MINIMUM WAGES, SOCIAL SECURITY AND HOUSEHOLD WELFARE IN TURKEY

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ABSTRACT

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In this study, we investigate the effects of minimum wage change together with a social security reform on households' welfare and social security budget in Turkey. For this research, we focus on 2014 and 2016 since both changes occurred in these years, and we can observe the effects and consequences jointly and severally. We used large-scale longitudinal data and developed an overlapping generations model (OLG) for our analysis. The main results of this study are: despite its restricted domain, social security reforms increased collected taxes, but it has extenuating effects on households' welfare. On the other hand, the minimum wage changes have a larger impact area, and it has altered both the social security budget and households' welfare positively.

ÖZET

TÜRKIYE'DE ASGARI ÜCRET, SOSYAL GÜVENLIK VE HANEHALKI REFAHI

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Bu çalışmada, Türkiye'de sosyal güvenlik reformu ile beraber yapılan asgari ücret artışının, hanehalkı refahına ve sosyal güvenlik bütçesi üzerine etkileri araştırılmaktadır. Bu çalışma için, bu iki değişimin de yer aldığı, değişimlerin ortak ve tekil etki ve sonuçlarını gözlemleyebildiğimiz 2014 ve 2016 yıllarına odaklandık. Çalışmamız için büyük ölçekli boylamsal verileri ve bu verilerin analizleri için ardışık nesiller modelini kullandık. Bu makalenin ana sonuçları ise: Sosyal güvenlik reformları, sınırlı alanlarına rağmen, toplanan vergi miktarını artırırken; hanehalkının refahını azaltıcı etkilere sahiptir. Öte yandan, asgari ücret değişikliğinin etki alanı daha geniş olup hem sosyal güvenlik bütçesini hem de hanehalkı refahını olumlu yönde etkilemiştir.

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In memory of Ismail Serhat Oğuz

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1.   INTRODUCTION

In Turkey, minimum wage changes have always been a debated area since a significant portion of the population earns around the minimum wage, at least legally. According to data from Social Security Institution (SGK), 38 percent of Turkey's population earned minimum wage in 2014, making it the leading country in Europe. On the other hand, the sustainability of the social security system has also been a well-known topic in Turkey, just like in other developing countries. Turkey's social security system, with early retirement and informal employment issues, counted as a reason for and a result of its budget deficits, ironically (Bagis 2017). In addition, with the effect of income inequality, policy changes in these areas have a great place and a precious working area for macroeconomic literature.

Minimum wage changes have both positive and negative implications on macroeconomic indicators such as consumption, collected taxes, and employment level. While some studies (Wascher and Neumark 2006), examine the employment effects of minimum wage changes and argue that increasing minimum wages decreases employment, others claim contrarily (Abowd, Kramarz, and Margolis 1999). Although current literature gives mixed messages about the impact of the minimum wage changes on the employment levels, it is quite indisputable that increasing minimum wages will raise consumption levels and collected tax levels. A rise in the minimum wage will increase taxable earnings, meaning that an increase in the minimum wage results in more taxes to be collected by governments. On the other hand, since governments collect more taxes, they have to give more retirement benefits and pensions to their citizens in the future. Having been informed by above mentioned research, in this study, the first aim is to examine this trade-off within the taxable earnings perspective, which remained unattended in the literature, especially for Turkey.

The second aim and working area of this research are studying a social security reform, which is also a debated area in Turkey. The social security system in Turkey is a pay-as-you-go pension system which is also well-known and widely applied in developing countries. In this system, social security taxes, like other taxes, are de-

termined by the government. Individuals pay taxes when they are working and get their retirement benefits when they get to retire. However, the execution of this system is not working as planned. Like other developing countries, Turkey has also been suffering from public debt, and the unsettled social security system has been counted as a significant source of this debt (Sayan and Kiraci 2001). Transfer payments made to the social security institutions from the public budget constitute a substantial part of Turkey's GDP (Bagis 2017). On the other hand, early retirement and informal employment problems of the current social security system are considered a result of high taxation in Turkey (Ozbek 2006). Based on this, especially social security and consumption taxes are counted as "high" compared with other countries' tax levels (*EUROSTAT* 2022). To deal with these issues, reforms about improving the social security system have always been a popular area for policymakers in Turkey.

