ACCOUNTING FOR INCOME INEQUALITY IN TURKEY: REGRESSION-BASED DECOMPOSITION APPROACH[*]

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TÜRKİYE'DEKİ GELİR EŞİTSİZLİĞİNİN AÇIKLANMASI: REGRESYON TEMELLİ AYRIŞTIRMA YAKLAŞIMI

Assist. Prof. Dr. Ömer LİMANLI
Artvin Çoruh University
Faculty of Economics and Administrative Sciences
Department of Economics
omerlimanli@artvin.edu.tr

Abstract

This paper examines the income inequality in Turkey over the period 2006-2014 by using Income Living Condition Survey. To this end, regression-based decomposition method has been used to demonstrate the influence of microeconomic factors on the income inequality. Findings indicate that the age of household head, unemployed household members per capita and ill health status per capita have a small effect on inequality while education per capita and region have an enormous effect not only in terms of relative factor weight but also in terms of change effect. This reveals that policy makers who pursue to reduce income inequality should consider education and region as major factors in the policy making process.

Keywords: Decomposition, income inequality, Turkey.

Öz

Bu makale Gelir ve Yaşam Koşulları Araştırması'nı kullanarak 2006-2014 dönemi için Türkiye'deki gelir eşitsizliğini incelemektedir. Bu amaçla, mikroekonomik faktörlerin gelir eşitsizliği üzerindeki etkisini ortaya koymak için regresyon temelli ayrıştırma yöntemi kullanılmıştır. Bulgular hanehalkı liderinin yaşının, hanede kişi başına düşen işsiz sayısının ve kişi başına düşen kötü sağlık durumunun eşitsizlik üstünde küçük bir etkisi olduğunu, buna karşın kişi başına düşen eğitimin ve bölgenin yalnızca eşitsizlikteki ağırlıkları anlamında değil eşitsizlikteki değişim anlamında da çok büyük etkiye sahip olduğuna işaret etmektedir. Bu durum gelir eşitsizliğini azaltmayı amaçlayan karar alıcıların eğitim ve bölgeyi politika oluşturma sürecinde ana faktörler olarak ele almaları gerektiğini ortaya koymaktadır.

Anahtar Kelimeler: Ayrıştırma, gelir eşitsizliği, Türkiye.

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1. INTRODUCTION

Developing countries and international policy agencies have particularly focused on poverty alleviation policies in order to stimulate growth especially after the 'Washington consensus.' The problem with this view is that it considers the poverty as a sole factor that hinders the growth. Fortunately, income inequality has taken its place in the policy agenda by "bringing income distribution from cold" (Atkinson, 1997; Kanbur & Lustig, 1999).

The resumed attention to income inequality roots in the emerging awareness of the importance of the income inequality in the poverty alleviation policies. According to Naschold (2009), income inequality affects poverty via two channels. First, income inequality determines the allocation of growth among the members of society. Second, income inequality aggravates the poverty by deterring the growth. The thing is that we do not know so many things about the microeconomic determinants such as gender, employment status, etc. of income inequality. Instead, scholars have primarily concentrated on the consequences of income sources on income inequality.

This paper investigates the microeconomic determinants of income inequality in Turkey over the period 2006-2014 so as to suggest policies to promote the growth and reduce poverty. In this regards, the questions this paper tries to answer may be given as follows: i) how much of the inequality in Turkey can be explained by household characteristics? And ii) how have the contributions of these factors to income inequality evolved over time? To answer these questions, we have used Income and Living Condition Survey which is conducted annually by Turkish Statistical Institute since 2006 and employed regression based decomposition technique which is developed by Fields (2003).

