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VULNERABILITY TO POVERTY IN TURKEY

Türkiye'de Yoksulluğa Karşı Kırılganlık

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Keywords:
Poverty, Turkey, Vulnerability.

JEL Codes:
C31, C33, I32.

Abstract

For many years, researchers have focused only on revealing the profile of poor or demonstrate determinants of poverty. All these initiatives are carried out after individuals/households fall into poverty. It is to prevent individuals from falling into poverty which is critical for policymaking. Therefore, it is essential to know what determines vulnerability to poverty. In this context, present study aims to demonstrate the size and determinants of vulnerability to poverty in Turkey by taking advantage of two methods which one considers the vulnerability as expected poverty and other as low expected utility. Data come from Survey on Income and Living Conditions and covers the period 2006-2017. Analysis has been performed at both the cross-sectional and panel data level. According to the findings obtained from the pooled cross-sectional data, 13% of households are vulnerable. Regional analysis shows that there is a big difference between East and West in terms of vulnerability to poverty. Findings from the model based on expected utility theory using panel data have revealed that vulnerability to poverty in the period 2006-2009 and 2014-2017 is 0.49 and 0.55, respectively. Education level, employment and health status of household leader are the most critical factors that determine vulnerability to poverty.

Anahtar Kelimeler:
Kırılganlık, Türkiye, Yoksulluk.

JEL Kodları:
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Özet

Araştırmacılar uzun yıllar yalnızca yoksulların profilini ortaya koymaya veya yoksulluğun belirleyicilerinin tespitine odaklanmıştır. Tüm bu girişimler bireyler/haneler yoksulluğa düştükten sonra gerçekleştirilmektedir. Politika yapımı açısından kritik olan bireylerin yoksulluğa düşmesini önlemektir. Bu nedenle yoksulluğa karşı kırılganlığı nelerin belirlediğinin bilinmesi önem arz etmektedir. Bu bağlamda, mevcut çalışmanın amacı Türkiye'deki yoksulluğa karşı kırılganlığın boyutunu ve belirleyicilerini, biri kırılganlığı beklenen yoksulluk diğeri düşük beklenen fayda açısından ele alan, iki yöntemden istifade ederek ortaya koymaktır. Veri Gelir ve Yaşam Koşulları Araştırması'dan gelmekte olup 2006-2017 dönemini kapsamaktadır. Analiz hem kesit hem de panel veri düzeyinde gerçekleştirilmiştir. Havuzlanmış kesit veriden elde edilen sonuçlara göre, hanehalklarının %13'ü yoksulluğa karşı kırılgandır. Bölgesel analiz, yoksulluğa karşı kırılganlık anlamında, doğu ve batı arasında büyük bir fark olduğunu göstermektedir. Panel verinin kullanıldığı beklenen fayda teorisine dayanan modelden elde edilen bulgular, 2006-2009 ve 2014-2017 dönemlerinde yoksulluğa karşı kırılganlığın, sırasıyla, 0.49 ve 0.55 olduğunu ortaya koymuştur. Hane liderinin eğitim düzeyi, istihdam ve sağlık durumu yoksulluğa karşı kırılganlığı belirleyen en önemli etmenlerdir.

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1. Introduction

Poverty is one of the most challenging socio-economic problems that countries have strived to tackle throughout history. Due to the diversity of the causes, and the complex interactions between these causes, there is still no final solution to the problem of poverty. Despite the diversified and complex structure of its causes, every attempt to reduce or eliminate poverty has a common two-step starting point; i) identifying who is poor and ii) composing a summary index using the information obtained in the first step (Sen, 1976, p. 219). Poor will be determined in the first step by setting a preassigned poverty line. The course of the index calculated in the second step over time will give clues about the effectiveness of the policies. In earlier research, scholars have tried to reveal the characteristics of the poor by employing stated two-step approach and cross-sectional data, and thus tried to develop policy recommendations. These studies address poverty as a static phenomenon because they use cross-sectional data. However, it is now clear that poverty is a dynamic phenomenon; individuals/households who are not poor can fall into poverty, or who are poor can never escape from poverty. In this regard, the researchers have agreed that poverty should be examined from a dynamic perspective (Bane and Ellwood, 1986; Yaqub, 2000).

Although the ways of approaching the poverty mentioned above are invaluable, they cannot propose policies that will eliminate poverty before individuals/households fall into poverty due to the fact that poverty has been evaluated using ex-post measurement. What is essential in terms of policymaking is to prevent poverty before it occurs with a forward-looking perspective. Even if they are not currently poor, factors such as unemployment, illness, unexpected spending, macroeconomic shocks, or social exclusion cause households to fall into poverty and poor households to remain poor. In addition to the factors stated in the previous sentence, another factor that is especially valid for agriculture-dependent households is climate. The fluctuations in the amount of harvest caused by climate change cause prices to change unpredictably. Therefore, there will always be a risk of falling into poverty for these households. Because of the insufficient social security and the limited access to resources in underdeveloped countries, the risks mentioned particularly affect the currently poor households (Alwang, Siegel and Jorgensen, 2001; Chaudhuri, 2003). Thus, to alleviate the effects of adverse shocks on the probability of the falling into poverty requires an ex-ante assessment. As a result of the need for ex-ante measurement, researchers have begun to examine poverty from the perspective of risk, uncertainty and expectation (Banerjee and Newman, 1994; Morduch, 1994; Ravallion, 1988).