In Turkey, minimum wage changes and social security reforms occur frequently. Minimum wage rises take place, especially after an increase in the exchange rate and/or inflation rate. As mentioned above, there is no need for additional incentives for social security reforms since the existing system is not running as planned. In this regard, this thesis aims to measure the impacts of these changes separately and jointly over the households' welfare and social security budget. From 2014 to 2016, both of the following changes took place: minimum wages increased, and a social security reform was made. In 2016, compared with 2014, minimum wages increased by 54 percent nominally and 36 percent in real terms (*Ministry of Labour and Social Security* 2022). Given that approximately 38 percent of the population earns around minimum wage, the expected impact of this change on households' welfare and social security budget will be significant. On the social security side, in 2016, the ceiling for maximum income subject to social security tax increased from 6.5 times the minimum annual salary to 7.5 times the minimum annual salary (*Sosyal Sigortalar ve Genel Sağlık Sigortası Kanunu - Mevzuat* 2016). As this change affects a relatively small amount of the population compared to minimum wage change, welfare and social security budget impact will be relatively narrower.

This study also examines these changes in the taxable earnings perspective. As mentioned above, in 2016, agents who benefit from the higher minimum wages will pay more taxes, especially social security taxes. In return, they will get more benefits when they get to retire. In this thesis, we developed an overlapping generations model (OLG) in which agents decide their consumption and saving to maximize their lifetime utility. On the government side, governments will collect more taxes, but they will be obliged to give more retirement pensions to citizens in the future. For this study, we are using longitudinal survey data from the Turkish Statistical

Institute (TUIK), which contains more than 500,000 individuals' information. After the arrangements over this data, we have constructed a wage dispersion and fit this into a distribution (Generalized-Pareto distribution) which allows a better understanding of welfare changes. Using the probabilities of wage levels, via utility and consumption compensation, we measured the welfare and fiscal effects of these changes separately and jointly.

The rest of this study is organized as follows: Section 2 introduces the literature review, Section 3 presents the details of the data and simplification process, Section 4 presents the OLG model, and Section 5 is about the calibration process of the OLG model into Turkish economy while section 6 presents results and Section 7 concludes.

2.   LITERATURE REVIEW

The debate over the effects of minimum wage changes or social security reforms in developing countries is prevalent due to high-income inequality, which allows the identification of the impacts of such changes. While the issues above have been considered as commonly debated, the contribution of this paper, investigating the effects of increasing minimum wages along with social security reform, and the consequences of these on individuals' (and society's) welfare and social security budget are not a prominent topic in the macroeconomics literature.

Numerous studies have examined the impact of an increase in minimum wages on the households' welfare level, but these studies reviewed this topic from a different or narrower point of view. Studies conducted by Krueger and Card (2015), Brown (1999) and Wascher and Neumark (2006) examined the household benefits and minimum wage. Still, these studies focused on the whole society's welfare, not individuals', mainly pointing out the distributional side and decreasing income inequality side of minimum wages. Likewise, for the case of Turkey, Korkmaz (2004) and Papps (2012) analyzed the minimum wage policies in the country and evaluated it as a distributional tool with its effects on employment. These studies are taking the minimum wages as a given tool for decreasing income inequality, and they are not measuring the change in the individuals' and society's welfare in the case of a minimum wage increase as we did in this thesis. Other studies examined the minimum wage and welfare relationship in a relatively narrower view. Clemens, Kahn, and Meer (2018) showed the relationship between minimum wage increase and household benefits within the fringe benefits scope. On the other hand, Agarwal et al. (2019) examined the increase in the minimum wage effects on benefits via expenses associated with housing. As a combination of these studies, Sabokkhiz, Guven Lisaniler, and Nwaka (2021) examined the consequences of an increase in the minimum wage on household welfare and consumption levels with econometric analysis rather than macroeconomic models and perspectives. Yet, these studies are not measuring the effect of minimum wage increases on the different households and

income levels like in our research.