The decomposition method of Fields (2003) has been extensively applied by researchers. For instance, Gindling and Trejos (2005) and Deng and Li (2009) have decomposed wage inequality while Gunatilaka and Chotikapanich (2009), Naschold (2009), Manna and Regoli (2012) and Brewer and Wren-Lewis (2016) have decomposed household income inequality. However, previous studies that focus on Turkey only have decomposed total income inequality into subgroup (Gürsel, Levent, Selim, & Sarıca, 2000; Özkoç, Gürler, & Üçdoğruk, 2011; Yıldırım, Öcal, & Özyıldırım, 2008) or income sources (Başlevent, 2010; Bayar, Günçavdı, & Selim, 2009; Çetin & Gün, 2013). Thus, it is thought that the present paper will fill this gap.

The rest of the article proceeds as follows. In Section 2, data and methodology that are used will be provided. In Section 3, we will first give a short overview of the income inequality in Turkey using Lorenz curves and inequality measures. Then, decomposition results and changes in the contribution to income inequality will be presented. Policy suggestions and implications for future research are given in Section 4.

2. METHODOLOGY and DATA

2.1. Methodology

This paper uses the regression-based decomposition method of Fields (2003). This approach has been developed following inequality decomposition by factor component method of Shorrocks (1982). For notational consistency, we have used the notations of Fields (2003).

Fields (2003) stars his methodology by the standard log-linear regression equation:

$$\ln(Y_{i1}) = \alpha_1 + \sum_k \beta_{k1} x_{ik1} + \varepsilon_{i1} \tag{1}$$

$$\ln(Y_{i2}) = \alpha_2 + \sum_k \beta_{k2} x_{ik2} + \varepsilon_{i2} \tag{2}$$

Equation 1 and 2 may be represented more compact form as follows:

$$\ln Y_{it} = a_t' Z_{it} \tag{3}$$

where $a_t = (\alpha_t, \beta_{1t}, \beta_{2t}, \dots, \beta_{Kt}, 1)$ and $Z_{it} = (1, x_{i1t}, x_{i2t}, \dots, x_{iKt}, \varepsilon_{it})$. Y_{it} represents the adult equalized disposable income of household i at time t. Next, Fields (2003) has used following theorem:

Theorem (Mood, Graybill, & Boes, 1974, p. 179) Let $A_1, \dots, A_p$ and $B_1, \dots, B_q$ be two sets of rundom variables and let $a_1, \dots, a_p$ and $b_1, \dots, b_q$ be two sets of constants. Then,

$$cov\left[\sum_{p=1}^{P} a_p A_p, \sum_{q=1}^{Q} b_q B_q\right] = \sum_{p=1}^{P} \sum_{q=1}^{Q} a_p b_q cov[A_p, B_q] \tag{4}$$

We get the following equalities when we apply Equation 4 to our log-linear equations:

$$lnY = \sum_{k=1}^{K+2} a_k Z_k \tag{5}$$

$$cov\left[\sum_{k=1}^{K+2} a_k Z_k, lnY\right] = \sum_{k=1}^{K+2} cov[a_k Z_k, lnY] \tag{6}$$

The left-hand side of the Equation 6 equals to the variance of lnY. Therefore, it can be rewritten as follows:

$$\sigma^2(lnY) = \sum_{k=1}^{K+2} cov[a_k Z_k, lnY] \tag{7}$$

After the dividing Equation 7 by its left-hand side, we obtain the "relative factor inequality weight" for each factor as follows:

$$s_k(lnY) = \frac{cov[a_k Z_k, lnY]}{\sigma^2(lnY)} \tag{8}$$

It is important to note that Equation 8 is valid if and only if right-hand side variables are orthogonal to error term and there are zero correlation between these variables as Cowell and Fiorio (2011) have demonstrated. Therefore, it should be kept in mind that Equation 8 is an "approximation." Fields (2003) has also shown that how much of the change in the income inequality results from the modification of the determinants of the income. Let $I(\cdot)$ be any inequality index, except for Atkinson inequality index (Bigotta, Krishnakumar, & Rani, 2015). Then,

$$I(\cdot)_2 - I(\cdot)_1 = \sum_k [s_{k,2} I(\cdot)_2 - s_{k,1} I(.)_1] \tag{9}$$

$$\%100 = \frac{\sum_k [s_{k,2} I(\cdot)_2 - s_{k,1} I(.)_1]}{I(\cdot)_2 - I(\cdot)_1} = \sum_k \Pi_k(I(\cdot)) \tag{10}$$

Note that constant term has no meaning in the decomposition analysis due to its "constant" structure and its coefficient which equals to one.