Considering the previous studies, the purpose of this paper is to uncover the level of vulnerability to poverty in Turkey for the period 2006-2017 benefiting from the expected poverty and low expected utility approaches. The data come from Survey on Income and Living Conditions (SILC) conducted and released by the Turkish Statistical Institute since 2006. The contributions of this paper to the literature are as follows; i) the course of vulnerability to poverty over time has been demonstrated, ii) alternative findings on vulnerability to poverty have been obtained using two different approaches, and iii) findings at the regional level have been presented. Findings obtained from the pooled cross-sectional analysis indicate that vulnerability to poverty has reduced in Turkey. The ratio of the vulnerable household has decreased from 17% to 9% between 2006 and 2017. Therefore, the vulnerability to poverty in Turkey for the period 2006-2017 is around 13%. Regional analysis suggests that there is a

severe gap in terms of vulnerability to poverty between East and west of the country just as in poverty analysis. Panel data analysis for the periods 2006-2009 and 2014-2017 shows that the vulnerability to poverty is 0.49 and 0.55, respectively. This finding, unlike the other method, indicates that vulnerability has increased. The weight of idiosyncratic and unexplained risk in vulnerability has increased significantly.

The rest of the paper is organized as follows. Literature review is provided in the next section. Detailed information about the method employed is given in the third section. In the fourth section, the data and empirical findings are provided. The conclusion is presented in the last section.

2. Literature Review

In the literature, the concepts stated in the introduction are examined in the context of vulnerability. Although these concepts have been used with or instead of vulnerability, there are considerable differences between them.[1] Therefore, before to proceed, we need to define vulnerability and what the vulnerable means in order to eliminate ambiguity.[2] There is no definition of vulnerability that the research has agreed upon. Indeed, Angelillo (2014, p. 317) gives 14 definitions used in the literature. As Angelillo (2014), we also follow the definition of Chaudhuri, Jalan, and Suryahadi (2002, p. 4). Using their own words, we consider the vulnerability, in terms of poverty, "as the ex-ante risk that a household will, if currently non-poor, fall below the poverty line, or if currently poor, will remain in poverty." Based on this definition, what vulnerable means can be revealed using the definition of Gallardo (2018, p. 1076): "An individual is vulnerable to poverty when she or he is at risk of becoming poor or at risk of remaining poor." As it is understood from the definitions, the focus is on the risks of individuals or households suffering from the loss of welfare. However, it should be noted at this point that the loss of welfare alone is not enough to define the vulnerability of individuals or households. The reason for this is that the welfare loss should fall below a certain social minimum, and the household cannot compensate for this loss on its own. Therefore, in this study, not every economic unit suffering from welfare loss will be considered vulnerable.

Hoddinott and Quisumbing (2003, p. 12) state that there are three main approaches applied in the vulnerability analysis; vulnerability as i) expected poverty (VEP), ii) low expected utility (VEU), and iii) uninsured exposure to risk (VER). The logic behind these approaches can be summarized as follows (detailed explanations are given in the method section). In the first approach (VEP), vulnerability is considered as the risk that the expected income/consumption of the household will be below a certain threshold. This approach, which is based on strict assumptions, is one of the most used approaches in the literature. In the second approach (VEU), which takes advantage of the expected utility theory, the risk avoidance attitude of the households is taken into account. Under certain assumptions, in VEU, which has a strong theoretical basis, vulnerability is evaluated in terms of utility gap between utility and expected utility functions. Although it differs from the first two approaches as it is based on ex-

[1] To avoid repetition, there will be no conceptual discussion here. For a discussion on the relationship between vulnerability and risk exposure, expected poverty, expectation of being poor and multi-term poverty, see Gallardo (2018, pp. 1078-1081).
[2] For a conceptual discussion on vulnerability, see Alwang et al. (2001), Fujii (2016), Klasen and Waibel (2013, Part I).

post measurement, the third approach (VER) is frequently employed in the vulnerability analysis. According to VER, the loss of welfare experienced as a result of shocks to which economic units are exposed is caused by the lack of sufficient insurance to protect themselves against these shocks. Gallardo (2018, pp. 1086-1090) presents four criteria for vulnerability in terms of exposure to risk.

As highlighted above, based on the importance of the ex-ante perspective in poverty analysis, the researchers have analyzed several countries in order to demonstrate the factors determining the vulnerability to poverty.[3] For example, Demissie and Kasie (2017) have revealed the determinants and level of vulnerability to poverty of rural households in Ethiopia. In their study, where they consider vulnerability as expected poverty, they have found that 54% of rural households are vulnerable, and 31% are poor. Using a similar approach, Tigre (2019) has found that 38% of households in Ethiopia are vulnerable to poverty. Moreover, while 89% of rural residents are vulnerable to poverty, this rate is 22% in the urban area. This finding is as expected. As stated before, the rural households are heavily dependent on agriculture, so the volatility in their consumption and income is much higher than the households living in the urban. This means that rural households are more likely to fall into poverty.

Mina and Imai (2017) have also utilized the vulnerability to expected poverty approach. However, unlike previous studies, they have employed the linear multilevel random coefficient model as an estimation method to uncover vulnerable households in the Philippines. They have considered vulnerability as the probability of falling into poverty for at least one period. According to their findings, 37.7% of the households are vulnerable. Finally, Pietrelli and Scaramozzino (2019) have examined how internal migration affects vulnerability to poverty in Tanzania. The study using causal inference methods has suggested that households with at least one migrant are less vulnerable to poverty.

When we turn our focus to Turkey, we face very few studies examining vulnerability to poverty. As far as we know, Yemtsov (2001) is the first study that analyzes vulnerability to poverty in Turkey utilizing Household Income and Consumption Expenditure Survey conducted in 1987 and 1994. According to him, "being vulnerable to poverty means being close to the absolute survival minimum" (p. 3). As it is understood from the definition, Yemstov (2001) did not use the methods mentioned above employed in the vulnerability to poverty analysis. Within the framework of consumption and income-based approaches, Yemston (2001, p. 49) has measured several vulnerability figures using various scales. According to consumption and income-based approaches, vulnerability varies between 14%-61.6% and 28.4%-29.6%, respectively. Although this study is the first, it fails to eliminate an essential gap due to not using formal methods applied, especially in vulnerability analysis.

