Poverty Dynamics in Turkey: A Multinomial Logit Model

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Abstract. The availability of longitudinal data allows researchers to analyse the dynamics of poverty. By using the Turkish Statistical Institute's (TurkStat) Income and Living Conditions Survey micro dataset, we analyse the households' long-term monetary poverty conditions. We categorise poverty as transitory and chronic and employ the multinomial logit method to analyse determinants of each types of poverty. Results indicate that education and household size are the most effective factors for reducing transitory poverty, and for chronic poverty, the most effective factors are having a regular job and having a skilled occupation; insurance, home ownership, and number of children are important determinants for both types of poverty.
Keywords: poverty dynamics; chronic poverty; transitory poverty; multinomial logit.

1. Introduction

Poverty has long been an interesting topic to economists as well as to other social scientists. From its definition to its determinants, thus policy recommendations, it is an important topic. With the availability of large longitudinal data sets it has become possible to observe the same households for several periods. This development allows researchers to analyse the characteristics of poor households. We depart from the view that only a one-year income of a household is not informative enough to identify the reasons of not being able to achieve a certain standard of living. As one understands the characteristics and reasons of the poverty, then, policy recommendations become more specific and effective. For instance, a country with more strict resource constraints may target to eliminate only chronic poverty since it is more severe to a relatively small number of a population.

The aim of this study is to make a distinction between transitory and chronic poverty for the households in Turkey. By doing this, we can analyse the determinants of each

type of poverty and suggest policy tools to reduce them. Osmani (2007) defines transitory poverty as a situation where the expected income stays above the poverty line, but the actual income would fall below the poverty line in some periods. Chronic poverty has several definitions. While Bane and Ellwood (1986) count a household as chronically poor if its income falls below the poverty line for half of the observed periods or longer, Rodgers and Rodgers (1993) consider households as chronically poor if their average income falls below the poverty line. Hulme and Shepherd (2003), on the other hand, introduce five groups of poverty: always poor, usually poor, churning poor, occasionally poor, and non-poor, which will be explained later throughout the study. In addition, the Chronic Poverty Advisory Network (2014) also defines chronic poverty as extreme poverty that persists over years or a lifetime, and emphasises that is passed through generations in the Chronic Poverty Report 2014-2015.

Since relative poverty is a subjective concept usually defined in terms of the distance to the average income, different definitions may yield different results in analyses. Considering this, the present study contributes to the literature by employing three different poverty lines, which are 40%, 50% and 60% of the median income, and repeating the analysis with each poverty line. Therefore, we are able to check the robustness of our results to a change in the definition of the poverty.

2. Literature review

Gonçalves and Machado (2015) use a modified version of Hulme and Shepherd's categories in their multinomial logit analysis of poverty in Brazil for the period of 2002-2011. For tackling chronic poverty, they suggest insured employment, training, and income transfer programs, while they suggest credit access, training for compatibility between skills and labour demand, and unemployment insurance for transitory poverty. In an earlier study, Roberts (2000) analyses the dynamics of poverty for the South Africa for the period 1993-1998 and finds that the households with a female household head and in urban areas have a larger probability of falling into chronic poverty. Garza-Rodriguez et al. (2015) estimate a multinomial logit model and find that 36% of the poor in Mexico are chronically poor. While living in a large family, living in rural area, or a female household increases the probability of being chronically poor, the probability to escape chronic poverty decreases with the education level and household age as well as having access to potable water and electricity in the house.

In order to analyse the determinants of poverty in Indonesia, Dartanto and Nurkholis (2013) employ a national socio-economic survey and divide the sample into three parts, such as chronic poor, transitory poor, and non-poor. While chronic poor are the households whose income is always below the poverty line, transitory poor households have an income above the poverty line at least for one year. Considering the period of 2005-2007, they use an ordered logit model to analyse the determinants of poverty. Findings show that education, location, and household size are important factors in the poverty status of the household. An increase in household size increases the probability of being

transitory or chronic poor, while it decreases the probability of being non-poor. Working in formal sectors, on the other hand, decreases the probability of being poor. Another important finding is that as the poverty line increases by 25%, the poverty rate increases more than 100%.

