade form. As the age of the household head increased, at first, the household income increased and the occurrence of poverty decreased. However, through the time and after reaching a stage, the household incomes reduced and the incidence of poverty increased. This confirms the life cycle hypothesis of Modigliani.

Based on this hypothesis, middle-aged people had higher productivity and efficiency, but becoming older and reaching the age of retirement gradually decreased their efficiency and income level.

In the case of the marriage of the household head, the probability of poverty among rural households decreased by 31.50%, which, among other variables, had the highest effect on reducing the probability of poverty. In some studies, it has been shown that marriage had a remarkable impact on alleviating the probability of poverty. According to these studies, the incidence of poverty was higher for single people and single-child families as compared to married people. Married people compared to single ones were wealthier since the first group saved and accumulated a large proportion of their incomes and assets.

The education level of the household head was considered as an indicator of the human capital of the household and the potential capacity of income generation of the household increased through efficiency and productivity so that higher educational qualification, resulted in a decline in the probability of poverty by 6.4%. The results

also showed that the probability of poverty decreased by 16.36% in case the head of the

household was employed (Table 2).

Table 2. Estimation results of marginal effects after the Probit in the average of independent variables of $\phi(X'\beta)\beta_k$ of the rural households
(Source: Research Findings, 2014)

Row	variable	β_k
1	the age of the household head	-0.1361*
2	The age square of the household head	0.0168*
3	The education level of the household head	-0.064*
4	The marriage of the household head	-0.3150*
5	The head of the household was employed	-0.1636*

* Significant at a level of <.05

4.2.2 Estimating the poverty incidence in rural households

Figure 1 shows the probability of poverty based on changes in the age of the household head. As can be seen, the incidence of poverty among rural

households was higher at a young age. However, as the age of the household head increased so did the probability of poverty, but from the age of 50, an increase in the age of the household head also led to an increase in the probability of poverty.

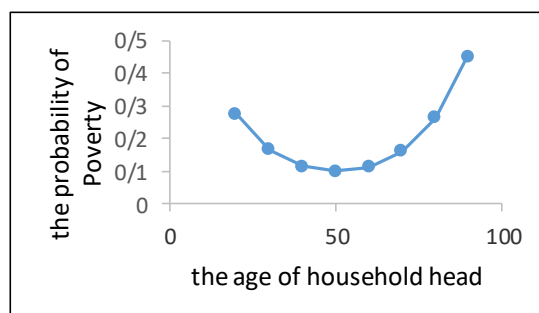


Figure 1. The probability of poverty by the age of the household head
(Source: Research Findings, 2014)

The probability of poverty of the rural households in terms of the basic level or educational degrees of the household head is provided in Figure 2. As the results show, the incidence of poverty among rural households was equal to 20.29% when the household head was illiterate. An increase in the

basic level or the educational qualification of the household head led to a decline in the incidence of poverty so that the probability of poverty was 2.63% for rural households with a BA degree and above.

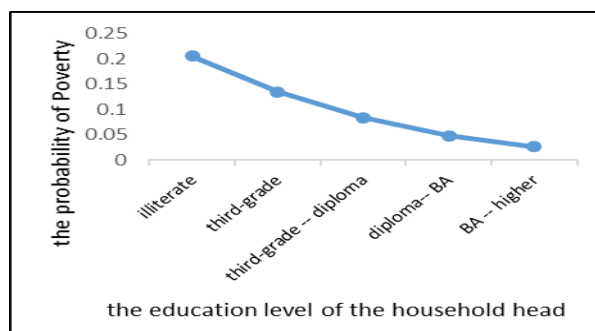


Figure 2. The probability of poverty by the basic level or educational degrees of the household head
(Source: Research Findings, 2014)

The probability of poverty by the marital status of the household head is represented in Figure 3. As can be seen, if the household head was married, the

probability of poverty would be decreased. That is, being married declined the probability of poverty among rural households from 43.87% to 12.36%.