Another study examined the vulnerability to poverty in Turkey is performed by Tekgüç (2013). That study is the first to examine the vulnerability to poverty in Turkey using the econometric method in the context of the approaches mentioned above. Tekgüç (2013) has investigated how consuming self-produced foods influence the vulnerability to total basic needs poverty and vulnerability to food poverty of rural households utilizing the Household Budget Survey for 2003. In addition, vulnerability levels have been presented calculated for whole sample and rural/urban distinctions using three thresholds; not vulnerable (if probability < 0.26),

[3] Only current studies are reviewed here. For a more comprehensive review on empirical studies on vulnerability to poverty, see Ceriani (2018) and Mahanta and Das (2015).

moderately vulnerable (if 0.26 < probability < 0.50), and vulnerable (if probability > 0.50). Tekgüç (2013) suggests that there is no significant difference in vulnerability between the households consume and do not consume self-produced foods in terms of basic needs poverty. However, self-producing households are less vulnerable when it comes to food poverty. In poor rural households that consume self-produced foods, 12% are highly vulnerable to basic needs poverty, whereas, in other rural poor households, it is 17%. In non-poor rural households, the relevant rates are 6%. While 8% of poor rural households consuming self-produced products are highly vulnerable to food poverty, this rate is 29% for other poor rural households. As he focuses on a single year, Tekgüç (2013) can not say anything about the course of vulnerability to poverty over time.

3. Methodology

In this study, expected poverty and low expected utility approaches have been adopted to analyze the vulnerability to poverty in Turkey. The estimation methods proposed by Chaudhuri et al. (2002) and Ligon and Schechter (2003) have been employed for the first and second approach, respectively. Detailed information on the estimation methods is given in the following subsections. All analysis has been carried out using Stata 16.1.

3.1. Vulnerability as Expected Poverty: Chaudhuri et al. (2002)

According to the vulnerability as expected poverty (VEP) approach, vulnerability is defined as the probability that the welfare (y) of the household i at time t falls below the poverty line (z) at time $t+1$. To put it more formally, the vulnerability can be written as follows;

$$V_{it} = \Pr(y_{i,t+1} < z) \tag{1}$$

Income, consumption or expenditure can be used as an indicator of welfare. In this study, per capita disposable household income has been chosen as an indicator of welfare. Although consumption is widely used as an indicator of welfare in the literature, we decided to utilize the income here because we think that income is a better indicator of welfare compared to consumption, based on the fact that consumption also depends on income. To estimate vulnerability, in other words, probability in Equation 1, Chaudhuri et al. (2002) have estimated the following equation,

$$\ln y_i = x_i'\beta + u_i, \tag{2}$$

where y_i is the per capita disposable household income, x_i' is the observable household characteristics, β is the vector of parameters to be estimated and u_i is the error term represents the idiosyncratic shocks. The variance of the error terms is heteroscedastic and depends on covariates. Therefore, the relationship between household characteristics and error variance can be modelled as follows,

$$\sigma_{u,i}^2 = x_i'\alpha \tag{3}$$

Employing three-step feasible generalized least squares method proposed by Amemiya (1977), we can achieve expected income and variance,

$$\hat{y}_i = x_i'\hat{\beta}$$
$$\hat{\sigma}_{u,i}^2 = x_i'\hat{\alpha} \tag{4}$$

In Equation 4, $\hat{\sigma}_{u,i}^2 = x_i'\hat{\alpha}$ is the consistent estimate of the variance of the idiosyncratic component of the household income. With this equation, the effect of explanatory variables on idiosyncratic risk can be revealed.

So, the vulnerability level of the household i can be estimated as follows,

$$\hat{V}_i = \Pr(\ln y_i < \ln z \mid x_i) = \Phi\left(\frac{\ln z - x_i'\hat{\beta}}{\sqrt{x_i'\hat{\alpha}}}\right), \tag{5}$$

where $\Phi(\cdot)$ is the cumulative distribution function of the standard normal distribution.

A number of assumptions are required for this method to function correctly. First of all, it is assumed that the dependent variable is distributed log-normal. Second, the method requires a large sample. Thus, in addition to the households affected negatively by shocks, the possibility of having the households affected positively will be allowed. Finally, it is assumed that the households are drawn from the same distribution of changes in the dependent variable (Hoddinott and Quisumbing, 2003; Kamanou and Morduch, 2002). The most important advantage of this method is that it allows the use of cross-sectional data. It is also highly preferred by researchers due to its ease of application. The main drawback of the method is that only the idiosyncratic shocks are seen as the source of changes in the future income. Ligon and Schechter (2004) have shown that this method works well if the dependent variable is normally distributed, and there is no measurement error.