Biewen (2014) is another study stating that most of the poor are transitorily rather than chronically poor. Findings of the study show that the transitorily poor comprise the largest part of the poor in the countries with a high rate of poverty. Chronic poverty decreases with high levels of education and government transfers, while it increases with large number of households. Alia et al. (2016) analyses the dynamics of poverty for Benin by using a household data for the period of 2006-2011 with logit and probit models. This study also underlines the importance of education and labour skills as factors that lift households out of poverty.

A panel data with a long timespan (2001-2009) is used by Kudebayeva (2018) in their analysis of poverty in Kazakhstan. Results show that households consist of individuals or couples with children under age six have a higher probability to suffer from any kind of poverty. While holding a college degree increases the probability of being non-poor, social benefits decrease the probability of being transitory or chronic poor. According to the author, these findings underline the need for such social benefits as public kindergartens, a public health system, and education.

For Turkey, Sigeze and Sengül (2018) estimate a multinomial logit model for the analysis of poverty in 2009-2012. They analysed 2,732 households in their study and obtained parameters for determinants of entry to/exit from transitory poverty. Being the closest analysis to ours, this study has the shortcoming of having insufficient years of observations for the analysis of entry and exit. As Hulme and Shepherd (2003) state in their seminal work on spells of poverty, five years of observation is sufficient for the analysis of different types of transitory poverty. A household may be poor for a while, then its income increases above the poverty line occasionally, which will decrease below the poverty line in the next period. A lack of a wide ranging period may mislead the researcher in the categorisation of this kind of household. An occasionally poor household may be categorised as exiting from poverty. Therefore, we decided to cluster them in a transitory poverty superset. In another study, Dalgıç et al. (2015) use probit analysis to investigate the determinants of transition from/to poverty and emphasise the importance of education, population policies, insurance, and income policies.

3. Data and methodology

3.1 Data set and summary statistics

The data set used in this analysis is the Income and Living Conditions Survey Micro Data Set of Turkish Statistical Institute. The data set covers the period 2014-2017. In each period 75% of the households remain in the data set and the rest of the households in the data set are replaced randomly. In order to analyse the poverty dynamics, one

needs to observe the same households throughout the whole period. Because of the rotation in the data collecting process there are 5,433 households left, which can be accepted as a large enough sample size considering the number of households in Turkey, which is around 22 million.

We started with the definition of poverty. We use the relative poverty concept used by the OECD and TurkStat as well. This definition of poverty considers the distance from the average income corrected by the household size. The related variable is the equivalent income. It is calculated as the total annual income of the household adjusted by the household size. Adjustment is made according to the OECD's equivalence scale. This scale weighs household members such that the head of household has coefficient 1, other adult members have coefficient 0.5 and children have coefficient 0.3. In this way, one considers the sharing of common resources by household members. Poverty lines are also calculated using equivalent income. We define the poverty line as the half of the median equivalent income. Households with an annual income below this line are considered as poor. Although our preferred measure is the half of the median equivalent income, we also use other two most widely used poverty lines, which are 40% and 60% of the median equivalent income, and compare results and provide a robustness check for our model. Table 1 shows the poverty rates by year. As seen in the table, the poverty rate in Turkey declines slightly throughout the period of interest. As we increase the poverty line by 50%, the poverty rate increases by more than 100%.

Table 1. Poverty rate in Turkey

	2014	2015	2016	2017
Poverty rate (%, poverty line: 40% of the median income)	8.12	7.58	6.94	6.48
Poverty rate (%, poverty line: 50% of the median income)	13.73	13.62	12.52	11.89
Poverty rate (%, poverty line: 60% of the median income)	19.84	19.33	18.70	17.67

Source: Own calculations using Income and Living Conditions Micro Data Set of TurkStat.

Hulme and Shepherd (2003) define five groups of households according to their poverty situation. These are (i) always poor, whose income falls below the poverty line in all periods, (ii) usually poor, whose average income falls below the poverty line even though it is above the poverty line in some periods, (iii) churning poor, whose average income is around the poverty line and becomes poor in some years and non-poor in others, (iv) occasionally poor, whose average income is above the poverty line but income falls below the poverty line at least in one year, and lastly (v) the non-poor, whose income is above the poverty line in all periods. Considering the authors' argument that at least five years are needed to define these categories, we cluster them in three wider categories: (i) chronically poor if income falls below the poverty line in all periods, (ii) transitory poor if income falls below the poverty line in some periods and above the poverty line in others, and (iii) non-poor if income is above the poverty line in all periods.

