"A SHORT ANALYSIS ON LABOR MARKET RETURNS OF THE RECENT RETIREMENT REFORM (EYT) IN TURKEY BY AGENT-BASED MODELLING"

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1- Introduction

The social security system (SSS) can be expressed as a system in which the public sector makes public expenditures in order to provide income to people in order to eliminate the problems that people may encounter in their lives. In other words, the SSS plans to alleviate or eliminate basic problems such as unemployment, health problems and old age that people will face in the future (Gümüş, 2010). However, in order for the system to function properly, it must be designed correctly and acted accordingly. The SSS started to become systematized, especially after the Industrial Revolution. When we look at the history of the social security system, it does not go back to very long times (Güvercin, 2004). In Turkey, it seems reasonable to start the beginning of the social security system in the modern sense after 1950. However, a system that can be called relatively new may have shortcomings.

SSS of Türkiye has been in place for about 80 years and has some significant problems related to increasing populist political decisions that are causing deeper crises in the social security payment (İzgi, 2008). The high number of retired people in the system places enormous burdens on the SSS and leads to crises. These crises are triggered by the creation of early retirement conditions. A 1999 law in Turkey has raised the retirement age to 55 at the earliest (but 58 for women and 60 for men at normal time). However, with a change in the law in 2008, the earliest possible retirement age has been raised to 65. However, the people entering the labor market in 1999 at the latest could not retire due to this change even if they worked the requisite minimum number of days. Therefore, those people have been still forced to wait until they reach retirement age under this modification. As a matter of fact, a new reform (Emeklilikte Yaşa Takılanlar, EYT) was introduced as an election promise for the 2023 Turkish General Elections. In particular, the new reform introduced the possibility to retire without waiting for retirement age for those who have completed the minimum number of days required for retirement and were employed before 1999. In other words, with the new reform, they will no longer have to wait until the age of 55 for early retirement.

As a result of this change, 1 million 814 thousand people who would not normally have been able to otherwise could be retired. However, such an increase in the number of retirees both poses a threat to the social security system and has an impact on labour supply and demand in the market. While some people continue their working life even after retirement, some people retire and leave the labour force. However, in any case, the burden on the public sector will unquestionably be high. The study we have conducted here mainly focuses on the impact on the labour force rather than the burden on the public sector. Because of this reform package, many people retire and withdraw from the labour market. In this context, this reform package creates new job opportunities besides its negativities. It might have significant impacts, especially on youth unemployment. For this purpose, an agent-based model (ABM) with heterogeneous agents is constructed in this study. The ABM is a modified version of the Overlapping Generations (OLG) Model which is established for populations of age groups focusing on the influence period of the reform (2023-2038) until the last agent of the target group leaves the labor force. According to the simulation results, instead of people dropping out of the labour force after the EYT, both the number of young unemployed and the total unemployment rate decreased in the short term. Accordingly, the participation of young people in the labour market has risen. In addition, the participation of the whole population grew. However, long after the shock, both the unemployment rate and the participation rate converge to the old equilibrium level.

According to the plan of this study, we will firstly describe and interpret the model environment and methodology in the Section 2. Section 3 refers to the calibration of parameters and data. The simulation results of the model will be presented, and hence the interpretations and suggestions about outputs will be provided in the Section 4. Finally, Section 5 will give the concluding remarks.

2- Model Environment and Methodology

The model employed in this study can be classified as a simulated version of the Overlapping Generations (OLG) Model. Similarly, the model has three main sectors: a government which has a budget constraint, a competitive representative firm that has a fixed labor demand growing at a constant rate and a constant returns to scale production function as well as heterogeneous households who save capital, consume goods and provide labor supply into the economy according to their budget constraints. However, rather than solving the stationary equilibrium and a set of conditions of the OLG Model, we employ these conditions in a dynamic setting given the interactions between agents. Thus, we could analyze the impact of the retirement reform for different age cohorts and for the whole economy.