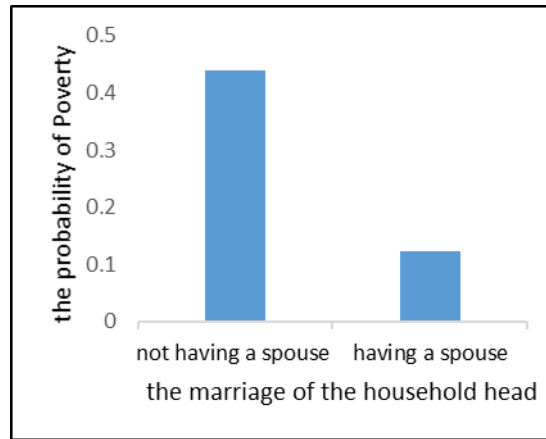


Figure 3. The probability of poverty by marital status of the household head
(Source: Research Findings, 2014)

The incidence of poverty respecting the activity status of the household head is shown in Figure 4. Analyzing the data indicates that the probability of poverty decreased if the household head was

employed so that the incidence of poverty alleviation among rural households reached from 28.10% to 11.73% upon the employment of the household head.

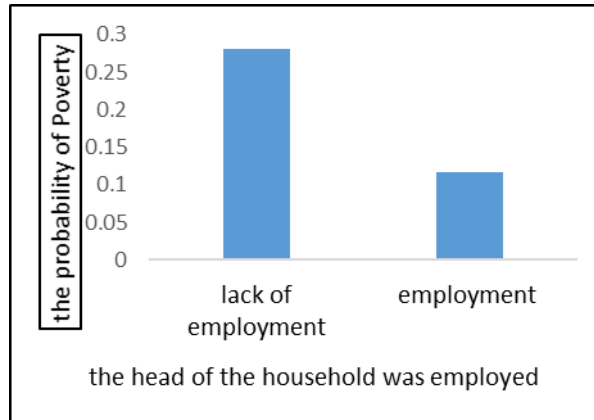


Figure 4. The probability of poverty by the activity status of the household head
(Source: Research Findings, 2014)

4.2.3 The results of the second stage of the Hackman model

The household poverty gap is defined as the ratio of the "gap between the poor household's expenditures and the poverty line" to "household poverty line". The results of the second stage estimation of the two-stage Heckman model are represented as a linear regression model in Table 3. The impact of variables such as age, level of education, and activity state of the household head, and also the number of employed members in the

household on the severity of poverty were explored. At this stage, based on the results of the Probit model, the inverse coefficient of Mills ratio was calculated for households with a high degree of poverty and was considered as one of the variables affecting the severity of poverty. The estimated results indicated that the effect of this variable on the severity of poverty was quite significant, indicating the need for using the two-stage Hackman model to avoid sample selection bias. Examination of other estimated coefficients demonstrated that the coefficients of activity status

and education level of the household head and also the remaining model coefficients were significant

at the levels of $<.10$ and $<.05$, respectively.

Table 3. Estimation results of the second stage of the Two-stage Heckman model (linear regression model-the effect of independent variables on the severity of poverty).
(Source: Research Findings, 2014)

Row	variable	β_k
1	activity state of the household head	-0.2173**
2	The marriage of the household head	-0.3667*
3	The education level of the household head	-0.0894**
4	the number of employed members in the household	-0.1494*
5	inverse coefficient of Mills ratio	0.5327252
6	ρ (correlation between e_i and v_i)	1
7	σ (Log of the standard error of residual in linear regression model)	0.53272519
8	Prob	0.001
9	Wald chi2	17.01

* & ** Significant at the levels of $<.05$ and $<.10$, respectively.

As the above table shows, the education level and the activity status of the household head reduced the severity of poverty among the rural households so that owing to the marriage and employment of the household head, the severity of poverty decreased about .3667% and .2173 %, respectively. Besides, the results indicated that higher educational qualification and the number of employed members of the household decreased the severity of poverty.

Discussion and conclusion

As previously mentioned, two types of errors were found possible in investigating the effect of family head characteristics on the severity of poverty. The first error was related to the non-random selection of the sample. It means that the statistical sample determining the factors affecting the poverty line only included households who were below the poverty line and those above the poverty line were not involved in the statistical sample. The second type of error was that influential factors in reducing the probability of poverty were not necessarily the same as those factors that would determine the severity of poverty, but could be of two different sets of variables. The Heckman model provided a two-stage method for estimating the poverty line determinants model, in which both types of error were avoided. The Heckman model included both Probit and linear regression models. In the first stage of the Heckman model, the Probit pattern was used to examine the effect of determinant indicators of individual characteristics of the household head and other factors affecting the probability of poverty reduction. And in the

second step, adding a reverse Mills coefficient, the effect of determinant indicators of individual characteristics of the household head and other factors affecting the severity of poverty were investigated. The results of this study are in line with the findings of several studies (Grivani et al. 2013; Merz & Rutjen, 2011; Mohammadzadeh et al. 2010, 2012; Singh et al. 2013;). The innovative nature of this study was related to the application of relative poverty line method in studying the impact of individual characteristics of the household head on the poverty level of rural households in West Azerbaijan Province and also the calculation of poverty incidence following the estimation of the Probit model.