3.2. Vulnerability as Low Expected Utility: Ligon and Schechter (2003)

According to the approach proposed by Ligon and Schechter (2003, p. 96), which derives its power from the expected utility theory, vulnerability is defined as the difference between the utility derived from consuming at least as much as certainty-equivalent consumption (z) and the expected utility of consumption (c). Therefore, households that consume more than or equal to z will not be considered as vulnerable. Accordingly, the vulnerability of the household i can be formulated as follows,

$$V_i = U^i(z) - \mathrm{E}U^i(c^i), \tag{6}$$

where E stands for expectation operator and U^i is the weakly concave utility function. One of the critical features of this method is its decomposability. Ligon and Schechter (2003) have decomposed Equation 6 into two parts, poverty and risk, as follows,

$$V_i = \underbrace{[U^i(z) - U^i(\mathrm{E}c^i)]}_{poverty} + \underbrace{[U^i(\mathrm{E}c^i) - \mathrm{E}U^i(c^i)]}_{risk} \tag{7}$$

Moreover, the authors have rewritten the risk part in Equation 7 as an aggregate and idiosyncratic risk.

$$V_i = \underbrace{[U^i(z) - U^i(\mathrm{E}c^i)]}_{poverty} + \underbrace{[U^i(\mathrm{E}c^i) - \mathrm{E}U^i(\mathrm{E}(c^i \mid \bar{x}))]}_{aggregate\ risk} + \underbrace{[\mathrm{E}U^i(\mathrm{E}(c^i \mid \bar{x})) - \mathrm{E}U^i(c^i)]}_{idiosyncratic\ risk}, \quad (8)$$

where $\bar{x}$ is the vector of aggregate variables. One of the things to be determined at this point is the structure of the utility function. Ligon and Schechter (2003) assume that the form of the utility function is $U^i(c) = (c^{1-\gamma})/(1-\gamma),\ \gamma > 0.\ \gamma$ is the sensitivity parameter of the utility function to risk and inequality. Finally, Ligon and Schechter (2003) have achieved the following equation by rewriting the idiosyncratic risk to take into account the variations in the unobservable factors and measurement error,

$$V_i = \underbrace{[U^i(\mathrm{E}c) - U^i(\mathrm{E}c_t^i)]}_{poverty} + \underbrace{[U^i(\mathrm{E}c^i) - \mathrm{E}U^i(\mathrm{E}(c_t^i \mid \bar{x}_t))]}_{aggregate\ risk} + \underbrace{[\mathrm{E}U^i(\mathrm{E}(c_t^i \mid \bar{x}_t)) - \mathrm{E}U^i(\mathrm{E}(c_t^i \mid \bar{x}_t, x_t^i)]}_{idiosyncratic\ risk} + \underbrace{[\mathrm{E}U^i(\mathrm{E}(c_t^i \mid \bar{x}_t, x_t^i) - \mathrm{E}U^i(c_t^i)]}_{unexplained\ risk\&measurement\ error} \quad (9)$$

where x_t^i is the vector of observed time-varying household characteristics. As can be seen from Equation 9, this method requires panel data. This is, in a sense, a drawback of approach because panel data is an exception, especially for underdeveloped and developing countries. The critical assumption of the method is that the dependent variable must be stationary. That is, the dependent variable observed at different time points must have the same distribution. Stationarity assumption will not be a severe problem, at least in studies using short panel data.

4. Data and Empirical Findings

4.1. Data Description

Data used in the study come from the SILC conducted and released by the Turkish Statistical Institute (TurkStat) since 2006. SILC provides detailed socio-economic and demographic information about households and individuals, such as income, education, employment and health status. Compared to other household surveys, SILC is particularly reliable in terms of income and employment information of individuals. TurkStat does not base this kind of information on the individuals' statement; instead, it sends the identity information of individuals to relevant institutions and collects official information. Moreover, SILC is the only household survey with panel data capability. TurkStat drops 25% of the households every year and samples new households. Therefore, a household can be followed for a maximum of four years. In the study, we have utilized the cross-sectional data covering 2006-2017 and panel data sets covering 2006-2009 and 2014-2017. SILC contains information from the previous year of its release. For example, the data set released in 2011 contains information from 2010. It is essential to keep this fact in mind when interpreting the findings. Definitions of the variables used in the analysis are presented in Table 1.

As emphasized earlier, disposable income has been used as a household welfare indicator. In order to eliminate the compositional difference between the households and to achieve equivalent income, disposable income has been divided by the square root of the household size. In all estimations, the natural logarithm of the income variable is used. We have

normalized the dependent variable by following Ligon and Schechter (2003) when we consider the vulnerability as low expected utility. Thus, in the absence of vulnerability, the average equivalent disposable income will be equal to one. Following previous studies (Ceriani, 2018; Mahanta and Das, 2015), we have selected two groups of explanatory variables one is associated with the household head, and other is associated with household conditions. The first group includes sex, age, educational level, marital status, employment status and health status of household head, which we use to control unobserved individual effects. The second group consists of household size, dependency ratio, environmental issues and crime and violence. The relationship between these variables and vulnerability to poverty can be explained as follows.

We will start with the variables in the first group; variables associated with the household head. In poverty literature, the fact that the household head is a woman is seen as a factor that exposes the household to the risk of poverty. However, this is especially true for countries with very low average incomes. Such an effect is expected due to the low socio-economic status of women (actually, the main reason is the low schooling rate of girls). In fact, from this point, we reach another critical variable; education level of the household head. Since it is expected that the educated household head will have higher income, and this income will be more stable, it is expected that the increase in education level will decrease the vulnerability to poverty. The impact of marital status on vulnerability to poverty is somewhat uncertain. However, we can say the following in general. Married individuals may be more resistant to poverty with the possibility of having employed spouses and the support of their families, even though they are under more financial burden. Widowed or divorced individuals are more vulnerable to poverty, especially if they are low-educated and unemployed. Regardless of marital status, households with an employed household head will be less vulnerable to poverty. Therefore, in our opinion, the employment status of the household leader is one of the most critical variables. The last variable associated with the household head and at least as important as the previous factor, which actually might cause it, is the household head's health status. Chronically ill household leaders are more likely to be unemployed or earn a low income. Similar risk exists for the situation in which unexpected health problem occurs.