The effects of the minimum wage changes on the social security budget are relatively accessible topics in the literature. Nevertheless, most of these studies calculated the revenues and costs of increasing minimum wages on the social security budget, and they are not considering the welfare of households as in this study. Carneiro (2006) reviewed the topic of the increase in minimum wages within retired people benefits and the government deficit framework. Similarly, Spicker (2010), and Saunders and Deeming (2011) pointed out the minimum wage changes as a burden on the budget and counted as a reason for the deficits. These studies were published to remedy the 2010 global economic crisis for developed countries. For the developing country case, de Mendonça and Tiberto (2014) takes the minimum wage changes as a "social shock" for Brazil's economy. They examined this shock as a result of public debt and considered it a reason for higher income inequality. Additionally, again for Brazil, Carneiro (2006) reviewed the minimum wage changes and pointed out these impacts as a reason for informality alongside its employment and inequality issues. Lastly, Mussi and Pinto (2014) showed that increasing minimum wages would increase the social benefits, creating risks for financial sustainability in the future, especially for developing countries.

After reviewing the studies on the minimum wage changes, studies that discuss the effects of a social security reform on the social security budget and household welfare should be checked. Ferreira (2006) criticized the economic status and social security reforms of Brazil's economy and offered some additional reforms. Similarly, Glomm, Jung, and Tran (2009) showed the consequences of eliminating early retirement decisions for preventing welfare and consumption loss again for Brazil. For the case of Turkey, Sayan and Kiraci (2001) reviewed the application of higher retirement ages and replacement rates of the pay-as-you-go system. In addition, Bagis (2017) studied a drastic reform that decreased retirement benefits by changing the benefits calculation formula in Turkey. On the side of developed countries, Feldstein (1996) and Diamond (1998) mentioned the possible outcomes of eliminating the unfunded social security retirement system for the U.S. case. Similarly, Kaygusuz (2015) analyzed the elimination of the pay-as-you-go system in the U.S.A. and some other changes with a life-cycle model. All these highly esteemed studies demonstrated occurred or potential reasons and results of social security reforms, but nearly all of them point to the distributional, social, and gender results of these reforms. Examining the social security reform alongside its effects on household welfare and collected tax-endowed benefit changes framework remained unique for this study.

As for modeling, this study benefits from a broad literature on modeling for con-

sumption, utility levels, and taxable earnings. Until this point, Modigliani and Brumberg (1954) and Beckmann (1959) provides modelings for individuals' consumption and saving models. In addition, Huggett and Ventura (1999) presented the O.L.G. model for evaluating U.S. social security system and reforms. We implemented our model in line with Kitao (2014) O.L.G. model, mainly about individuals' decision-making on consumption, savings, labor participation, and working hours over a life cycle in a competitive production economy. However, in this study, we assumed a model with a small open economy and ignored labor participation and working hour decisions; and discussed the topic of finding individuals' and society's aggregate utility within taxable earnings and given benefits.

3.   DATA

For this study, the researcher analyzed extensive longitudinal data, Household Labor Force Survey (HLSF) from the Turkish Statistical Institute, to examine whether workers' consumption, utility collected taxes, and given benefits changed by the increase in the minimum wage and social security rule changed. This data includes fundamentals of demographic information such as age, marital status, and education level alongside the main concerns of this study like employment status and income level of workers. This household survey includes more than 500,000 individuals per year. For a better understanding, since taxable earnings and benefits are the main concerns in this study, we excluded unpaid, self-employed workers, and unemployed people. For precision, we also excluded the half-time workers since they may not earn their income according to labor acts.

As this study is based on Turkey statistics, we have to make some other arrangements. This study is analyzing only men whose ages are between 25 to 55 because men whose age is below 25 and after 55, together with women, have statistically low labor participation, and they are working informally primarily (Öztürk and Başar 2018). Lastly, since this study examined the minimum wage changes alongside a social security reform, workers whose income below the minimum wage were dropped for a better understanding of the effects of change in the minimum wages and social security reform. In this data set, workers' previous month's incomes are recorded. With the assumption that workers earn the same amount in all months of that year, scaled and calculated net salaries translated to gross salaries as we seek to compare collected taxes before and after minimum wage and social security changes. The same process was applied to the 2016 data set with inflation-adjusted net salaries to drive out the inflation effects. Below one can find the descriptive statistics for 2014 and 2016 salary data.

