Intertemporal CGE Analysis of
Income Distribution in Turkey

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Abstract

This study focuses on the effects of public policies on the size distribution of income in Turkey. To this end, an intertemporal dynamic equilibrium model with heterogeneous agents in a small open economy framework is constructed. This study serves several extensions to the literature via its algebraic structure and the calibration process in which various micro-level data sets are utilized. The results reveal that, in line with the previous findings of the literature, increasing budget allocations to unilateral social transfer programs has no significant effect on the size distribution of income and has adverse effects on the labor market decisions of relatively poor laborers. On the contrary, subsidizing the cost of labor has positive impacts on labor supplies and the size distribution of income improves in favor of relatively poor households.

Keywords: Income distribution, Redistributive policies, Internal migration, Intertemporal CGE

JEL classifications: D33, D58, D91, D92, H23

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Table of Contents

1 Introduction

Acceleration of globalization, removal of barriers to international trade and financial flows have led to an economic transformation towards changing sectoral composition of gross domestic product (GDP) in favor of services. The declining share of industry has also caused concomitant changes in labor markets and employment relations. Under the new structure, a large portion of total employment is created by services in which wage rates, especially for new entrants, and its growth rate are low because of relative productivity and lower productivity growth (Esping-Andersen, 1999).

In the Nordic countries, especially to alleviate the unemployment effects of such transformation, a new employment regime, so-called flexicurity, have been introduced in 1970s. The term refers to flexibility for firms in hiring and firing, while it means employment / job security for individuals according to their skills. The effective flexicurity policies are intend not to discourage individuals from participating in the labor market and also allow the recipients to accumulate skills. Eligibility conditions for unemployment benefits are tightened and duration of being a recipient is shortened to achieve the former objective. For the latter objective, active labor market policies such as mandatory participation to vocational education activities, job search, on-the-job training, etc. are implemented. Obviously, this policy framework requires a connection between labor market regulations and social policies including social security services, health-care services, social services and social assistance programs. These policies aim to make people participants of the society as free individuals enjoying equal rights while charity and informal solidarity networks are beyond the scope of these policies (Buğra & Keyder, 2005b, 7). The main objective of new social policy framework has been to help active working population without encouraging exits from the labor market.

The flexicurity framework also forms the basis of the employment regime of the European Union (EU). Hence, welfare practices of the EU have also been reformed accordingly, although there are substantial differences across the member states in terms of composition of GDP, composition of total employment (and the shares of skilled and unskilled workers) and historical and cultural standpoints. Aiginger (2002) states that if a country wants to keep the level of welfare provisions intact, costs of production and productivity have to evolve in a balanced manner and fiscal balance should hold. Thus, the major policy package should focus on boosting education and research activities in new technologies which should aim to match productivity growth with higher wages. However, this process in the EU has been interrupted by the global financial crisis of 2008-9 and then debt crisis in several Mediterranean member states. Despite huge monetary easing policies of the major central banks that resulted in negative long-term interest rates, neither

employment nor economic growth could be stimulated as desired. Therefore, the reform agenda has been extended by the incorporation of achieving and keeping fiscal balances which is formed around the German Chancellor A. Merkel's statement; *"7% of the world's population producing 25% of the global output cannot sustain 50% of global social protection spending"*(Begg et al., 2015, 4).

As an element of social policy design, social assistance programs are designed in order to support needy, poor, disabled, etc. individuals by cash or in-kind benefits. It is clear that one of the major problems of the governments is to coordinate these programs with the labor market regulations. If these programs were designed in a unilateral and time limitless manner, they would have discouraging effects on the labor market participation decisions of the recipients. In this case, decreasing wage income of poor households, which is the main source of income for them, has to be compensated by welfare payments. If change in the former is greater than the latter, the income distribution worsens. In this respect, a bulk of the literature reveals that the social assistance programs' effectiveness on poverty alleviation and income distribution are questionable.