Now we turn our focus to explanatory variables related to household conditions. The dependency ratio, which is the ratio of the number of household members under the age of fifteen and over the age of sixty-five in the total household members, affects the vulnerability to poverty, primarily through the working conditions channel. Individuals under the age of fifteen are prohibited from working. Therefore, these individuals are financially dependent on their parents. The increase in the number of household members in the relevant age group decreases the per capita household income, and this increases the risk of the household being subjected to poverty. A similar process applies to individuals over the age of sixty-five. These individuals have to work for a lower wage if they are not retired due to the loss of physical and mental strength. Variables that provide information about whether the household is in an environment where there is environmental pollution, crime and violence enable the control of many unobservable factors related to the household. The industrialization has brought environmental pollution as well as job opportunities. For this reason, it can be expected that the environmental pollution variable will reduce the vulnerability to poverty since the regions with high environmental pollution will be industrialized regions in a sense. The living environment where crime and violence are intense is generally located in the regions with low socio-economic status. Therefore, it can be expected that living in such an environment will increase the risk of

vulnerability to poverty. Since the question of the last two variables was not asked in the panel data, these variables were not included in the Ligon and Schechter (2003) approach.

4.2. Empirical Findings

We would like to begin presenting estimation results obtained using from the method proposed by Chaudhuri et al. (2002) which consider vulnerability as expected poverty. Estimations are presented in Table 2 for selected years and pooled data. Generally speaking, the coefficients have the expected signs, except for some variables. We will focus mainly on the pooled estimation. Compared to the basic categories, the coefficients of both education and marital status variables are positive and increasing. This situation is at least expected for the education variable. Among the variables related to the household, the variable that has the opposite sign with expectation is environmental pollution. It is seen that the increase in pollution positively affects household income. The fact that environmental pollution occurs primarily in industrialized cities may be an explanation of why the sign of this variable may be positive. The effects of the explanatory variables on the variance (idiosyncratic shock) are generally statistically significant.

Table 1. Variables Used in the Analysis

		Dependent Variable
Name	***Variable Type***	***Description***
Log(income)	Continous	Disposable household income is divided by the square root of the household size. Hence, the equivalent disposable household income has been obtained.
		Explanatory Variables
Name	***Variable Type***	***Description***
		Variables Associated with Household Head
Sex	Dummy	= 1 if the head is female.
Age	Ordered	15-19, 20-24, …, 65+
Education Level	Ordered	The last completed education level of the household head. Recoded as the dummy variable. Illiterate/not educated is the
Marital Status	Multinomial	Recodded as a dummy variable. Single is the base category.
Employment Status	Multinomial	= 1 if unemployed, seasonal worker, old/disabled/deactivated or housekeeper, 0 otherwise.
Health Status	Ordered	= 1 if bad or very bad, 0 otherwise.
		Variables Associated with Household Conditions
Household Size	Count	The number of people lives in the same household.
Dependency ratio	Continous	The ratio of the number of household members younger than 15 and older than 65 years old to the total household size.
Environmental issues	Dummy	= 1 if there is air pollution, environmental pollution or other environmental problems in the living environment, 0 otherwise.
Crime and Violence	Dummy	= 1 if crime and violence are encountered intensely in the living environment.

Source: Own elaboration.

Although the estimates presented in Table 2 say something about income and idiosyncratic shock generation process, and hence about vulnerability, it cannot provide us with a summary vulnerability value. That is, Table 2 cannot tell us what percentage of households are vulnerable. We can obtain the desired vulnerability rates using the expected vulnerability values obtained through Equation 5. In the literature, it is generally accepted that households with vulnerability value below 0.5 are defined as vulnerable. Following Tekgüç (2013), we will use three thresholds to determine whether a household vulnerable or not. We will consider the household as not vulnerable if its the estimated vulnerability score is less than 0.26, as moderately vulnerable if its score between 0.26 and 0.5, and as vulnerable if its score higher than 0.5. The regional results obtained by using the relevant thresholds are given in Table 3. The table shows very clearly that the vulnerability rate increases going from the East to the west of Turkey. Once again, when we focus solely on the results from pooled data, we see that vulnerability is very low as 1%, while the lowest vulnerability in Eastern Anatolia is 33%.