2.2. Data

Data on the household income and the characteristics of household comes from the Income and Living Condition Surveys (ILCS). This survey is conducted by Turkish Statistical Institute since 2006, and we have performed our analysis by using cross-section data over the period 2006-2014. ILCS contains a large number of information related to the households and people who live in those households such as income, household conditions, region, schooling, employment status, etc. Our essential variable is total disposable household income. All calculated inequality indices, curves, and decomposition analysis by using regression analysis are based on total disposable household income. We have also used five independent variables in the regression analysis. Desired information about these variables is given below.

Households differ from each other in terms of the number of children and adults they contain. This raises comparability issue because the cost of a child and an adult is not the same. In order to take into account the cost of children relative to adults, total disposable household income has been adjusted by using OECD scale (OECD, 2017). Let y_i and m_i be the total disposable household income of i-th household and adult equivalent size of household, respectively. Then, per adult equaivalent disposable household income equals to y_i/m_i. m_i can be calculated as follows:

$$m_i = (1 + \alpha n_i^a + \beta n_i^c)^\epsilon \qquad (11)$$

In the Equation 11, n_i^a is the number of adult and n_i^c is the number of children in the i-th household. ϵ is the measure of economies of scale within the household, $0 \le \epsilon \le 1$. α and β are the cost of an adult and a child, respectively. We assume that there is constant return the scale. Therefore, we set the ϵ equals 1. Following modified OECD scale, we equalize the α to 0.5 for each adult out of household head and β to 0.7 for each children. 1 in the paranthesis represents the household head.

Five independent variables have been used in the regression analysis. First is the age of household age. The second variable is region. We hope that this variable will capture the regional development differences that influence income distribution in Turkey. Other three independent variables have been calculated per capita within the household. Hence, we expect that the effects of all household members can be represented. The third independent variable is the number of unemployed persons per capita. Wage or salary is the primary income source of the household. Therefore, the number of unemployed people might have a significant impact on the household income. The fourth variable is the number of the individual who has ill health status per capita. This variable might influence household income through employment chances. Unhealthy individuals cannot work properly, or healthy members of the household cannot work properly because they should take care of them. The last variable is the education. We believe that education is the most important variable in the income generation process. Increasing number of the schooled members of the household might make higher household income possible.

3. RESULTS

3.1. An Overview of Income Distribution in Turkey

As we all know, income inequality research entails the microdata that might come from two primary sources: household surveys and tax registers. Later is not available for Turkey, yet. Household surveys were started to conduct officially in 1987 by State Institute of Statistics (former name of Turkish Statistical Institute). Before this date, some attempts had been made by individual researcher or institutions. However, these studies have some problems related to sampling frame, the purpose of the survey, etc. Nevertheless, these studies are crucial for understanding income distribution in Turkey. They indicate that income inequality in Turkey has been falling consistently, except for crisis years such as 1994 and 2007-2008. Gürsel et al. (2000) provide detailed information about these studies. The first survey whose primarily purpose is to collect information regarding poverty and inequality is ILCS. We have presented the commonly used income inequality indices, Gini, Atkinson,

Generalised Entropy, and Quantile Ratio, by using ILCS for the period 2006-2014 in Table 1. This survey also indicates that income inequality keeps falling in Turkey in the corresponding period.