Table 3.1 Descriptive Statistics for 2014 and 2016

Descriptive Statistics		
Statistics	2014	2016
Mean	31801.82	40474.07
Median	25077.20	24269.15
Standard Devia-tion	24071.21	24806.78
Skewness	6.133924	4.517048
Kurtosis	113.5903	45.16701

After this process, the distributions of salaries occurred. We can observe that, with the increase in the minimum wage, the salary graph of 2016 skewed to the right. As expected, compared to 2016, salaries in 2014 are more dispersed, while in 2016, salaries are more clustered around the mean. And graphic for wage distributions is as follows:

Figure 3.1 Wage Levels of 2014 and 2016
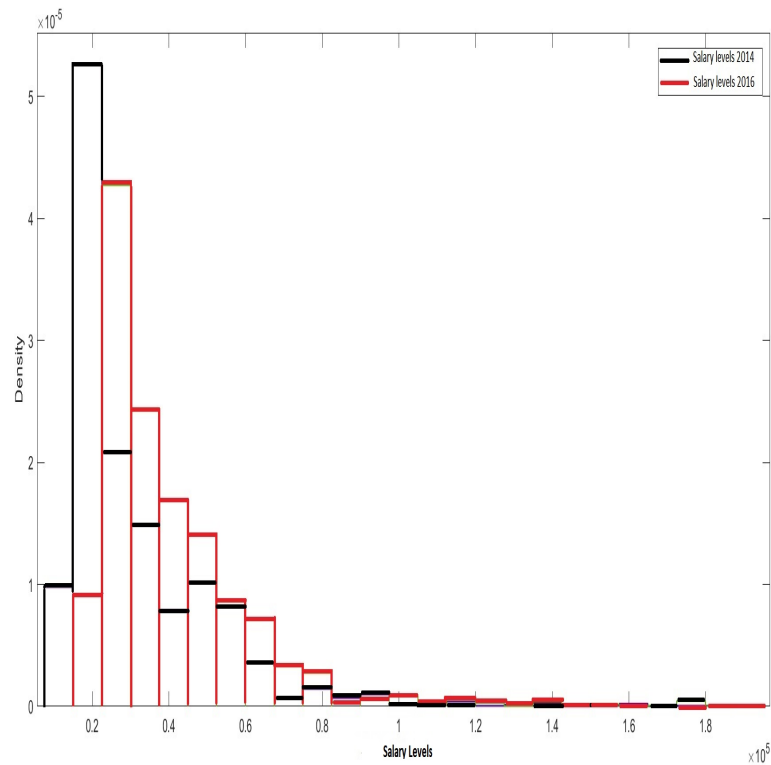
4. MODEL

This part of the thesis deals with the model economy. The model analyzes Turkey's households' welfare and social security budget after the changes in minimum wages and social security reform in 2014 and 2016.

This model has a dynamic model of overlapping generations (OLG) economy. We have different generations alive at a given date. This model economy consists of finitely lived individuals who live only for two periods: the working life shown as period one and the retirement life shown as period two. In this economy, there is a continuum of measure one of heterogeneous households, and each household consists of one male agent representing the household.

Under the assumption that it is a small and open economy, agents differ in their earnings w_i, and these earnings are randomly drawn from a distribution $F(w_i)$. After the adjustments are made in the data part, the raw and unfitted form of distribution is created. This non-parametric distribution fitted to the Generalized-Pareto distribution[1], which is commonly used for the data consisting of income inequality.

This distribution reflects both observable (education, experience, age) and unobservable (ability, personality) characteristics of agents. The parameters of the earnings distribution (μ_{2014}, μ_{2016}, σ_{2014} and σ_{2016}) determine where the agents are concentrated in the salaries and the other parameters, such as minimum wages of that year, determine the shape, location and reference point of the fitted distribution. The probability density functions corresponding to the salary levels of this distribution will be used in the aggregation process, which will be explained widely in the results part.