The findings related to the age of the household head among the rural households demonstrated that the probability of poverty was high when the household head was very young. As was previously mentioned, as the age of the household head increased, at first, the household income increased and the probability of poverty decreased. However, over the time and after reaching a stage, the households' incomes showed a decline and the incidence of poverty increased. This confirmed the life cycle hypothesis of Modigliani and indicated that the probability of poverty was found to be high at the beginning of the young age and also retirement age. With regard to the age of the household head which was effective in reducing the probability of poverty, young people and retirees need more support in different economic areas. Accordingly, attention to employment, housing, and marriage of young people, as well as

providing effective social services for the retired people can play an important role in reducing the probability of poverty of the households. Villagers' accessibility to financial and credit resources, appropriate extension, skill, and technology training, and participation in economic and social decision-makings at the local level are suggested to increase the welfare and reduce the poverty level of the youths and rural retirees.

The results of the study revealed that increasing the level of literacy of the household head would reduce the poverty and its severity in rural households. Besides, it was found that a higher level of education on the part of the household head decreased the probability of poverty. In this regard, it should be noted that the poor are less involved in raising the education level of the household head. In addition, combating poverty requires investment in more endangered households. In this respect, low-income rural households need to be given priority in state-run education investments in schools and universities.

The results also demonstrated that the incidence of poverty in households of the Province was highly affected by personal characteristics of the household head so that being married led to a decline in the incidence and severity of poverty among the rural households. Accordingly, the importance of developing the culture of marriage along with providing the necessary economic environment for the marriage of young people are

considered as the most important and required movements toward reducing the occurrence of poverty. Providing easy marriage conditions as well as conditions for housing and granting bank facilities can be a source of motivation for young people to be able to take responsibility for marriage. It is also recommended to study methods that increase the strength of the families and reduce the rate of divorce.

Meanwhile, the findings of the activity status of the household head in rural households also showed that employment of the household head alleviated the incidence and the severity of poverty. Therefore, considering the reducing effect of the household head's employment on the likelihood and the severity of poverty of the rural households, it is suggested to create productive employment opportunities for earning income by the household heads.

Moreover, the results of the simple linear regression model (second stage of Hackman model) indicated that having a spouse, employment, higher education level of the household head, and the number of employed members in the household reduced the intensity of poverty among the rural households.

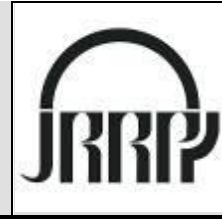
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بررسی تأثیر ویژگی‌های سرپرست خانوار بر فقر و شدت فقر خانوارهای روستایی استان آذربایجان غربی

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چکیده مبسوط

۱. مقدمه

پدیده فقر معضلی است که جوامع بشری در تمامی دوران‌ها به نوعی با آن روبرو بوده و هستند. این پدیده نمودی از توسعه نیافتگی اقتصادی، اجتماعی و فرهنگی است که ثبات سیاسی، همبستگی اجتماعی و همچنین سلامت جسمی و روحی ملت‌ها را تهدید می‌کند، موجب افزایش مرگ و میر، کاهش متوسط طول عمر و بهره‌وری اقتصادی می‌گردد. از سوی دیگر، فقر موجب پیدایش بیماری‌های اجتماعی و فساد در جامعه می‌شود. کاهش فقر به عنوان یکی از مهم‌ترین مباحث توسعه می‌باشد. تعدادی از محققان اقتصاد توسعه نظیر نظیر امانو و همکاران (۱۹۹۵)، بر این عقیده هستند که مبارزه با فقر شرط لازم برای رشد است. با این حال، برنامه‌های مبارزه با فقر همان اندازه که به کارایی سیاست‌گذاری و نحوه اجرای برنامه نیاز دارد، به شناخت ابعاد مختلف پدیده فقر و دلایل و پیامدهایش نیز وابسته است. بدین ترتیب بررسی و آگاهی از وضعیت فقر در یک جامعه اولین قدم در مسیر برنامه‌ریزی برای مبارزه با فقر و محرومیت است.