Table 2 shows the share of total households by the number of years their income falls below the poverty line. More than 75% of the households are non-poor; in other words, their income never falls below the half of the median equivalent income. Note that only 4.4% of households are chronically poor even though the poverty rate is above 11% throughout the period of 2014-2017. Ten percent of households experience poverty only in one year, and the share of households that have an income below the poverty line for two or three years is around 5%. This table alone shows us most of the poverty is transitory even when the 60% of the median income is used as the poverty line. Although the data set allows us to monitor the change in the income of households only for a period of four years, setting the poverty line to three different levels would help us capture smaller changes in income and provide robustness to our results.

Table 2. Distribution of poverty score

Number of years in poverty	0	1	2	3	4
% of total households (poverty line: 40% of the median income)	84.43	7.66	3.90	2.39	1.62
% of total households (poverty line: 50% of the median income)	75.56	10.22	5.54	4.29	4.40
% of total households (poverty line: 60% of the median income)	67.33	11.63	7.22	5.82	8.00

Source: Own calculations using Income and Living Conditions Micro Data Set of TurkStat.

Using the data, we created the variables in Table 3 to use them in explaining the poverty situation of households. Some of the variables are related to the household head. They are age, gender, education, marital status, regular job, occupation, working hours, chronic disease, and insurance. Age is a numerical variable; gender is a dummy that takes the value zero for male household heads. We also checked the non-linear effects of the age, but results show that these are not significant. Education is measured in years. Marital status is a dummy variable with value zero for single household heads. If the household head has a regular job, which is a long-term paid job or their own business rather than a seasonal job, then the regular job dummy is equal to one.

The data set also provides information on occupations of individuals according to ISCO-08 groups. We categorised the occupation of the household head into three groups by skill level. The low-skill occupation includes unskilled occupations, medium-skill occupation includes machine operators, craft workers, skilled agricultural, forestry, and fisheries, services and sales workers, and clerical support workers; and high-skill occupation includes technicians and associate professionals, full professionals, and managers. We also control for having a chronic disease with a dummy variable with a base group of household heads without a chronic disease. Finally, we also include working hours to the model in order to make a more specific analysis of the effect of labour market position of the household head on the poverty situation.

Table 3. Summary statistics

	Mean	**Standard Deviation**	**Minimum**	**Maximum**
Equivalent income (Turkish lira)	21,991.67	22,478.20	221.89	525,359.80
Age (year)	51.65	14.48	19	103
Gender (dummy; base: male)	0.18	0.38	0	1
Education (years)	2.97	1.79	0	6
Marital status (dummy; base: single)	0.80	0.40	0	1
Household size (person)	3.61	1.84	1	22
Number of children	0.88	1.21	0	11
Home ownership (dummy; base: not owned)	0.78	0.41	0	1
Regular job (dummy; base: not regular)	0.16	0.37	0	1
Working hours	31.72	28.05	0	99
Chronic disease (dummy; base: none)	0.44	0.50	0	1
Insurance (dummy; base: none)	0.43	0.50	0	1
Occupation (categorical; base: not working)				
Low-skill	0.06	0.24	0	1
Medium-skill	0.40	0.49	0	1
High-skill	0.15	0.35	0	1

Source: Own calculations using Income and Living Conditions Micro Data Set of TurkStat.

Variables related to the household are equivalent income, household size, number of children, and home ownership. While the household size and number of children are useful indicators to analyse the effect of dependent population and on the poverty, home ownership (a dummy variable where the base group is lessees) is directly related to the wealth of the household.

The average household head is 52 years old, 18% of the household heads are female, and 80% of the total household heads are single. The average number of children is 0.88, which is in parallel with the marriage rates. While the average number of years of schooling is below 3, only 16% of the household heads have a regular job, and 15% of the households have a high-skill occupation, compared to higher rates of those with low-skill and medium-skill occupations (6% and 40%, respectively). An average household has 3.6 members, and 43% of the household heads have insurance. The average household works 32 hours a week; however, the maximum hours of work is 99. 44% of all household heads have a chronic disease.