Table 2. Vulnerability as Expected Poverty

		2006		2011		2017		Pooled	
		Variance	**Log (income)**	**Variance**	**Log (income)**	**Variance**	**Log (income)**	**Variance**	**Log (income)**
Household size		-0.010	-0.079	0.001	-0.051	0.001	-0.013	0.008	-0.055
		(0.010)	(0.010)**	(0.007)	(0.006)**	(0.007)	(0.007)	(0.002)**	(0.002)**
Household size^2		0.001	0.004	0.000	0.002	0.000	-0.001	-0.000	0.002
		(0.001)	(0.001)**	(0.001)	(0.000)**	(0.001)	(0.001)	(0.000)	(0.000)**
Sex of Head (Female)		0.025	0.150	0.002	0.171	-0.020	0.116	-0.001	0.197
		(0.028)	(0.028)**	(0.020)	(0.020)**	(0.015)	(0.014)**	(0.006)	(0.006)**
Education of Head	Basic	0.016	0.279	0.034	0.266	-0.002	0.220	-0.014	0.289
		(0.017)	(0.017)**	(0.014)*	(0.014)**	(0.012)	(0.012)**	(0.005)**	(0.005)**
	High School	0.025	0.680	0.042	0.597	0.033	0.492	0.016	0.686
		(0.022)	(0.022)**	(0.018)*	(0.018)**	(0.015)*	(0.015)**	(0.006)*	(0.006)**
	University	0.029	1.087	0.098	1.096	0.081	0.961	0.047	1.143
		(0.025)	(0.025)**	(0.020)**	(0.020)**	(0.016)**	(0.015)**	(0.007)**	(0.006)**
Marital Status	Married	-0.054	-0.029	-0.083	0.075	-0.021	0.094	0.079	0.071
		(0.037)	(0.037)	(0.029)**	(0.027)**	(0.023)	(0.021)**	(0.005)**	(0.005)**
	Other	-0.034	0.013	-0.085	0.076	-0.023	0.146	0.057	0.096
		(0.043)	(0.043)	(0.032)**	(0.031)*	(0.025)	(0.023)**	(0.008)**	(0.007)**
Employment Status		0.012	-0.349	0.031	-0.268	0.033	-0.286	0.025	-0.299
		(0.018)	(0.018)**	(0.015)*	(0.015)**	(0.013)*	(0.012)**	(0.005)**	(0.005)**
Health Status		-0.006	-0.163	0.017	-0.150	-0.011	-0.115	-0.001	-0.189
		(0.015)	(0.016)**	(0.013)	(0.013)**	(0.012)	(0.011)**	(0.005)	(0.004)**
Dependency Ratio		-0.036	-0.441	-0.020	-0.469	-0.029	-0.478	-0.065	-0.476
		(0.028)	(0.029)**	(0.022)	(0.022)**	(0.018)	(0.017)**	(0.008)**	(0.007)**
Environment: Pollution		-0.018	0.086	-0.013	0.007	-0.023	0.010	-0.037	0.016
		(0.014)	(0.014)**	(0.010)	(0.010)	(0.009)*	(0.009)	(0.004)**	(0.003)**
Environment: Violence		-0.013	0.078	-0.048	-0.022	0.022	-0.008	0.002	-0.047
		(0.015)	(0.016)**	(0.014)**	(0.015)	(0.015)	(0.013)	(0.005)	(0.005)**
Region		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year		-	-	-	-	-	-	-	Yes
R^2		0.26	0.43	0.01	0.42	0.01	0.38	0.01	0.36
N		10,919	10,919	15,024	15,024	22,869	22,869	200,218	200,218

Notes: The age of the household leader is not included in the table due to the shortage of space. It can be sent upon request. Robust standard errors are in parentheses. *, ** — significant at the 5% and 1% level, respectively.

Table 3. Percentage of Vulnerable Household Across Regions, 2006-2017

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Pooled
İ	NV	97.7	98.6	98	96	97	96.7	95	97	96	95	95	95	90
	MV	2.2	1.3	1.6	3	2	3	4	2.6	3.6	4.8	4	4.5	9
	V	0.1	0.1	0.4	1	1	0.3	1	0.4	0.4	0.2	1	0.5	1
WM	NV	81	71	70	67	62	66	66	76	77	70	76	80	60
	MV	16	26	27	29	33	32	30	22	20	25	20	19	35
	V	5	3	3	4	5	2	4	2	3	5	4	1	5
Aegean	NV	84	79	78	79	76	77	77	80	80	77	76	78	68
	MV	15	20	20	18	22	21	21	19	17	21	22	20	29
	V	4	1	2	3	2	2	2	1	3	2	2	2	3
EM	NV	94	90	93	82	82	83	83	87	86	90	88	90	79
	MV	5	9.7	6.9	16	16	15	15	12	13	8.3	11	9	19
	V	1	.3	.1	2	2	2	2	1	1	1.7	1	1	2
WA	NV	87	84	78	84	84	80	82	80	85	84	87	83	75
	MV	11	14	20	14	15	19	17	19	14	14	12	15	22
	V	3	1	2	2	1	1	1	1	1	2	1	2	3
M	NV	50	39	55	56	63	57	56	57	56	57	60	63	50
	MV	39	45	34	35	31	36	36	36	33	33	32	30	38
	V	11	16	11	9	6	7	8	7	11	10	8	7	12
CA	NV	74	61	53	53	56	60	65	67	64	66	60	71	52
	MV	22	34	38	37	34	33	31	29	31	29	33	24	39
	V	4	5	9	10	10	7	4	4	5	5	7	5	9
WBS	NV	56	58	56	54	56	69	70	74	75	72	71	81	62
	MV	37	36	35	38	35	26	28	23	22	24	25	17	33
	V	7	6	9	8	9	5	2	3	3	4	4	2	5
EBS	NV	81	74	71	65	63	68	68	78	78	74	75	77	54
	MV	17	23	26	30	32	28	26	20	20	23	23	17	35
	V	2	3	3	5	5	4	6	2	2	3	2	6	11
NA	NV	40	37	31	29	34	34	32	29	33	39	50	48	29
	MV	36	43	41	35	34	33	31	39	44	40	34	36	38
	V	24	20	28	36	32	33	37	32	23	21	16	16	33
CEA	NV	37	31	40	32	38	32	26	28	31	32	36	38	30
	MV	35	34	28	26	24	32	35	36	37	36	38	35	32
	V	28	35	32	42	38	36	39	36	32	32	26	27	38
SA	NV	14	10	12	11	17	14	14	16	24	20	21	23	16
	MV	27	24	28	25	26	24	24	30	34	35	33	34	31
	V	59	66	60	64	57	62	62	54	42	45	46	43	53

Source: Own elaboration.

İ: İstanbul, WM: West Marmara, EM: East Marmara, WA: West Anatolia, M: Mediterranean, CA: Central Anatolia, WBA: West Black Sea, EBS: East Black Sea, NA: Northeast Anatolia, CEA: Central East Anatolia, SA: Southeast Anatolia. NV: Not Vulnerable, MV: Moderately Vulnerable, V: Vulnerable.

Increasing vulnerability as we go from the west to the East of the country is, in a sense, within expectations and not surprising. The most important reason for this is that the economy is heavily based on agriculture in the East, especially for Southeast Anatolia. At this point, the relationship between agriculture and vulnerability operates through two channels. First of all, the dependency of agriculture on weather conditions does not make continuous, more importantly stable, income possible. Income volatility between harvest periods significantly affects the risk of household poverty in the next period. Another critical factor is the seasonal worker reality. Household income will have an unstable structure as individuals can only work

in certain seasons. In order to reduce vulnerability, policies need to be developed to ensure that farmers and workers in the agricultural sector have a regular income.