In the Turkish case, attempting to reform of social policies[1] have started in the field of the social security at the end of the 21st century and mainly focused on gradual increase of the retirement age. The health system reform was also enacted in 2002 with several dimensions including expansion of the Green Card program (a non-contributory health-care program introduced in 1992 and was replaced by General Health Insurance on January 2012), conditional cash transfer programs to ensure health services accessions of children under age six and pregnant women who live in poor households, etc.. In the case of social assistance, number and variety of the programs have been increased and total budget of such programs has been expanded. However there have been a number of voids during this viewpoint change of government policy from charity-based approach to universal rights-based approach. The main controversy about such programs have been emphasized the escalation of transfer payments in line with the election calendar and clientelistic and rich households-biased coverage. Several studies for Turkey claim that these payments have played a corrective role in terms of income distribution and poverty alleviation, in spite of their small shares in total household income. Balaban (2014) states that either increase in the social expenditures

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[1] Since this study focuses on unilateral social assistance payments, parallel developments in the other fields of social policies are not emphasized. Grütjen (2008) and Üçkardeşler (2015) provide a general assessment of the recent changes in the Turkish social policy framework. Değer (2011) gives a detailed analysis of the Turkish social security system before and after the reforms enacted in the last decade. Moreover, the author presents the effects of these reforms on the institutions' balance sheets and on the overall economic outlook in an OLG framework. The health system reforms also constitute another major aspect of changes in the social policy framework. In the Turkish case, the general effects of the reforms can be found in World Bank (2014), while Hone et al. (2016) analyzes family medicine reform enacted in 2005 by assessing its effects on user satisfaction and service usage.

relative to GDP is not sufficient or that there are operational deficits since the effect of such social transfers on the poverty rate is negligible relative to that of EU-27. Despite its importance, there are only a few studies focusing on the effects of these programs on the labor market decisions of the recipients for the Turkish case. According to Şeker (2011), being a recipient of welfare payment deteriorates the job search behavior of unemployed individuals due to absence of time limit on being a recipient. Yakut (2015) states that there is a negative association between the amount of welfare receipts of households and the hours of work decision of male head of households for all income quintiles but the effect decelerates as income increases.

There are two basic definitions of the income distribution. The first is called as functional income distribution and it measures distribution of income among factors of production such as labor, capital, and land or among different socioeconomic groups such as occupation, sector of employment, region, educational attainment, level of skill, etc. The second definition is the distribution of income among individuals, so-called size distribution of income:

> functional income distribution or income distribution between socio-economic groups provide appropriate conceptual frameworks for studying the linkages, which shape the distributional dynamics including the impact of economic policies. Size distribution of income, on the other hand, is **the statistical end result** of these relations of distribution, Boratav et al. (2000, 18-9).

For the Turkish case, there are several studies that analyze the effects of social policies on the income distribution. However, most of these studies utilize reduced form econometrics which typically ignores the behavioral changes and simultaneity of the decisions of several agents. However, under a detailed representation of the labor market structure, change in sectoral demand for a particular type of labor would lead to differentiated effects on other types of labors. Since wage income is the basic source of income of most households, especially for less educated and un-skilled households, household disposable income is affected automatically. Moreover, changes in the government indebtedness or transfer scheme or tax policies, so-called redistribute policies, also alter the disposable income of households. The effects of external environment such as changing terms of trade, interest rate in the international markets or country-specific effects such as deterioration/improvement in the perception about the country resulting increasing/decreasing risk premium would change income sub-items and / or their distributions among households and thus disposable income. As disposable incomes change, the size distribution of income also changes. Hence, one can immediately advocate that the size distribution of income requires a comprehensive method which incorporates behaviors of different economic agents and the relations among them. In this

respect, general equilibrium models are widely utilized in the analysis of the size income distribution since they allow researchers to consider several dimensions simultaneously in a broader and consistent framework.