۲. مبانی نظری تحقیق

مرور کلی بر مبانی نظری و پیشینه پژوهش نشان می‌دهد که ویژگی‌های جمعیتی و اقتصادی خانوارها از جمله عواملی هستند که بر میزان فقر خانوارها مؤثر می‌باشند. متغیرهای جمعیتی نظیر وضعیت تأهل سرپرست خانوار، سن و بعد خانوار در کنار سایر متغیرهای اقتصادی نظیر نوع شغل و منبع درآمد خانوار و دیگر متغیرها از جمله مواردی هستند که بر فقر خانوارها مؤثر می‌باشند.

همسردار بودن سرپرست خانوار نیز از نظر مهیا نمودن محیطی آرام بخش برای زندگی و افزایش بهره‌وری از طریق افزایش تمرکز بر مسائل شغلی می‌تواند بر افزایش درآمد و کاهش فقر مؤثر باشد. همچنین، سن سرپرست خانوار از دو طریق می‌تواند بر سطح زندگی خانوار تأثیرگذار باشد. سرمایه انسانی انبارهای از دانش است که به صورت غیرفیزیکی در نیروی کار نهفته شده است. این سرمایه، مجموعه‌ای از مهارت‌ها و توانایی‌های فردی را شامل می‌شود که فرد در بازار کار آنها را به همراه دارد و از طریق کارایی و بهره‌وری به ظرفیت بالقوه درآمدزایی خانوار می‌افزاید و موجب کاهش احتمال فقر می‌شود. اطلاع از گستردگی فقر حاکم بر جامعه و عوامل مؤثر بر آن از مسائل مهم در تدوین برنامه‌های کاهش فقر به شمار می‌رود. با توجه به اهمیت این موضوع این مطالعه برآن است با استفاده از داده‌های خرد، تأثیرپذیری احتمال وقوع فقر و شدت فقر خانوارهای استان آذربایجان غربی از ویژگی‌های فردی سرپرست خانوار را مورد ارزیابی قرار دهد.

۳. روش‌شناسی تحقیق

در این مطالعه برای بخش تجربی مطالعه از داده‌های تفصیلی طرح هزینه و درآمد خانوارهای روستایی سال ۱۳۹۳ استان آذربایجان غربی استفاده شده است. در این سال مرکز آمار ایران از ۶۳۸ خانوار روستایی پرسشنامه پر نموده و اطلاعات هزینه‌ای به همراه سایر اطلاعات خانوار نظیر سن، سطح تحصیلات سرپرست خانوار، وضع فعالیت سرپرست خانوار، تعداد افراد شاغل در خانوار و وضعیت تأهل جمع‌آوری گردیده است که در این مطالعه از این داده‌ها بهره گرفته شده است.

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تحصیلات سرپرست خانوار در سطح زیر ۱۰ درصد و بقیه ضرایب مدل در سطح زیر ۵ درصد معنی دار می‌باشند.

۵. بحث و نتیجه‌گیری

در بررسی تأثیر ویژگی‌های سرپرست خانوار بر شدت فقر وجود دو نوع خطا محتمل است. خطای اول به انتخاب غیرتصادفی نمونه برمی‌گردد، به این معنا که نمونه آماری تعیین‌کننده عوامل مؤثر بر میزان خط فقر تنها شامل خانوارهای زیر خط فقر بوده و افرادی که بالای خط فقر هستند، در نمونه آماری در نظر گرفته نشده‌اند. مفهوم خطای نوع دوم این است که عواملی که بر کاهش احتمال وقوع فقر تأثیر گذارند با عواملی که میزان شدت فقر را تعیین می‌کنند لزوماً یکسان نیستند، بلکه می‌توانند دو مجموعه متفاوت از متغیرها باشند. روش حکمن، یک روش دو مرحله‌ای برای برآورد مدل عوامل تعیین‌کننده خط فقر فراهم می‌کند که در آن از بروز هر دو نوع خطا اجتناب می‌شود. الگوی حکمن، دو الگوی پروبیت و الگوی رگرسیون خطی را شامل می‌شود که در مرحله اول الگوی حکمن برای بررسی اثر شاخص‌های مشخص‌کننده ویژگی‌های فردی سرپرست خانوار و سایر عوامل مؤثر بر احتمال کاهش فقر از مدل پروبیت استفاده شده و در مرحله دوم با اضافه نمودن ضریب معکوس میلز اثر شاخص‌های مشخص‌کننده ویژگی‌های فردی سرپرست خانوار و سایر عوامل مؤثر بر شدت فقر مورد بررسی قرار می‌گیرد. نتایج این مطالعه با نتایج مطالعات مرز و راتجن (۲۰۱۱)، سینگ و همکاران (۲۰۱۳)، محمدزاده و همکاران (۱۳۸۹ و ۱۳۹۱) و گریوانی و همکاران (۱۳۹۲) همخوانی دارد. نوآوری این مطالعه به استفاده از روش خط فقر نسبی در بررسی تأثیرپذیری فقر خانوارهای روستایی استان آذربایجان غربی از ویژگی‌های فردی سرپرست خانوار و نیز محاسبه احتمال وقوع فقر پس از تخمین مدل پروبیت مربوط می‌شود.