**Table 1.** Income Inequality in Turkey, 2006-2014.

Inequality Measures	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gini	.405	.387	.387	.394	.383	.385	.381	.380	.376
Atkinson									
$\varepsilon = .5$	.134	.124	.124	.129	.122	.122	.119	.118	.115
$\varepsilon = 1$	.247	.225	.225	.233	.221	.223	.220	.217	.212
$\varepsilon = 2$	.431	.388	.393	.409	.386	.390	.399	.406	.377
Generalised Entropy									
$\theta = 0$	.284	.255	.255	.265	.250	.252	.248	.245	.239
$\theta = 1$	.297	.283	.280	.292	.275	.275	.264	.263	.254
$\theta = 2$	.444	.478	.458	.493	.454	.439	.400	.397	.371
Quantile Ratio									
$p10/p90$	.159	.183	.178	.172	.183	.182	.186	.187	.186
$p25/p75$	.384	.411	.410	.407	.418	.412	.414	.419	.415

Source: Author's calculation by using ILCS, 2006-2014.
Notes: Bigger values mean higher inequality. ε and θ are both represent inequality sensitivity. Higher inequality sensitivity values give more weights on the bottom part of distribution.

The other way of showing the trend of inequality is to use Lorenz Curve (LC). LC is a graph of cumulative percentage of income received by each cumulative proportion of the population against the cumulative percentage of the population which is ordered poorest to richest. However, if the means of two samples are not the same, then, LCs might intersect. Thus, we have used Generalized Lorenz Curve (GLC) that is calculated by multiplying LC by the sample mean. Figure 1 shows the GLC for each year and pooled data.

Figure 1. Generalised Lorenz Curves, 2006-2014.
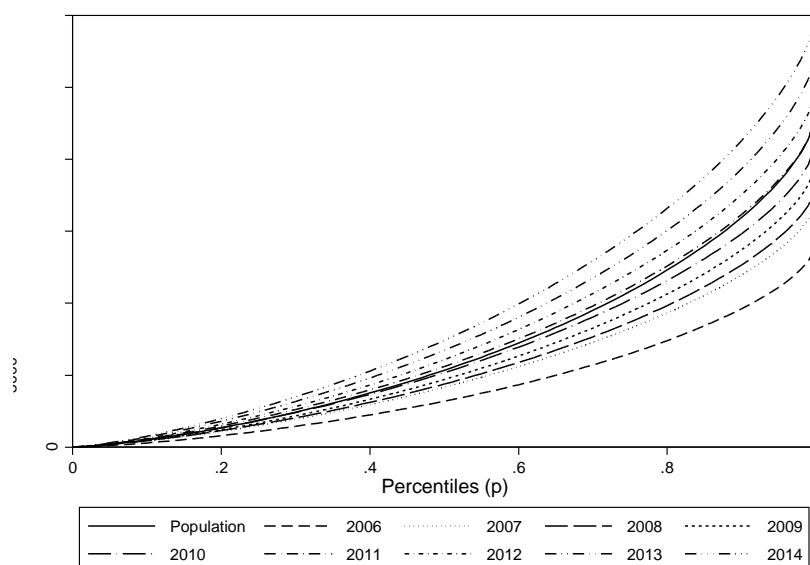
Source: Author's calculations by using ILCS, 2006-2014.
Note: Curves which are on the upper-left side of the graph indicate less inequality.

Even if aggregate income inequality figures tell so many things, decomposing inequality by regions might tell more in terms of regional differences in Turkey. In order to present income inequality by regions, we have decomposed Theil inequality measure which is derived from Generalised Entropy Measure by setting theta to 1. The reason we have chosen this index is that Theil index ensures the exact subgroup decomposition property. We have provided not only inequality by region but also the contribution of each region to total inequality in Table 2. Generally speaking, decomposition by subgroup has also demonstrated that income inequality in regions falls between 2006-2014. This fact is displayed by Figure 2.

Table 2. Income Inequality by Regions, 2006-2014.