2.1- Demographics and Heterogeneity

The economy consists of an overlapping generations of individuals of age cohorts / generations $j = 1, 2, \dots, J$. Agents with $j = 0$ are assumed that they enter the labor market recently, so they are approximately at the age of 20, rather than being recently born. Each age cohort is populated by a finite number of people such that $\varphi = \sum_{i=1}^{I} i$. Additionally, the number people in the generation I decreases as generations get older so that we can replicate the bell shape of the population pyramid in Turkey. There is a single consumption good c which is consumed by each individual in each generation. There is no borrowing in the model, but agents can save capital for the next period in capital markets and receive a yield at a rate of $r > 0$, where r is the rate of real return or interest rate. Lastly, agents die after living for $J - 1$ periods in the economy without leaving any bequests, where J is the life expectancy. The population growth n percentage is constant and each year a new generation with a relatively larger population replaces the population who leave the economy at age J. Therefore, the relative population size of age j is calculated by :

$$\varphi_j = \frac{\varphi_{j-1}}{1+n} \quad for \quad j = 1, \dots, J-1$$

We provide the heterogeneity in the model with differences in households' age j, and their age-efficiency / labor productivity profiles $e_{i,j}$. Even though $e_{i,j}$ is assumed to be exogenous and deterministic for each age generation, for each individual, an $e_{i,j}$ is drawn uniformly between the margins of error of the e_j distribution function. Therefore, as can be seen in the Figure 1, households could be heterogeneous since their productivities are not necessarily correlated with only age. Agents have one unit of time $l_{i,j} \in [0,1]$, where 1 can be interpreted as 24 hours. $l_{i,j}$ can be supplied into the labor market elastically until retirement age. After the normal retirement age J^R, agents could decide whether they will work or retire with their utility functions, given their labor productivities. Before the J^R, agents even could prefer to stay out of the labor force if their utility function requires. But if they work, agents receive pre-tax earnings of $we_{i,j}l_{i,j}$, where $e_{i,j}l_{i,j}$ is the effective hours and $w > 0$ is a constant wage rate.

2.2- Firm

One competitive representative firm in the economy produces a single consumer good with a normalized price of one. The Cobb-Douglas production function of the firm, $Y = F(K, L) = K^{\alpha} L^{1-\alpha}$, has a constant returns to scale. The function uses α to represent the capital share, Y to represent aggregate output, K to represent aggregate capital stock, and L to represent aggregate effective labour supply. δ represents the capital depreciation rate. The constant prices of capital r and labour w are determined endogenously within the model as $w = F_L(K, L)$ and $r = F_K(K, L) - \delta$, at the end of each period. In the model, prices of w and r which are calculated at the end of a year is updated sequentially for the maximization problem of agents for the next year, similar to the fact that wage and price raises are calculated according to the previous year's inflation rate in Turkey.

The firm uses the labor in the production function which is supplied by agents in the model. However, in order to create unemployment, the firm demands a fixed and calculated amount of total effective labor work at wage w, which grows at the rate of population growth. In the hiring process, the firm employs agents starting from the one with the highest effective hours in decreasing order until the demand for total effective labor work is filled. Each year, an effective productivity limit is determined by the last agent employed in the firm given its labor demand. After filling all the positions in the firm, agents whose labor decisions are still different from 0 hence could not find a job. We assume such agents as "unemployed". However, if the labor decision of an agent is 0 according to the utility function, the agent is already defined as "out of the labor force".

2.3- Fiscal Policy and Retirement Decisions

In the model, a Pay-As-You-Go social security system is managed by the government. Households contribute to government budget constraints by paying a proportionate amount of social security tax τ based on their labour income during each period. The overall amount of social security contributions is therefore calculated by:

$$\tau w \sum_{j=1}^{J-1} \varphi_j \sum_{i=1}^{I} e_{i,j} l_{i,j} = \tau w L$$

Government redistributes these collected social security contributions the next year among households who decide to retire at given year, as the real government budgets do. The retirement preferences of households are purposefully constructed in a way that allows households to choose when to retire within the model. Similar to the case in Turkey and other countries, workers could retire but still remain in the labor force after retirement. Therefore, in our model, we assume that individuals after the age of J^R, could have a right to retire and receive pension benefits. Each household after J^R calculates his or her utility given the budget constraint with additional pension benefit so that they could decide their labor decisions endogenously. In this stage, we assume that individuals after some age will intentionally decide to retire / leave the labor force given wage rate and their labor productivities. The pension benefit b_t, which retirees could receive after J^R, is calculated according to the number of retirees and assumed to be zero for all workers before J^R:

$$b = \begin{cases} 0 & if \quad j < J^R \\ \dfrac{\tau w L}{\sum_{j=J^R}^{J-1} \varphi_j} & if \quad j \geq J^R \end{cases}$$