3.2. Estimation strategy

To analyse the determinants of transitory and chronic poverty, we employ the multinomial logit model. The multinomial logit model is a discrete choice model in which the dependent variable represents more than two mutually exclusive sets without natural ordering. (Cameron and Trivedi, 2009, pp. 477-489). Here in this study, there are three distinct outcomes, $j = 1, 2, 3$, of dependent variable $y_i = j$ for each household $i = 1, 2, …,$ N. Probability of outcome j for household i conditional on the explanatory variable X_i is

$$p_{ij} = Pr(y_i = j) = F_j (X_i, \theta)$$

Table 4. Multinomial logit model average marginal effects

Poverty line (% of median income)	40		50		60	
	TP	CP	TP	CP	TP3	CP1
Age (years)	-0.003***	-0.001	0.0001	0.0001	-0.005***	-0.001
Gender (dummy; base: male)	-0.071***	-0.017**	-0.070***	-0.013	-0.069***	-0.030**
Education (years)	-0.049***	-0.007***	-0.051***	-0.019***	-0.052***	-0.030***
Marital status (dummy; base: single)	-0.044**	0.001	-0.070***	0.018	-0.054**	0.005
Household size (person)	0.020***	0.002***	0.030***	0.006***	0.029***	0.008***
Number of children	0.027***	0.007***	0.027***	0.016***	0.023***	0.033***
Home ownership (dummy; base: not owned)	-0.030***	-0.018***	-0.032**	-0.027***	-0.044***	-0.032***
Regular job (dummy; base: not regular)	-0.101***	-0.038***	-0.090***	-0.064***	-0.103***	-0.080***
– Occupation (categorical; base: not working) –						
Low-skill	0.015	0.001	0.049	-0.006	0.011	0.031
Medium-skill	-0.012	-0.014	0.024	-0.040**	-0.002	-0.030
High-skill	-0.072***	-0.019*	-0.070**	-0.061***	-0.105***	-0.074***
Working hours	-0.001**	-0.001	-0.001**	0.001	-0.001	-0.001
Chronic disease (dummy; base: none)	0.012	0.003	0.006	0.013**	0.016	0.005
Insurance (dummy;base: none)	-0.083***	-0.023***	-0.111***	-0.027***	-0.094***	-0.041***
N	5,074					
Pseudo R-squared	0.240		0.219		0.205	

Standard errors are in parenthesis: *** p<0.01, ** p<0.05, * p<0.1.

Note: TP: transitorily poor; CP: chronically poor.

In the estimation of the multinomial logit model, the maximum likelihood method is used. One of the alternative values, j, of the outcome y_i is set as the base outcome and parameter estimates are interpreted with comparison to the base category, which is chosen as the "non-poor" in this study. Like in any other non-linear model, one should interpret marginal effects rather than parameter estimates itself:

$$ME_{ijk} = \frac{\partial Pr(y_i = j)}{\partial x_{ik}} = \frac{\partial F_j(X_i, \theta)}{\partial x_{ik}}$$

4. Results

A multinomial logit estimation of the poverty dynamics yields statistically significant results. Table 4 presents parameter estimates for the transitorily poor and chronically poor categories while the non-poor is the base category. The model with 5,074 households has pseudo R-squared of 0.219 and most of the estimates are statistically significant at 1%. We report average marginal effects which are the simply the sample average of the partial effects computed for each of the households. As a robustness check, we also report the same analysis with poverty lines set at 40% and 60% of the median equivalent income.

Results show that the probability of falling into transitory poverty is independent of the household head's age, as the parameter estimates are economically and statistically insignificant. However, when we use alternative poverty lines, the age variable becomes significant and probability of being transitorily poor decreases by 3-5 percentage points as the household head ages by 10 years. For chronic poverty, age is insignificant for all models. An important result is that households with female household head are 7 percentage points less likely to be transitorily poor. This contradicts the view that households with female household head are more likely to be poor. When the household head is married, transitory poverty is 7 percentage points less likely to be the case. For alternative poverty lines, this effect is smaller but significant. All of these three variables are insignificant for the chronic poverty. One more year of education, on the other hand, leads to a significant decrease in probability of both types of poverty. While the probability of falling to the transitorily poor category decreases by 5 percentage points, it is only 2 percentage points for the chronic poverty.