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
İstanbul	.245	.218	.232	.232	.244	.246	.268	.288	.236
	(.13)	(.11)	(.12)	(.12)	(.15)	(.14)	(.14)	(.14)	(.11)
West Marmara	.224	.198	.195	.250	.239	.254	.263	.237	.234
	(.05)	(.04)	(.04)	(.05)	(.05)	(.05)	(.06)	(.05)	(.05)
Aegean	.310	.253	.286	.266	.294	.293	.285	.262	.230
	(.16)	(.12)	(.15)	(.13)	(.16)	(.16)	(.16)	(.14)	(.12)
East Marmara	.285	.320	.214	.276	.222	.189	.225	.205	.227
	(.09)	(.11)	(.07)	(.08)	(.06)	(.05)	(.07)	(.07)	(.08)
West Anatolia	.289	.255	.301	.268	.220	.248	.222	.271	.273
	(.10)	(.08)	(.10)	(.09)	(.08)	(.09)	(.08)	(.11)	(.12)
Mediterranean	.302	.342	.276	.304	.341	.323	.295	.271	.263
	(.08)	(.10)	(.09)	(.10)	(.12)	(.12)	(.12)	(.11)	(.11)
Central Anatolia	.234	.226	.211	.336	.261	.255	.221	.195	.233
	(.05)	(.04)	(.04)	(.07)	(.05)	(.05)	(.05)	(.04)	(.05)
West Black Sea	.249	.279	.269	.268	.202	.208	.201	.203	.204
	(.05)	(.06)	(.05)	(.05)	(.03)	(.05)	(.05)	(.06)	(.06)
East Black Sea	.275	.243	.245	.241	.185	.195	.192	.181	.191
	(.05)	(.05)	(.04)	(.03)	(.02)	(.02)	(.02)	(.02)	(.02)
Northeast Anatolia	.229	.291	.344	.235	.233	.252	.230	.284	.290
	(.03)	(.06)	(.06)	(.03)	(.04)	(.04)	(.04)	(.05)	(.05)
Central East Anatolia	.262	.253	.281	.315	.275	.285	.227	.213	.267
	(.03)	(.04)	(.05)	(.06)	(.06)	(.05)	(.04)	(.03)	(.05)
Southeast Anatolia	.259	.241	.274	.303	.285	.254	.218	.227	.240
	(.04)	(.04)	(.05)	(.05)	(.05)	(.05)	(.04)	(.05)	(.06)
Within	(.90)	(.91)	(.93)	(.93)	(.93)	(.93)	(.93)	(.93)	(.95)
Between	(.10)	(.09)	(.07)	(.07)	(.07)	(.07)	(.07)	(.07)	(.05)

Source: Author's calculation by using ILCS, 2004-2014.
Notes: The values in the parenthesis are the contribution of the corresponding region to total inequality. Values at the bottom of the table represent the contribution of inequality with and between regions to total inequality.

As Table 2 reveals, there is higher income inequality in the east relative to the western region in Turkey. Aegean and Mediterranean regions have greater inequality the other regions while East Black Sea has the lowest inequality. Besides, Aegean is the major contributor to total inequality in all years. It is also worth to note that the contribution of within and between inequality indicate that the inequality within the regions dominates to the inequality between regions. At least in terms of the contribution to income inequality, higher income inequality is a result of inequality within regions, not between.

Figure 2. Income Inequality by Regions, 2006-2014.
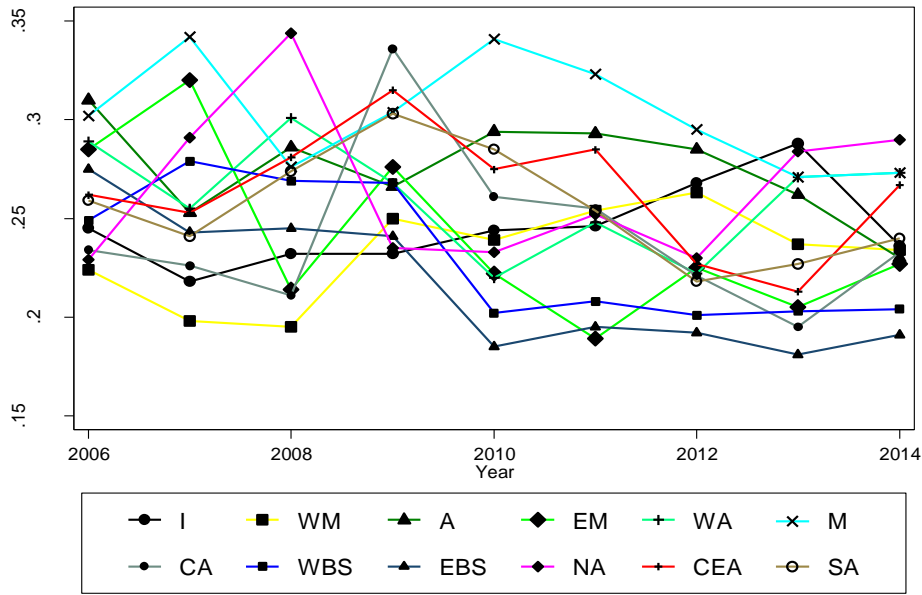
Source: Author's calculation by using ILC.