We have also estimated the logit equation to reveal the impact of vulnerability on poverty. 60% of the median income that is frequently used in the literature to determine whether a household is poor or not is used as the poverty line. Since the coefficients of the logit model cannot be used directly in the interpretation, the average marginal effects have been calculated. Relevant marginal effects are given in Figure 1, with 95% confidence intervals. The impact of vulnerability on the probability of being poor has been realized within the expectation; an increase of 1% in vulnerability increases the probability of being poor 4.6% on average. It can be surprising that gender reduces the likelihood of being poor because it identifies the female household leader. However, the sign of gender alone is positive. Interaction variables created between gender and marital and employment status are included in the model to explore the possible reasons for this finding. Being unemployed/elderly/unable to work or having to deal with housework, regardless of gender, increases the likelihood of being poor, as would be expected. Since the marginal effects show the average effect, it is thought that the related sign change is caused by the interaction variables created with the marital status.

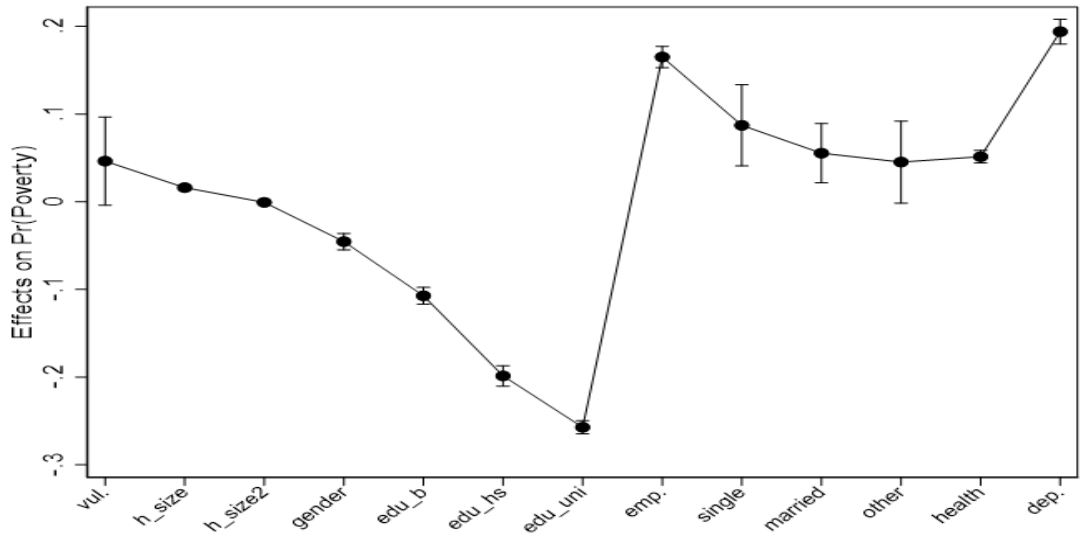

Figure 1. Average Marginal Effects of the Explanatory Variables on the Probability of Being Poor, with %95 Confidence Intervals
vul: vulnerability, h_size: household size, h_size2: square of household size, edu_b: basic education, edu_hs: higher education, dep: dependency ratio.

The findings obtained from the second method proposed by Ligon and Schechter (2003) are provided in Table 4 and Table 5 for the periods 2006-2009 and 2014-2017, respectively. The tables also show the effects of explanatory variables on vulnerability and its components. According to Table 4, the average household's utility is 49% less than the utility it would have if resources would be distributed to eliminate all income inequality and risk. The most significant share among the components of vulnerability is poverty and then the unexplained risk. Just like the results from the previous estimate, the employment and health status of the household leader, and the dependency rate are the most critical factors influencing vulnerability.

Table 4. Vulnerability as Low Expected Utility, 2006-2009

	Vulnerability	Poverty	Aggregate Risk	Idiosyncratic Risk	Unexplained Risk
	.4928**	.3975**	.0169**	.0007**	.0775**
	(.0205)	(.0186)	(.001)	(.0002)	(.0024)
Household size	.0781**	.0736**	.0006**	.00009	.0037*
	(.0203)	(.0195)	(.0001)	(.00007)	(.0018)
Household size^2	-.0024	-.0023	-.00003**	-.000008*	-.00005**
	(.0022)	(.0021)	(.00001)	(.000004)	(.0001)
Sex of Head (Female)	-.275**	-.269**	-.0020**	-.001	-.0031
	(.0760)	(.0719)	(.0004)	(.0007)	(.0074)
Education of Head					
Basic	-.439**	-.421**	-.0033**	.0004**	-.0147**
	(.0418)	(.0392)	(.0003)	(.0001)	(.0035)
High School	-.809**	-.772**	-.0068**	.0005**	-.0313**
	(.0484)	(.0469)	(.0005)	(.0001)	(.0048)
University	-1.12**	-1.05**	-.0106**	.0006**	-.0564**
	(.0561)	(.0515)	(.0007)	(.0001)	(.0042)
Marital Status					
Married	.0697	.0738	.0006	.0007**	-.0054
	(.0695)	(.0654)	(.0005)	(.0002)	(.0091)
Other	.0253	.0427	.0005	-.00003	-.0178
	(.0978)	(.0981)	(.0006)	(.0002)	(.0122)
Employment Status	.497**	.463**	.003**	.0036**	.0271**
	(.0474)	(.0459)	(.0003)	(.0008)	(.0041)
Health Status	.16**	.152**	.0013**	.0013*	.0055
	(.0357)	(.0346)	(.0002)	(.0006)	(.0029)
Dependency Ratio	.736**	.707**	.0055**	.0001	.0233**
	(.0683)	(.0637)	(.0006)	(.0002)	(.0052)
N	2,387	2,387	2,387	2,387	2,387

Notes: Robust standard errors are in parenthesis (1000 replications). We take $\gamma = 2$.