Given that information, the government budget constraint becomes:

$$\tau w L = b \sum_{j=J^R}^{J-1} \varphi_j$$

2.4- Households' Maximization Problem

The timing of events consists of simultaneous and sequential moves as follows. At the beginning of each period, each individual decides how much to consume and supply labor into labor market given their budget constraints. The lifetime constant relative risk aversion (CRRA) utility function of an agent is calculated by:

$$u(c_{i,j,t}, l_{i,j,t}) = \frac{\left(c_{i,j,t}^{\gamma}(1 - l_{i,j,t})^{1-\gamma}\right)^{1-\sigma} - 1}{1 - \sigma}$$

In this function $c_{i,j}$ denotes the consumption and $l_{i,j}$ stands for labor supply for individual i at age j. γ stands for the weight on consumption while σ stands for the coefficient of relative risk aversion. Agents determine their labor supply and consumption decisions in each period t with the prices calculated at the end of the previous year (w_{t-1}, r_{t-1} and b_{t-1}), by solving

$$max\, u(c_{i,j,t}, l_{i,j,t})$$

subject to the budget constraint of

$$c_{i,j,t} = (1-\tau)w_{t-1}e_{i,j,t}l_{i,j,t}(1-SGDP) + (1+r_{t-1})k_{i,j,t} + b_{t-1}$$

In the model, households start their life with assets endowed by luck or bequest according to a uniform distribution between 0 and a maximum level of capital. This capital could grow in each period at the interest rate and could be used for consumption. This random distribution of capital is also required for the heterogeneity of agents. Additionally, $k_{i,J,t} = 0$, $l_{i,j,t} \epsilon [0,1]$, $c_{i,j,t} \geq 0$ and $k_{i,j,t} \geq 0$. SGDP is a penalty factor for retirees if they still want to work after retirement. SGDP means "social security support premium" (sosyal güvenlik destek primi, in Turkish) and does not accumulate in the model. After all agents decide on their labor supply and consumption, prices are determined according to aggregate capital, aggregate labor supply and aggregate social security contributions. The age cohort j then will ages one year older and moves into the next generation with its group as a whole. At the end of the cycle, a new generation with an increased population is created out of nothing and their initial "bequest" capitals are distributed according to a uniform distribution. In the next year, the process continues as explained.

The point we also want to emphasize here is that we are employing the same budget constraint for different age generations. For individuals before the retirement age J^R, $b_t = 0$ (and $SGDP = 0$) by assumption and after J^R, $b_t \geq 0$ (and $SGDP \geq 0$), so that we could idenify agents who are still working or retired but continue to work even after they could be retired. After that age, if their labor supply is 0, we defined them as retired and out of the labor force. Therefore, we could say that the budget constraint above can apply for different age generations. In order to replicate the shock of the retirement reform, we identified the group who will have a right to retire by the reform and hence is in the influence sphere of the shock, as the target group. They are the people who enter the job market at year 1999 so that they could be classified as $j = 25, ..., 39\ at\ t = 2023$. In order to understand their response to the reform, we isolate the group from the population, treat their population as constant, age them as a whole group and follow them during the influence period of the shock. Since we also desire to investigate the responses of other groups against the reform, we artificially construct additional population cohorts within a specific age interval for all years (i.e. youth population consists of $j = 1, ..., 10\ for\ t \epsilon \forall$). Other groups and variables that are of interest for this study are thus presented in Table 1 with actual values given in parentheses.

3- Calibration and Data

Parameter	Description	Value	Sources
Demographics			
n	Population Growth Rate	1.57%	TURKSTAT
J	Life Expectancy	58 (78)	TURKSTAT
J^R	Retirement Age	40 (60)	TURKSTAT
Overall Population	$j = 1, ..., J-1\ for\ t \epsilon \forall$		Model Assumption
Youth Population	$j = 1, ..., 10\ for\ t \epsilon \forall$		Model Assumption
Productive Population	$j = 25, ..., 39\ for\ t \epsilon \forall$		Model Assumption
Target Population	$j = 25, ..., 39\ at\ t = 2023$		Model Assumption
Retired Population	$j = 40, ..., J-1\ for\ t \epsilon \forall$		Model Assumption
Preferences			
γ	Weight on Consumption	0.45	Schoen (2020)
σ	Risk Averse Coefficient	1.2	Schoen (2020)
Technology			
α	Capital Share of the Output	0.4766	Jones (2003)
δ	Depreciation Rate	0.0375	BLS
Government			
τ	Social Security Tax Rate	15%	MTF
SGDP	Penalty Factor on Benefits	7.5%	MTF
Labor Productivity			
$e_{i,j}$	Age-Efficiency Profiles	Figure 1	HFCS