کلید واژه‌ها: شدت فقر، ویژگی‌های فردی سرپرست خانوار، خط فقر نسبی، مدل حکمن دو مرحله‌ای، استان آذربایجان غربی.

تشکر و قدردانی

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پس از تعیین خانوارهای فقیر می‌توان نسبت به تعیین مقادیر متغیر فقر اقدام نمود که در آن متغیر فقر برای خانوارهای زیر خط فقر مقدار یک و برای خانوارهای بالای خط فقر مقدار صفر را اختیار می‌کند. برآورد الگوی حکمن در دو مرحله صورت می‌پذیرد. در مرحله اول لازم است عوامل مؤثر بر فقر در قالب مدل پروبیت مورد ارزیابی قرار گرفته و احتمال وقوع فقر محاسبه می‌گردد. در مرحله دوم عوامل مؤثر شدت فقر با اضافه نمودن ضریب معکوس نسبت میلز در قالب مدل رگرسیون خطی صورت می‌پذیرد. که با استفاده از متد MLE و به کمک نرم‌افزار Stata به برآورد مدل اقدام می‌شود.

۴. یافته‌های تحقیق

نتایج تخمین مدل تحقیق نشان‌دهنده معنی دار بودن کلی رگرسیون در بین خانوارهای روستایی می‌باشد چرا که آماره LR بیش از مقادیر بحرانی جدول می‌باشد. در جامعه خانوارهای روستایی، تمامی ضرایب متغیرهای توضیحی در سطح کمتر از پنج درصد معنی دار می‌باشند. باید دقت داشت ضرایب گزارش شده در جدول شماره دو مقادیر B_k بوده و تنها نشان‌دهنده جهت تأثیر متغیرهای مستقل بر کاهش فقر می‌باشد. نتایج حاکی از تأثیر معنی دار متغیرهای سن سرپرست خانوار، مجذور سن سرپرست خانوار، میزان سطح تحصیلات سرپرست خانوار، همسر دار بودن و شاغل بودن سرپرست خانوار بر احتمال وقوع فقر خانوار در خانوارهای روستایی می‌باشد. میزان $Pseudo R^2$ برای خانوارهای روستایی ۰/۱۹۴۴ برآورد شده است. نتایج برآورد مرحله دوم مدل حکمن دو مرحله‌ای در قالب مدل رگرسیون خطی نشان داده شده است و متغیرهای سن سرپرست خانوار، میزان سطح تحصیلات سرپرست خانوار، وضع فعالیت سرپرست خانوار، تعداد افراد شاغل در خانوار بر شدت فقر خانوار مورد بررسی قرار گرفته است. در این مرحله بر اساس نتایج مدل پروبیت، ضریب معکوس نسبت میلز برای خانوارهایی که شدت فقر در آنها مقداری مثبت است محاسبه شده و به عنوان یکی از متغیرهای تأثیرگذار بر شدت فقر در نظر گرفته شده است. نتایج برآورد نشان می‌دهد تأثیر این متغیر بر شدت فقر کاملاً معنی دار است که نشان‌دهنده لزوم استفاده از مدل حکمن دو مرحله‌ای برای پرهیز از تورش انتخاب نمونه می‌باشد. بررسی سایر ضرایب برآورد شده نشان می‌دهد ضریب وضع فعالیت سرپرست خانوار و میزان

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