Now, we are back to our model economy used in this study. This model is based on taxable earnings, so benefits and taxation are the priority. There are four taxes

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[1]Fitted distributions can be found in the appendix part

in this model economy similar to a working (and later retired) person in Turkey: consumption tax (T_c), income tax $T_1(w_1)$, social security tax T_{ss} and tax function for asset income $T_2(rs_1)$. All agents are paying the consumption tax with respect to their consumption level, $(1+\tau_c)c_t$ in both their working and retirement life. While working, these agents are paying income tax $T_1(w_1)$ and social security tax payment $T_{ss}(w_1 \mid \bar{I})$ and lastly when they get retired they pay $T_2(rs_1)$ a tax for their asset income. Where $\bar{I}$ stands for maximum income subject to social security tax and rs_1 indicates the savings earning tax rate. And $T_{ss}(w_1 \mid \bar{I})$ is taking the values of:

(4.1)
$$T_{ss}(w_1 \mid \bar{I}) = \begin{cases} \tau_{ss}w_1 \text{ if } \bar{I} \geq w_1 \\ \tau_{ss}\bar{I}, \text{otherwise} \end{cases}$$

In this regard, limiting retirement benefits via agents' maximum income subject to social security tax ensures that even if agents differ positively in their working life, their retirement payments are not altered. Other taxes will be explained in the calibration part broadly.

Agents get retirement pension which is the combination of b ,the replacement rate, and minimum of their income or maximum income subject to social security tax $\min(w_1 \mid \bar{I})$:

(4.2)
$$b\min(w_1, \bar{I})$$

There is population growth, which is the essence of pay-as-you-go social security systems, and N_{t+1} shows the next generation while N_t shows the current generation. The population is growing with η, and the ratio between the members of generations becomes:

(4.3)
$$\frac{N_{t+1}}{N_t} = 1+\eta$$

Agents have identical utility function, assuming that it is twice differentiable, strictly increasing, and strictly concave. All agents get utility from their consumption level only:

(4.4)
$$U(c_t) = \log c_1 + \beta \log c_2$$

Each agent tries to maximize his/her life-time utility via maximizing his c_1, c_2 and his private saving s_1 with given w_1. With exogenous r and subjective discount factor β (both explained in the calibration part broadly), the maximization problem of agents becomes:

(4.5)
$$\max_{c_1, c_2, s_1} U(c_1) + \beta U(c_2)$$
$$\text{s.t.} (1 + \tau_c)c_1 + s_1 = w_1 - T_1(w_1) - T_{ss}(w_1 \mid \bar{I})$$
$$(1 + \tau_c)c_2 = b \min(w_1, \bar{I}) + (1 + r)s_1 - T_2(rs_1)$$
$$s_1 \geq 0$$

Agents are deciding on their consumption and saving levels which bounded from below means that agents can't lend or borrow in return for their retirement benefits. While working, agents' consumption and saving will equal their wages, income, and social security taxes. Agents will consume their retirement benefits and savings while giving asset income taxes during retirement.

4.1 Stationary Equilibrium

This model consists of heterogeneous agents in terms of their earnings, saving, asset holdings and consumption decisions. And a sequential competitive equilibrium solves the problem of heterogeneous agents' problem.

Definition: A sequential equilibrium for this economy consists of agents' decisions about their consumption levels c_1 and c_2, saving level s_1, governments' policy variables R, τ_c, τ_{ss}, $\tau_1(w_1)$, $\tau_2(rs_1)$ such that:

1) Given c_1, c_2, s_1, R, τ_c, $\tau_{ss}, \tau_1(w_1)$, $\tau_2(rs_1)$ are optimal.

2) Social security budget is balanced

(4.6)
$$\sum_{n=1}^{N(t)} b \min(w_1, \bar{I}) = \sum_{n=1}^{N(t)} T_{ss}$$

3) Governments' budget is balanced

(4.7)
$$G = C\tau_c + \sum_{n=1}^{N(t)} T_{ss} + \sum_{n=1}^{N(t)} \tau_1(w_1) + \sum_{n=1}^{N(t)} \tau_2(rs_1)$$

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4) Markets clear.

5. CALIBRATION

In this section, the calibration of the model to the Turkish economy and the application process of particular parameter values will be examined. This process contains the selection of the values and parameters for the model economy and some implications for the Turkish economy, especially for social security and taxable earnings.