Table 1. *Value of Model Parameters*

It is necessary to employ the correct calibration parameters in order to incorporate the model properly. The parameters collected for this purpose about demographics, technology, preferences, technology, government and labour productivity, are presented in Table 1. The parameters related to demography were obtained from the data of the Turkish Statistical Institute (TURKSTAT), in addition to the artificially constructed groups for deeper analysis. In this respect, overall population refers all agents in the economy while youth population represents the first 10 generation who enter the labor market given the year. Likewise, the most productive group in the economy belongs to the interval between generations 25 and 39 where their labor productivities are relatively high. (We define this group because they also will have the right to retire in the future.) Target population, as mentioned before, is a stationary group which we analyze them only inside the influence period. Lastly, retired population is the group who are older than the normal retirement age J^R. Population growth rate was obtained by calculating the average increase for the period 1980-2022 by considering the annual increase amounts. We have considered life expectancy at birth in Turkey to express the maximum age J. In the model, we consider agents to enter the job market at $j = 0$ (at age 20 in real life) rather than being born, while they start their working life at $j = 1$. The normal retirement age J^R is taken as 40 (60 in real life) for all agents, without the reform. However, after the reform, we will grant the right to retire to the cohort of the people which we call "candidate retirees" and we follow this unchanged group throughout the influence period.

The production function is the Cobb-Douglas production function. The depreciation rate is derived from the U.S. Bureau of Labor Statistics (BLS) while the capital share of output in Turkey is obtained from Jones (2003). In the same way, we will use the parameters for the weight of consumption and the risk aversion coefficient from Schoen (2020). Apart from this, the social security tax rate and SGDP were accessed from Republic of Türkiye, Ministry of Treasury and Finance (MTF). In order to provide the heterogeneity in the model, in the first step, we assumed that the labor productivities of agents are changing in relation to age. For this purpose, we employed the data from Eurosystem Household Finance and Consumption Survey (HFCS) to calibrate the age-efficiency / labor productivity profiles e_j. In the second step, we assigned different age-efficiencies for individual agents within an interval of margins of error of the age-efficiency function, in order to introduce "luck" concept and exhibit heterogeneity. The labor productivities are constructed on, however, the HFCS data of Germany due to lack of consistencies in Turkish data. The main idea behind employing different data is based on the general empirical suggestions about the matching and resembling shapes of labor productivity levels for different countries. In this respect, the age-efficiency profiles calibrated to use in the model is presented in Figure 1.