Following such discussions, we construct an intertemporal general equilibrium model with heterogeneous households and firms in a small open economy framework. This study, to our best knowledge is a first attempt to analyze the income distribution phenomenon in the Turkish context, utilizing a dynamic GE framework. There are a few studies employing similar methods but this study includes several extensions to such models. First, utilizing several micro-level data sets in order to reflect the heterogeneities among the agents is a very first attempt for the Turkish case. Besides the national accounts, an updated version of an input-output table for sectoral variables and inter-sectoral flows, the summary results of Annual Industry and Service Statistics to obtain the investment by destination figures, the Household Budget Survey (HBS) to compile the household level parameters and the Household Labor Force Survey (HLFS) to obtain sectoral distribution of employment and sectoral wage rates, are used extensively. Secondly, the model incorporates heterogeneous households taking into account differences in saving decisions, compositions of households' disposable incomes, compositions of households' consumption baskets, etc. Thirdly, even it is widely used in the dynamic stochastic general equilibrium models, to our best knowledge, this study is the very first to incorporate non-Ricardian households, who are assumed to be hand-to-mouth, into a CGE framework. Moreover, households of this subset are also differentiated in terms of sources of incomes and labor supply decisions. These heterogeneities allow the model to produce richer results in evaluating the policy changes. Fourthly, this household heterogeneity is also reflected in the labor market structure and labor market is divided into 52 strata. From the point of view of firms, all types of workers are imperfect substitutes for one another, while from the point of view of households and based on their labor endowment category, all sectors are imperfect substitutes. Thus, firms (households) allocate their labor demand (supply) among different types of workers (sectors) to minimize (maximize) the cost of labor (wage income). Another notable characteristic of the model economy is the incorporation of an internal migration from rural to urban along with an endogenous labor supply decision of individuals. For the CGE literature, this study, again to our best knowledge, is also the first attempt to solve for an intertemporal CGE model in which households endogenously choose labor/leisure in the presence of internal migration.

The recent policy framework of welfare payments in Turkey is based on unilateral unconditional cash and in-kind payments which are paid as long as individual/household can prove her/its necessity. However, the government has been criticized due to budget allocations on social policies. Among the OECD member countries, Turkey, still has the lowest total social transfers to GDP

ratio. The first policy experiment constructed in this study analyzes the effects of an increase in the share of government transfers in GDP by 20%. The expected but undesired outcome of such a policy change is its disincentive effects on the labor supply behaviors of informal workers and unskilled formal wage earners. These results are consistent with the general findings of the literature and the conclusions of Şeker (2011) and Yakut (2015) for Turkey.

As a second experiment, a modified version of the employment subsidy program designed and implemented in the aftermath of the global financial crisis of 2008-9 is simulated. The program has proposed five percentage points reduction in sectoral social security contribution rates to stimulate total formal employment. This study, rather than treating all sectors homogeneously, assumes that the subsidy rates are endogenous and are functions of sectoral shares in total unskilled formal employment. The results reveal that migration inflows from the rural to the urban expand and the labor supplies of all households increase. The effect is the highest for the informal workers.

The outline of this study is as follows. The next section is devoted to summarize the evolution and characteristics of the Turkish welfare regime, and the current social policy framework. Section 3 provides a brief summary of the related literature. The next section explains the details of the model economy and calibration process. In Section 5, the results of the experiments are presented in detail and Section 6 provides the changes in the income distribution indicators as a part of the result of policy experiments. Section 7 concludes.

2   A Brief Account of the Turkish Welfare Regime

2.1   Evolution and Characteristics

Esping-Andersen (1990) defines three different welfare regimes; conservative, liberal and social-democratic. The classification is based on the social stratification, the quality of the social rights, and the relationship between the state, market and family. Conservative (Continental European) welfare state puts family into the center of the social policy framework and aims to keep the status differentials among classes / social statuses. Wage rate is determined by collective bargaining and maintenance of (full) employment (if possible) is the major concern. The eligibility conditions of the welfare programs include the means-tested procedures to get the moderate amount of assistance. In a liberal welfare state, the stigmatized means-tested assistance with strict eligibility conditions and the modest universal transfers are predominant. Wage rates are determined by individual bargaining in the relatively unregulated labor markets. The state encourages individuals to participate in the private welfare provisions by backing them via tax credits and tax shelters schemes (Esping-

Andersen, 1999; Aiginger et al., 2007). In the social-democratic (Scandinavian or Nordic) welfare states, the redistribution, the high level of social inclusion, and the universal rights are the main pillars. The regime aims to generate an equally distributed higher living standards regardless of the status of individuals. In order to prevent a decrease in the welfare of individuals due to family failures, the state provides children- and elderly-care services to encourage the participation of females into the labor force (Aiginger et al., 2007).