5.1 Demographics

The model aims to measure the effects of changes in minimum wages and social security rules. For this purpose, as it will give concrete results, we chose the years 2014 and 2016 for bench-marking and comparison. Social security reform which is increasing the ceiling for maximum income subject to social security tax ($\bar{I}$) increased from 6.5 times the minimum salary to 7.5 times the minimum salary. In addition, minimum wages in Turkey increased drastically both in real and nominal terms. In this regard, the model economy is calibrated to these years. Each agent lives for two periods, working and retirement; as we chose the years of 25 and 55 for active years, these two periods correspond to the 30 years of agents' life.

The population growth rate, which is the essence of the pay-as-you-go social security system, "η" was set as an average of ten years of the growth rate of Turkey between the years 2004 and 2016, which is equal to 1.55 percent (TUİK). All these rates are calibrated to the power of 30 due to our assumption of active years mentioned above. Hence, "η" takes the value of 0.586.

5.2 Interest rate

The interest rate "r" in this economy is the average of the real interest rate of Turkey, which is equal to 4.3 percent (Central Bank of Turkey). Like the population growth rate, this rate is also calibrated to the power of 30 since a period equals 30 years and the interest rate in this model is equal to 2.536, which is quietly close to similar studies.

5.3 Preferences

In this model economy, the utility function which is representing the preferences of the agents is as follows:

(5.1)
$$\max_{c_1,c_2,s_1} U(c_1) + \beta U(c_2)$$

As observed, agents only get utility from their current and future consumption levels. Agents are discounting their future consumption by the discount rate "β". This value was taken from similar research of Bagis (2017). This rate is also calibrated like other values and takes the value of β=0.2286

5.4 Taxation

In this economy, taxation is a simulation of the Turkish economy. There are four taxes in this model economy similar to a working (and retirement later on) life in Turkey: consumption tax (τ_c), income tax ($T_1(w_1)$), social security tax (T_{SS}) and tax function for asset income ($T_2(rs_1)$).

The consumption tax (τ_c) calibrated as a ratio of total collected consumption tax to the total consumption level of Turkey in 2014. According to the data *Presidency of Strategy and Budget* (2022), this rate is 16.6 percent.

(5.2)
$$\tau_c = \frac{\text{Total collected consumption tax}}{\text{Total Consumption}}$$

Income taxes mimic Turkey's income tax rates which is a kind of progressive tax,

and income taxes are increasing with respect to agents' income.

Social security tax rate (τ_{ss}) calibrated like other taxes and takes the value of Turkish social security tax rates. In Turkey, for social security, employers pay their share of 20 percent of income, and employees pay their social security share as 14.5 percent of their income. As a rate of these shares to total income plus these shares, social security tax rates take the value of 30.4 percent as such:

$$(5.3) \qquad \tau_{ss} = \frac{0.20I + 0.145I}{1.145I}$$

The last tax used in this model economy is the tax which taken from the asset income of the retired people, and it takes the value of 10 percent of savings to come from the working life.

5.5 The social security system

The social security system of this model economy is a classical pay-as-you-go social security system, and the application of this system is a basic module of the Turkish social security system. In this model, b is the replacement rate, and retirement benefit is:

$$(5.4) \qquad b\min(w_1, \bar{I})$$

The replacement rate,b is the ratio of an individual's annual employment income that is replaced by retirement income when they retire, and it gets the value of 0.4774 for 2014 and 0.4650 for 2016. Below one can find the list of parameters used for calibration.