Notes: I: İstanbul; WM: West Marmara; A: Aegean; EM: East Marmara; WA: West Anatolia; M: Mediterranean; CA: Central Anatolia; WBS: West Black Sea; EBS: East Black Sea; NA: Northeast Anatolia; CEA: Central East Anatolia; SA: Southeast Anatolia.

3.2. Regression-Based Decomposition Results

In this section, we will present the regression-based inequality decomposition results. We will start by providing relative factor inequality weights and then will give the effects of factors on the change in income inequality. Results are presented in Table 3 and Table 4 for the former and later, respectively. Remember that we have used cross-sectional data, so results have not reflected the characters of the same household. Hence, differences between findings across years might at the same time be a result of sample differentiation.
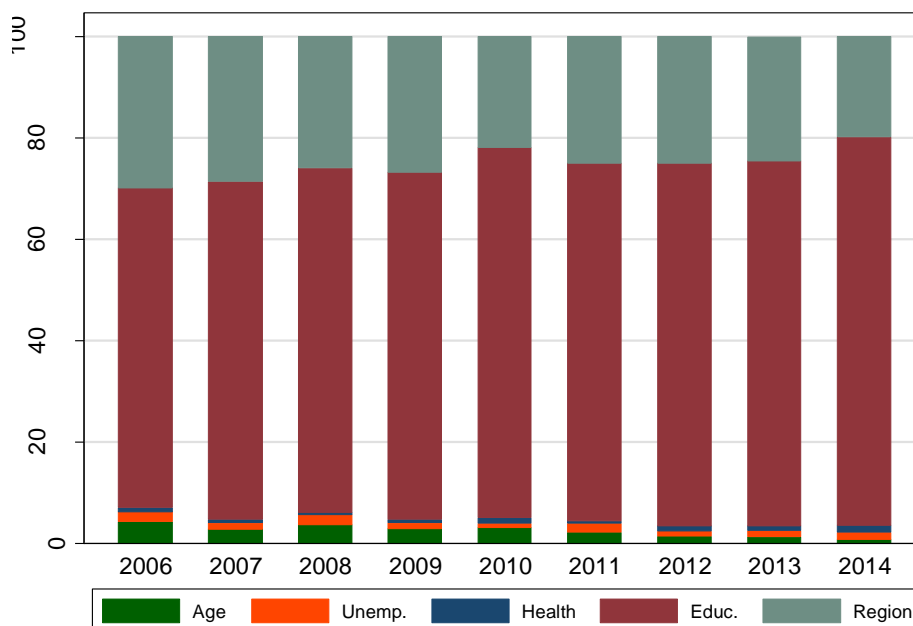
The weight of the age of household head reaches its maximum value in 2006 and its smallest value in 2014. Age explains the 4.21 percentage of income inequality in 2006 and .76 percentage in 2014. It can loosely be said that the weight of age decreases over time, except for 2008. This might be occurred by reason of crisis. Age has been always considered as a major explanatory factor in income generation functions. However, its weight is quite small.