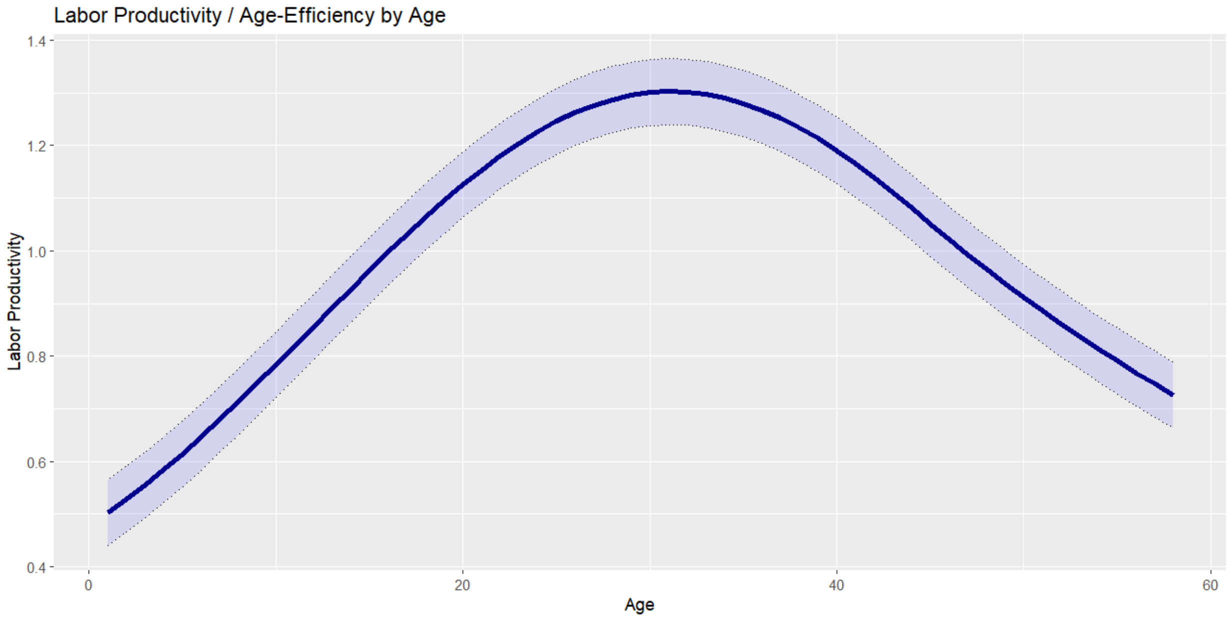

Figure 1. *Labor Productivity / Age-Efficiency Profiles*

4- Simulation Results

According to the figures below, direction of results matches our expectations. The main interest of this paper has been to identify: 1) whether the retirement reform has an impact on youth unemployment and overall unemployment, and 2) how the labor force participation of different groups response to the retirement reform.

4.1- Unemployment Rates

Figure 2 gives the information about the evoluion of unemployment rates by year for the whole population and the youth poulation. Apart from the first couple of years when the model was tuning itself, we could see that unemployment rates show a slightly increasing trends until the year of the shock. The first gray column indicates the shock period starting with 2022 when expectations about the reform was taking shape, until 2024 when the first decisions about the retirement is supposed to be made by candidate retirees. The second gray column, therefore, indicates the period when candidate retirees could reach to the normal retirement age and the impact of the shock is neutralized.

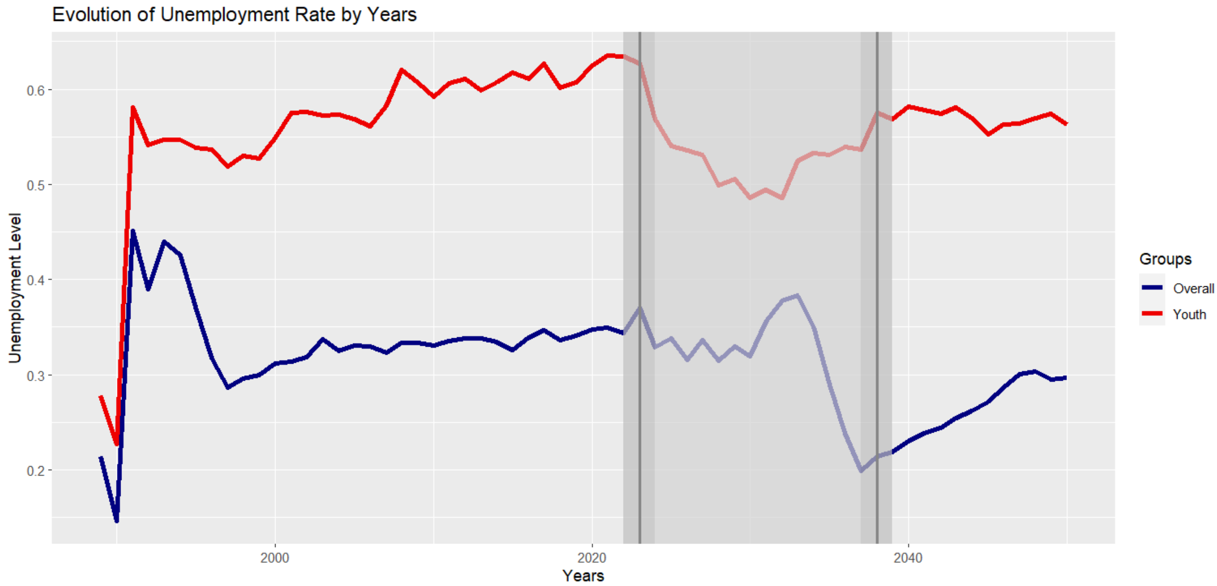

Figure 2. *Unemployment Rates*

According to the Figure 2, the transition from 2022 to 2023 results in a slight increase in the overall unemployment while the youth unemployment decreases. After 2023, the overall unemployment balances while the youth unemployment decreases even further. Given the first decisions, the overall unemployment shows a rise until a maximum point but then decline rapidly. In the case of youth unemployment, the graph shows a first decreasing then increasing trend until the neutralization of the shock. The interpretation of the trends of unemployment rates could be related to the LFP decisions of groups. As we also can see in the Figure 3, the new vacancies created by the decline in the LFP of candidate retirees is fulfilled by the unemployed / non-participant youth population. While the youth population at the time the reform occurs gets older in the recovery period hence they could occupy vacancies more readily with their advanced productivities, the successor youth population is supposed to face with an increasing rate of youth unemployment until the rate is balanced at a lower level. In terms of the overall level, we could mention the reduced level of unemployent after a sharp decline in the recovery period when the shock of the reform is re-balanced, will increase through its constant trend with a small reduction.