*, ** — significant at the 5% and 1% level, respectively.

The vulnerability has increased from 2014 through 2017, as shown in Table 5. The average household's utility is 55% lower than it would be. Although poverty is still the most critical component, its weight in total has decreased. On the other hand, the share of unexplained risk has increased. We think that an important reason why the unexplained risk has high and significant parameters in both periods is that the region variable is not included in the models. Region information provided for cross-section data is not available for panel data. Besides, environmental pollution and crime variables presented for horizontal cross-section data are not included in the panel data. The power of these variables to control unobservable effects could not be exploited at this point in the analysis. As the mean marginal effect of the gender variable is negative in Figure 1, the sign of the gender variable is negative here as well. The reason for this happening here is similar to the reason mentioned earlier. Recall that the income variable has been normalized. Therefore, the time average of the explanatory variables has been used in the estimations. As a result, panel data has been transformed into cross-sectional data, and the average effects of explanatory variables have emerged. As the education level of the household leader increases, the fragility decreases. Compared to the uneducated or illiterate household leader, the households where the household leader is a university graduate are, on

average, 112% and 45% less vulnerable in the periods of 2006-2009 and 2014-2017, respectively. Single household leaders have less vulnerability than other household leaders.

Table 5. Vulnerability as Low Expected Utility, 2014-2017

	Vulnerability	Poverty	Aggregate Risk	Idiosyncratic Risk	Unexplained Risk
	.5501**	.3149**	.0166**	.0243**	.1942**
	(.0096)	(.0087)	(.001)	(.001)	(.0029)
Household size	-.0029	-.0167	-.0001	.0017**	.0121**
	(.0107)	(.0095)	(.00008)	(.0003)	(.0016)
Household size^2	-.0004	-.0002	.0000001	-.00004**	-.0001*
	(.0003)	(.0002)	(.000002)	(.00001)	(.00005)
Sex of Head (Female)	-.138**	-.127**	-.0008**	-.0003	-.0098*
	(.0345)	(.0314)	(.0002)	(.0015)	(.0049)
Education of Head					
Basic	-.131**	-.115**	-.0008**	-.0006	-.0143**
	(.0225)	(.0213)	(.0002)	(.0015)	(.0033)
High School	-.265**	-.23**	-.002**	-.0015	-.0315**
	(.025)	(.0229)	(.0002)	(.0014)	(.0038)
University	-.451**	-.387**	-.004**	-.0033*	-.0567**
	(.0255)	(.0229)	(.0002)	(.0014)	(.004)
Marital Status					
Married	.0142	.0117	.00008	-.0005	.003
	(.0321)	(.0291)	(.0002)	(.0023)	(.006)
Other	.0628	.0658	.0006*	-.004	.0005
	(.0393)	(.0368)	(.0003)	(.003)	(.007)
Employment Status	.329**	.311**	.0019**	.0269**	-.0105*
	(.0433)	(.0408)	(.0002)	(.002)	(.0049)
Health Status	.14**	.119**	.001**	.0348**	-.015**
	(.0260)	(.0255)	(.0002)	(.0022)	(.0039)
Dependency Ratio	.349**	.342**	.0028**	-.0023	.007
	(.0352)	(.0311)	(.0003)	(.0021)	(.0043)
N	5,075	5,075	5,075	5,075	5,075

Notes: Robust standard errors are in parenthesis (1000 replications). We take $\gamma = 2$.

*, ** — significant at the 5% and 1% level, respectively.

5. Conclusion

Like other emerging countries, Turkey is also developing policies to reduce poverty for many years. However, the studies that the source of the policy development process of Turkey have intensely adopted ex-post approaches. The ex-post approach of traditional poverty analysis is inadequate in developing preventive policies, as it reveals the causes of poverty after households fall into poverty. The main thing is to reduce or eliminate the likelihood of households falling into poverty before it occurs. In this regard, we have analyzed the vulnerability to poverty in Turkey from the ex-ante point of view to demonstrate the percentage of the vulnerable households and the determinants of vulnerability using cross-sectional and panel data. We have utilized two approaches: vulnerability as expected poverty (VEP) and vulnerability as the low expected utility (VEU).

According to the VEP approach used cross-sectional data, vulnerability to poverty in Turkey has decreased between 2006 and 2017. However, regional findings reveal a remarkable difference between East and west. While the rate of vulnerable households in the west of the

country decreases up to 1%, the smallest value seen in the East is 33%. The VEU approach, on the other hand, has revealed that the utility of an average household is about 50% less than it should be due to inequality and risk. This finding makes it clear that inequality should not be ignored when tackling poverty. However, in the mainstream approach, it is claimed that inequality can be neglected while the "main" issue is claimed to be poverty. According to both approaches, the most important factors affecting the risk of households falling into poverty in the future are the education level, employment and health status of the household leader. In addition, the marital status of the household leader also has a significant effect on idiosyncratic risk; compared to the single household leader, other household leaders have a higher vulnerability to poverty. Moreover, according to the logit model, in which the determinants of vulnerability to poverty are estimated, the explanatory power of the variables used in the analysis is once again revealed. Education significantly reduces the probability of being vulnerable to poverty, while the dependency ratio, unemployment and poor health of the household head significantly increase the probability of being vulnerable to poverty. It is thought that policies taking these points into consideration will have significant effects on future poverty.

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