Table 3. Relative Factor Inequality Weights (%), 2006-2014.

Variables	2006	2007	2008	2009	2010	2011	2012	2013	2014
Age of HH	4.21	2.76	3.71	2.93	3.16	2.15	1.39	1.27	.76
Unemployed per capita	2.03	1.25	1.95	1.11	.75	1.78	.98	1.21	1.36
Ill health status per capita	.80	.64	.45	.67	1.04	.42	1.09	.92	1.42
Education per capita	63.10	66.73	67.93	68.48	73.18	70.60	71.54	72.0	76.53
Region	29.84	28.61	25.94	26.79	21.85	25.02	24.97	24.51	19.91
N	10,920	10,796	11,228	11,870	12,106	15,025	17,562	19,899	22,740

Source: Author's calculations by using ILCS. HH: Household Head.

Figure 3. Relative Factor Inequality Weights (%), 2006-2014.

The second variable, the number of unemployed household members per capita, has smaller weights than the weights of the age of household head in all years. Apparently, this factor has not as much explanatory power as other factors have even after controlling the effects of other factors. This is somewhat absorbing. Employee income is evaluated as one of the most important components of household income. Households, where the number of unemployed individuals increases, are expected to fall to the bottom part of the distribution. Therefore, there should be more explanatory factors. Unfortunately, the number of household members who have ill health status per capita is not one of them. Its weights are incredibly small. The remaining factors, education and region, explain at least 90 percentage of income inequality in Turkey. Actually, this is not surprising. Education has been always assessed the most important factor in the income generation process not only for personal but also for the household. The weight of education has been increasing. So, equality of opportunity in the accessing to the high-quality education become relevant for the income inequality. We believe that region variable represents so many dimensions of the determinants of income inequality such as the number of children, dependent persons, sectors where individuals might work, culture, and social structure. Given these realities, policies which particularly revolve around regional disparities should be reconsidered and improved.

Table 4. Contributions to the Inequality Changes (%)

Variables	2006-2010	2010-2014	2006-2014
Age of HH	22.4	132.5	48.9
Unemployed per capita	24.3	-31.9	10.7
Ill health status per capita	-3.4	-19.5	-7.3
Education per capita	-112.1	-106.8	-110.9
Region	169	125.9	158.5

Source: Author's calculation by using ILCS. HH: Household Head.

The contributions to the changes in inequality are given in Table 4 for three different time periods by using Gini coefficient. The positive values in Table 4 indicate that the corresponding factor

intensifies the change in inequality, no matter which way the change occurred. The age of household head intensifies inequality in all periods. The number of unemployed household members per capita affect inequality positively in the first period of change and negatively in the second. The first period covers the crisis years. However, unemployment still intensifies inequality in the widest time period by the 10.7 percentage. It is seen that health status of persons has been mollifying income inequality over time.

The changes in the weights of education and region variables influence the changes in income inequality enormously. However, the direction of the effects is opposite. The good news is that education lessens the inequality in all periods. It explains the 110.9 percentage of the change in inequality in the negative direction in the last period. On the contrary, region intensifies inequality in all periods. It explains the 158.5 percentage of the change in inequality in the last period.

4. CONCLUSION

This paper has investigated the microeconomic determinants of income inequality in Turkey by using regression-based decomposition method. Findings indicate that education and region where household locate are major explanatory factors of income inequality. These factors are also crucial for the changes of inequality. Therefore, we believe that they have important policy implications. Policy makers have developed various policies to promote and improve educational attainment and the quality of education in Turkey, especially in terms of the access to education. However, we believe that the policies which concentrate more on the quality side of education are needed. On the other hand, the region plays a vital role in the income inequality determination process. The region represents not only economic disparities but also, and more importantly, the cultural differences and distributional disparities of land in the countryside of the East of Turkey. There are no such data in the ILCS, and it is not possible to merge it with other surveys which contain needed information. This is very important for more precise and accurate analysis of income inequality in Turkey for the future research.

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