4.2- Labor Force Participation Rates

There exist other results in terms of labor force participation of different groups. After not considering the years when the model is adapting, we generally observe constant trends for groups at different levels, until the shock is implemented. The most productive group has nearly full participation in the labor force, while other groups have coinciding values to the actual cases in Turkey. The first group we prefer to analyze is the group who has right to retire given them by the reform, and who belongs to the most productive group. The number of people in the group is constant since the shock is one-shot and has an impact on agents who enter the job market after t = 1999. After the reform policy is implemented, they start to decide retirement contrary to what would do in case of no shock. With the increasing age and hence decrising labor productivity, their participation level continue to decrease until 0. When it comes to the most productive group j\ \epsilon\ [25,\ 39], their LFP shows a declining trend at te beginning due to the fact that most agents in the group belong to the influence sphere of the reform. After the candidate retirees leave the labor market, the LFP of the group starts to rise again until 1, because of the incoming generations with improving productities.

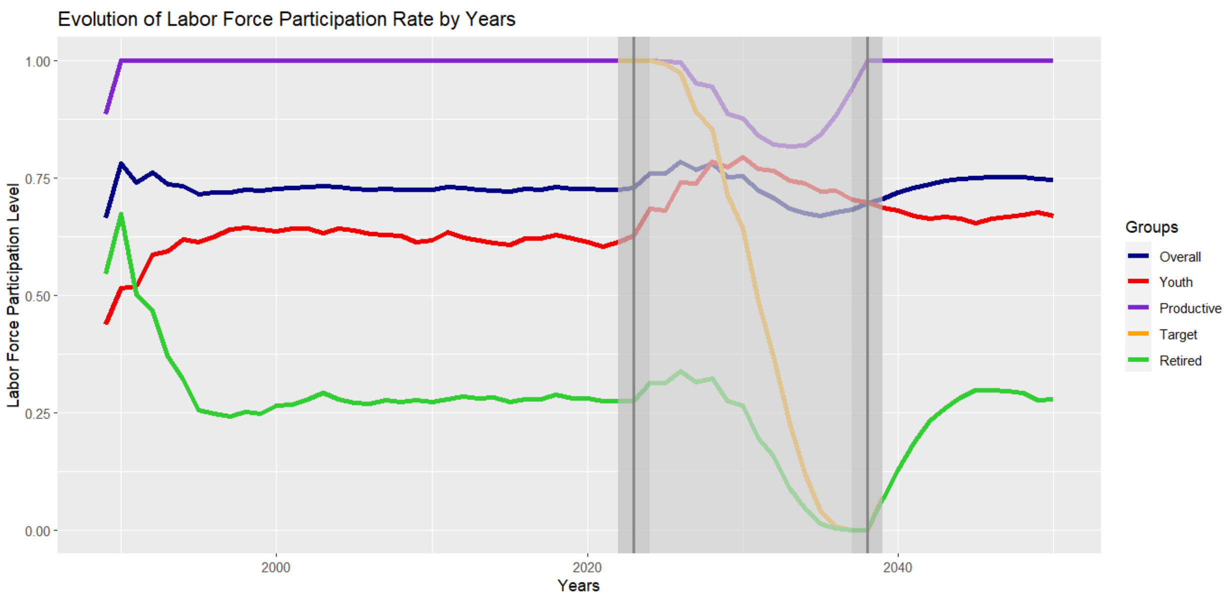

Figure 3. *Labor Force Participation Rates*

In the case of the youth population, we could interpret the gradual increase in the LFP by the assumption that non-participant youth population substitute for the vacancies left by retirees after the shock. They could compete with others by increasing their working hours. However, eventually after all vacancies are fulfilled and the new youth generations appear, the LFP level shows a decreasing trend through its old stage, but probably with a small incrementation. In conjuction, the LFP of overall population driven by the youth LFP has a slight increase after some point then reaching its old level by gradual adjustments. When it comes to the LFP of the population of retired agents at their normal time, we could also assume that such agents would be able to fulfill the vacancies left by retirees, in addition to the youth.