It can be inferred that education is a significant factor for reducing the poverty, at least with this methodology. It is as expected when we consider the average years of schooling which is 3 years for the average household head. For chronic poverty, on the other hand, there are more effective policy tools to reduce the probability. For instance, if the household head has a regular job, probability of being chronically poor decreases by 6.4 percentage points, which is quite high and statistically significant. It is even higher, 9 percentage points, for transitory poverty. These results give us an idea about possible policy solutions for the problem of poverty. While education policies can be beneficial for the transitorily poor, chronically poor households' crucial need is probably an oppor-

tunity to have a regular job in the first place. The probability of being chronically poor increases by 1.3 percentage points for household heads suffering from a chronic disease. Hours worked, on the other hand, have very little impact, if at all. We can infer that overtime work does not give an opportunity to escape from poverty. Female participation in the labour market, on the other hand, is significant in reducing transitory poverty.

The household size and number of children have positive effects on the probability of being poor in both categories, while it is less effective for the chronic poverty case. Occupation by skill level, on the other hand, is only significant with higher skill levels. While having a low-skill occupation does not have a significant effect on the poverty, households with medium-skill occupation are 4 percentage points less likely to be chronically poor. Having a high-skill occupation, on the other hand, decreases the probability of falling into both types of poverty by 6-7 percentage points. This can be a useful policy recommendation. Finally, we analysed the effect of insurance and found statistically significant parameters. While an insured employment of the household head decreases the probability of being chronically poor by 3 percentage points, it is even higher for the transitory poverty, with almost 11 percentage points. Therefore, policies aimed to reduce uninsured employment can be highly effective.

Table 5. Actual frequencies and predicted probabilities

	Non-poor	**Transitorily poor**	**Chronically poor**
Observed (poverty line: 40% of the median income)	0.844	0.140	0.016
Predicted (poverty line: 40% of the median income)	0.843	0.140	0.017
Observed (poverty line: 50% of the median income)	0.756	0.200	0.044
Predicted (poverty line: 50% of the median income)	0.754	0.200	0.046
Observed (poverty line: 60% of the median income)	0.673	0.247	0.080
Predicted (poverty line: 60% of the median income)	0.672	0.243	0.085

Source: Own calculations using Income and Living Conditions Micro Data Set of TurkStat.

We also compare the predictions, which are predicted categories given the values of explanatory variables, with the actual categories and reported results in Table 5. According to results, observed and predicted probabilities are almost identical.

5. Conclusion

In this study we analysed poverty in a dynamic framework. By modifying Hulme and Shepherd's (2003) categories of poverty, we grouped households in three categories with respect to their situation of poverty. Setting the non-poor as the base category, we analysed the effect of several factors on the probability of falling into transitory and chronic poverty. Considering the different determinants and characteristics of the different types of poverty, this study aims to give an idea about the determinants of poverty and possible ways to reduce it.

Dividing poverty into two categories gives us a better idea of it. With the help of panel data we infer that while poverty rates are above 11%, only 4% of the households are poor throughout the whole period, and around 20% of the households are transitorily poor. After obtaining a more detailed picture of the situation of poverty, one can analyse the determinants of each types of poverty. Results show that transitory poverty is less likely to occur if the household has less members, its own home, a more educated household head, and if the members have insured employment and high-skill occupations. Education policies can be effective for reducing transitory poverty. Chronic poverty, on the other hand, is less likely to occur when the household head has a regular job, a medium- or high-skill occupation, and insured employment. Chronic disease is another significant factor that causes the household to fall into chronic poverty. To reduce chronic poverty, training opportunities and regular job opportunities can be created. Note that as we employ 60% of the median equivalent income as the poverty line, more factors begin to affect households' probability to fall into chronic poverty. This result underlines the importance and subjective nature of the definition of poverty.

Population policies and insured employment are highly effective for both types of poverty, considering the rate of uninsured employment and number of household members and children in Table 3. Despite the differences in model setting and differences in parameters, results of this study are mainly in line with those of Dalgıç et al. (2015) and Sigeze and Sengül (2018).

In this study we aimed to utilise all of the meaningful variables in the most comprehensive data set in Turkey. The availability of 4-year panel data is the major limitation throughout this study. To overcome the shortcomings of the data set and make a contribution to the sensitivity of the poverty measure, we used three different poverty lines in our study and aimed to provide a robustness check to the results obtained. Further analysis with a longer period of data may give a better idea about the dynamics of poverty and give more effective policy recommendations for more specific types of poverty.

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