Table 5.1 List of Parameters for Calibration

Calibration List		
Parameter	Description	Value
β	discount parameter	0.2286
η	population growth rate	0.586
r	interest rate	2.536
τ_c	consumption tax rate	0.166
τ_{ss}	social security tax rate	0.301
$T_2(rs_1)$	tax rate for asset income	0.1
b	replacement rate	0.4774 for 2014 and 0.4650 for 2016

6. RESULTS

In this part, together with the changes in the environment, the aggregation process, results and interpretation of these processes will be presented. In this regard, we will simulate the model according to years' variables such as wages, tax rates, and maximum income subject to social security tax $(\bar{I})$. However, before this simulation, it will be convenient to mention the aggregation process, which will be used for measuring tax, households' utility levels, and retirement benefits. For this, we used the corresponding probability densities of wage levels $(f(w_i))$ and corresponding consumption, tax, or benefit level of that wage levels and aggregation of their products, such as:

$$(6.1) \qquad\qquad \sum f(w_i)c_i$$

Repeating the same procedure for the benefits and collected taxes will be similar. As a difference, in the aggregation of T_{ss}, the population growth rate should be taken into consideration. In countries that are applying pay-as-you-go social security systems like Turkey, the young generation (workers) are financing the old generation (retired). In this regard, young workers are paying taxes with $T_{ss}(1+\eta)$ and retired people get their benefit with $b\min(w_1, \bar{I})$. With the population growth rate, where b is the replacement rate. Hence, the aggregation of the benefits and taxes will be:

$$(6.2) \qquad\qquad \frac{\sum f(w_i)b\min(w_1, \bar{I})}{1+\eta}$$

$$(6.3) \qquad\qquad \sum f(w_i)T_{ss}$$

The same procedure for the utility is crucial in this study as it is an indicator for measuring households' welfare. For this measurement, we need to aggregate the

utility of corresponding wages first as such:

(6.4)
$$\sum f(w)U(c_1, c_2)$$

After finding a year's aggregate utility, the rest is measuring the utility compensation and finding the "Δ" value, which is the difference between old and new status. The process of finding delta:

(6.5)
$$U(c_t) = \log c_1 + \beta \log c_2$$
$$V_{new} = \log c_1 (1+\Delta) + \beta \log c_2 (1+\Delta)$$
$$V_{new} = \underbrace{\log c_1 + \beta_2}_{V_{old}} + (1+\beta)\log(1+\Delta)$$
$$\log(1+\Delta)(1+\beta) = \frac{V_{new} - Vold}{1+\beta}$$
$$\Delta = (\exp \frac{V_{new} - Vold}{1+\beta}) - 1$$

As mentioned above, moving from 2014 to 2016, minimum wages, wage levels (hence corresponding probabilities), collected tax levels, and maximum income subject to social security tax ($\bar{I}$) are changing. For measuring the impact of the social security reform, as a benchmark study, we simulated this change in the model economy and calculate the tax and Δ levels. Without changing the wages and corresponding probabilities $f(w_i)$, Δ value will be evaluated as follows:

(6.6)
$$\Delta = (\exp \frac{V_{2014withnew\bar{I}} - V_{2014}}{1+\beta}) - 1$$

Agents who earn more than $\bar{I}$, will not get an extra benefit when they retire. And after the change was made in social security, this threshold increased, so people who earn more than the threshold would get less benefit. Since people who will be affected by this change, only those who earn between the old and new threshold, are a small part of society (approximately 2 percent of our sample), a negative but small delta value occurred as expected.

Table 6.1 Effects of Social Security Reform in 2014

Social Security Reform Effect		
	2014	2014 with new $\bar{I}$
Aggregate benefit and T_{ss}	9140.018	9299.3405
Replacement rate (b)	0.477388	0.477386
Consumption level (c_1)	14254.392	14213.347
Consumption level (c_2)	11522.247	11489.069
Total consumption	25776.639	25702.416
Aggregate utility	11.5254	11.5672
$\Delta = \% - 0.080422$		

After measuring the welfare effect of changing the social security reform, it is time to measure the delta between 2014 to 2016, which means changing both social security and minimum wages. In Turkey, from 2014 to 2016, one of the most significant minimum wage changes occurred. In 2016, compared to 2014, nominal wages increased by 54 percent, and real wages rose by 36 percent approximately. In addition, in 2016, the ceiling for maximum income subject to social security tax increased, as we calculated its effects above. To eliminate the inflation effects, we use the real wage changes and calculate the delta such that:

$$(6.7) \qquad \Delta = (\exp \frac{V_{2016} - V_{2014}}{1 + \beta}) - 1$$

And results of these changes are:

Table 6.2 Effects of Minimum Wage Change and Social Security Reform

Minimum Wage Change and Social Security Reform Effects		
	2014	2016
Aggregate benefit and Social Security Tax T_{ss}	9140.018	12033.842
Replacement rate (b)	0.477388	0.46495
Working consumption level (c_1)	14254.392	17412.063
Retired consumption level (c_2)	11522.247	14074.686
Total consumption	25776.639	31486.7488
Aggregate utility	11.5254	11.8231
$\Delta = \%27.42$		

Despite the negative welfare effect of the social security reform mentioned above, there is a significant and positive welfare change due to the increase in minimum wages. Like in other developing countries, a considerable portion of Turkey's population (approximately 38 percent) earns minimum wage, and increasing the minimum wage by 35 percent would increase their welfare immensely.

7.   CONCLUSION

This thesis shows the effects of minimum wage change together with a social security reform on the households' welfare and social security budget in Turkey. The reason for choosing Turkey as a case country in this thesis is, like other developing countries, Turkey's high-income inequality, which allows a better understanding of the impacts of mentioned changes. In this regard, we have chosen the years 2014 and 2016 since both minimum wage change and social security reform took place in these years in Turkey. We have used a large scaled longitudinal data, household surveys that include more than 500,000 individuals' information, a good representative of the country's population. In the modeling part, we developed an overlapping generation (OLG) model, wherein agents try to maximize their lifetime utilities via optimal saving and consumption decisions.

In the results part of this thesis, we measure the effects of social security reform and minimum wage changes jointly and separately. In this regard, increasing the maximum income subject to social security tax ($\bar{I}$), despite the execution of this affecting a small portion of the population, has a positive effect on the social security budget, i.e., collected taxes increases. On the contrary, individuals have been worsening-off with this change, which is a slight change, but their household utilities have been affected negatively. On the other side, the minimum wage rise influenced a larger population segment, and this change had positive and significant effects on social security budgets and individuals' welfare levels. Keeping in mind the long-term effects of minimum wage increases, the results of social security reform showed that Turkey's unsettled social security system needs more attention.

This thesis demonstrated how drastic changes in public policies affect households and state-level economies. As a suggestion for future studies, our study can be simulated with time-series data rather than the longitudinal data we already used. With the availability of panel data in the future, measuring the income level changes may give additional suggestions about the distributional issues in Turkey.

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APPENDIX A

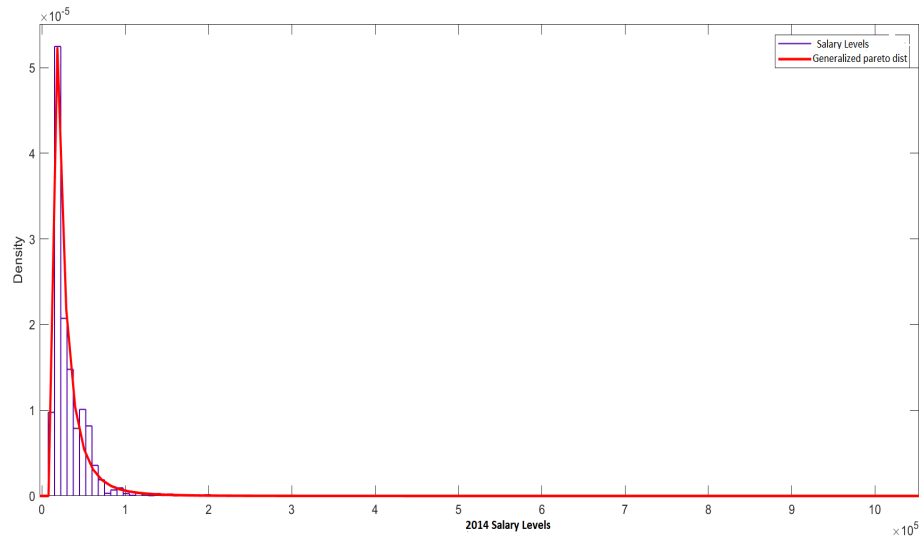Figure A.1 2014 Salary Levels Fitted to Generalized Pareto Distribution

Figure A.2 2016 Salary Levels Fitted to Generalized Pareto Distribution