However, together with their declining age-efficiencies, they gradually coincide with the candidate retirees and withdraw from the labor market completely. After the neutralization of the shock, the LFP of the age cohort of retirees recovers to the level of its old trend. For a more detailed investigation, Table 2 summarizes the results in the influence period while the extended table could be found in Appendix.

Years	Overall UN	Youth UN	Overall LFP	Youth LFP	Productive LFP	Target LFP	Retired LFP
2022	0.34347	0.634269	0.725065	0.613579	1	1	0.274784
2023	0.370051	0.626926	0.728498	0.625625	1	1	0.273504
2024	0.329203	0.568749	0.759809	0.683692	1	0.999407	0.311891
2025	0.338363	0.539971	0.759406	0.680194	0.998182	0.991103	0.312139
2026	0.315308	0.536061	0.783119	0.740167	0.995238	0.97331	0.337143
2027	0.336667	0.530524	0.766686	0.73857	0.951462	0.890273	0.314931
2028	0.315003	0.499143	0.779744	0.784438	0.943103	0.852906	0.322181
2029	0.330001	0.505345	0.751107	0.771671	0.885311	0.713523	0.274006
2030	0.319372	0.485459	0.752691	0.793315	0.875556	0.642349	0.264937
2031	0.355957	0.493995	0.721954	0.769315	0.839344	0.488731	0.195238
2032	0.377773	0.485837	0.707678	0.765499	0.82043	0.369514	0.157277
2033	0.382981	0.524002	0.6848	0.743767	0.815873	0.227165	0.087334
2034	0.350841	0.533023	0.674997	0.738381	0.818229	0.118031	0.045584
2035	0.289064	0.531373	0.667718	0.720308	0.842564	0.040332	0.011785
2036	0.238078	0.53904	0.675904	0.722532	0.882828	0.007117	0.003315
2037	0.198895	0.536379	0.682819	0.702743	0.940299	0	0
2038	0.213949	0.574976	0.695867	0.696806	1	0	0
2039	0.218305	0.568463	0.70515	0.685714	1	0.071137	0.064211

***Table 2**. Results of Unemployment and LFP Rates*

5- Conclusion

The growing number of retirees in Turkey's social security system is having a serious impact on the country's social security system. The policies implemented by the current government as part of its electoral promises are exacerbating these problems. In particular, the EYT proposed for 2023 could have a negative impact on the SSS in the long term. The fact that almost 2 million people are receiving retirement salaries as retirees will put a lot of pressure on the system. However, this article analyzes the impact of EYT, which is our subject, on youth unemployment and overall unemployment. The significance of this is that it is a labour gap that may occur in the economy with the EYT. An analysis using the agent-based model was carried out in this study. The purpose of the analysis is to examine the impact of the withdrawal of a large number of workers from the market upon the occurrence of a shock such as EYT on youth unemployment and overall unemployment after the sudden shock and in the long run.

In this research, young and productive people enter the market to replace the labour force withdrawn from the market after the shock that occurred in 2023, thus reducing the unemployment level. The trend in youth unemployment seems to stabilize in the following years, returning to previous levels. Accordingly, there is initially an increase in the labour force participation of young people. Overall labour force participation is also on an upward trend. After a short period of time, however, these trends decline and reach a level of equilibrium. As can be seen from this, it can be seen that it has a positive effect on the unemployment rate in the short run. In the long run, however, unemployment rates and labour force participation tend to return to the old equilibrium point. The impact of this reform seems to have had a positive effect on unemployment in the short run. In any case, the impact of this reform may be a serious burden on public expenditure in the future, given the burdens that the SSS will bring.

Within the scope of this study, unemployment and labour force participation of the reform are analyzed. Especially with early retirement, the loss of social efficiency of people retiring at the age of 40-45 and leaving the labour force with high levels of productivity is not examined. This is an issue that may be the subject of a different area of research. For the purposes of our analysis, we have not taken this issue into account.

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Appendix

Years	Overall UN	Youth UN	Overall LFP	Youth LFP	Productive LFP	Target LFP	Retired LFP
1990	0.146712	0.227356	0.78041	0.515247	1		0.673139
1991	0.450808	0.580739	0.739426	0.518135	1		0.500529
1992	0.389481	0.541245	0.760536	0.586735	1		0.46729
1993	0.440094	0.547321	0.735551	0.594378	1		0.367992
1994	0.425275	0.546868	0.732745	0.618954	1		0.32032
1995	0.371018	0.538486	0.714744	0.612027	1		0.255654
1996	0.317863	0.536836	0.718313	0.62381	1		0.248309
1997	0.286218	0.518623	0.719174	0.640187	1		0.241216
1998	0.296297	0.530092	0.724666	0.644037	1		0.251167
1999	0.300038	0.527553	0.72251	0.640541	1		0.247016
2000	0.311651	0.549177	0.725573	0.635398	1		0.264679
2001	0.313861	0.574841	0.727977	0.64087	1		0.265778
2002	0.317986	0.576398	0.730571	0.641026	1		0.278215
2003	0.337384	0.57274	0.732128	0.632773	1		0.291128
2004	0.32546	0.573085	0.729692	0.641322	1		0.27905
2005	0.331116	0.568229	0.727183	0.637398	1		0.270677
2006	0.330163	0.560854	0.724607	0.6304	1		0.268313
2007	0.323424	0.583074	0.726751	0.628346	1		0.27575
2008	0.33342	0.620315	0.724548	0.627132	1		0.271783
2009	0.333125	0.606805	0.724132	0.61374	1		0.276596
2010	0.330519	0.592446	0.724327	0.616541	1		0.27195
2011	0.334922	0.6063	0.729437	0.633333	1		0.278161
2012	0.33796	0.610814	0.727693	0.621898	1		0.283447
2013	0.33809	0.5988	0.72447	0.617266	1		0.280388
2014	0.334046	0.60757	0.722424	0.611348	1		0.281089
2015	0.325873	0.617075	0.720313	0.606294	1		0.271605
2016	0.338846	0.611207	0.727197	0.62	1		0.278853
2017	0.346196	0.626703	0.725004	0.621088	1		0.278132
2018	0.336736	0.601796	0.730086	0.627517	1		0.287212
2019	0.341464	0.606853	0.726236	0.619868	1		0.280883
2020	0.347495	0.625237	0.727014	0.612018	1		0.280845
2021	0.349624	0.635584	0.724579	0.603992	1		0.273401
2022	0.34347	0.634269	0.725065	0.613579	1	1	0.274784
2023	0.370051	0.626926	0.728498	0.625625	1	1	0.273504
2024	0.329203	0.568749	0.759809	0.683692	1	0.999407	0.311891
2025	0.338363	0.539971	0.759406	0.680194	0.998182	0.991103	0.312139
2026	0.315308	0.536061	0.783119	0.740167	0.995238	0.97331	0.337143

2027	0.336667	0.530524	0.766686	0.73857	0.951462	0.890273	0.314931
2028	0.315003	0.499143	0.779744	0.784438	0.943103	0.852906	0.322181
2029	0.330001	0.505345	0.751107	0.771671	0.885311	0.713523	0.274006
2030	0.319372	0.485459	0.752691	0.793315	0.875556	0.642349	0.264937
2031	0.355957	0.493995	0.721954	0.769315	0.839344	0.488731	0.195238
2032	0.377773	0.485837	0.707678	0.765499	0.82043	0.369514	0.157277
2033	0.382981	0.524002	0.6848	0.743767	0.815873	0.227165	0.087334
2034	0.350841	0.533023	0.674997	0.738381	0.818229	0.118031	0.045584
2035	0.289064	0.531373	0.667718	0.720308	0.842564	0.040332	0.011785
2036	0.238078	0.53904	0.675904	0.722532	0.882828	0.007117	0.003315
2037	0.198895	0.536379	0.682819	0.702743	0.940299	0	0
2038	0.213949	0.574976	0.695867	0.696806	1	0	0
2039	0.218305	0.568463	0.70515	0.685714	1	0.071137	0.064211
2040	0.23045	0.581572	0.718542	0.680668	1		0.127329
2041	0.238113	0.577775	0.727597	0.667921	1		0.184733
2042	0.244602	0.574483	0.735561	0.662651	1		0.231116
2043	0.254282	0.580395	0.743813	0.666362	1		0.259587
2044	0.262199	0.569568	0.747394	0.662921	1		0.282126
2045	0.271463	0.552708	0.748866	0.653097	1		0.297246
2046	0.286878	0.563064	0.75109	0.662021	1		0.297386
2047	0.300886	0.563975	0.750576	0.666095	1		0.294766
2048	0.303779	0.569819	0.750541	0.670603	1		0.290876
2049	0.294781	0.574288	0.747413	0.675934	1		0.276889
2050	0.296997	0.563217	0.745031	0.66898	1		0.277778

Table A.1. *Results of Unemployment and LFP Rates for All Years*