This is criticized as there are some other countries that do not fit into these typologies with their differences in the labor market structures and the cultures, especially in terms of the importance of family, and the coverage of the social policies. Esping-Andersen (1999) defines other forms of welfare regimes such as the Antipodean, the East Asian, and the Mediterranean[2]. The author expresses that the Mediterranean system could not be defined as a "regime" because it is just related with family-based social assistance programs which are designed for the political clientelism rather than the social protection. The countries that belong to the Mediterranean welfare regime, or the Southern Europe model as commonly used in the literature, share the following commonalities (Buğra & Keyder, 2003; Karamessini, 2007).

- **Role of Government:** Public employment opportunities are available for individuals who are selected for the sake of favoritism than by taking into account their qualifications. This affects efficiency of public institutions negatively.

- **Labor Market Structure:** Since small family entrepreneurship lived longer due to the late industrialization, self-employment and unpaid family workers constitute the majority of total employment. Working in informal casual jobs is a common phenomenon. Employment of males, as the main bread-winner, is under the protection which makes women (gender inequality is high) and less-experienced individuals, especially youth, disadvantaged. The skill-based segmentation feeds wage inequalities, determines the working conditions and the rights of employees even in the formal jobs.

- **Social Security System:** It is based upon status differentials which also have repercussions on the coverage of the health insurances. Dependent members' social security are provided by the head of household's social security. The system has corporatist elements since the government supports the system to provide social security for individuals who do not have any sources of income.

- **Social Policies:** Family, as a welfare producer unit, is at the core of the system. A needy

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[2] The former is a variant of the liberal welfare regime while the latter is an hybrid of the liberal and the conservative-state corporatist welfare regimes, although they have indigenous characteristics.

individual should be supported primarily by his/her family in terms of income security and shelter. Mothers are responsible for caring children and older individuals. Local governments, charity organizations, and religious institutions are also important welfare providers. Being a participant of any welfare programs is subject to favoritism and there are strict eligibility conditions to be a recipient of unemployment insurance. Absence or deficiencies in the vocational education system feeds not only income support necessities of disadvantaged individuals but also do not allow them to shift into a better labor market segment.

According to Buğra and Keyder (2003), Turkey belongs to the Southern European model due to several commonalities. Grütjen (2008) compares indicators of Turkey with four typical Southern European countries and concludes that except civil society's, market actors' and regional authorities' impacts and absence of universalistic health system, Turkey is "the ideal" type of Southern European Model. On the other hand, Aybars and Tsarouhas (2010) states that the Turkish welfare regime is an hybrid of the Southern European model and the Middle Eastern welfare system. The authors state that clientelistic and residual social assistance scheme, religiously dominant political ideology, huge gender differences in educational attainment, lower female labor force participation and high fertility are basic characteristics of the Middle Eastern welfare regime. They also highlight EU's influences on the policy reform initiatives to explain the differences between Turkey and Middle Eastern countries but they conclude that Turkey's efforts towards EU will end up with having a pure Southern European welfare model.

The practices of the welfare regime in Turkey started in the second half of the 20th century with the establishment of the social security system. Until 2005, there were three different institutions which were organized according to employment status of workers. Economic crises and expansions in the participants to the non-contributory programs and their costs due to higher informality worsened the balance sheets and transfers from the central government to cover their deficits increased over time. Social security reform was enacted at the beginning of 2000s. Firstly retirement age has been raised in echelons and then these three institutions were merged under the name of Social Security Institution in 2006. The first social assistance program, i.e. the old-age annuity, of Turkey was enacted in 1976. Eligibility conditions of the program was being 65+, having no social security coverage, having no income generating property and any other source of income, and having no close relatives to take care of them. As criticized by Buğra and Keyder (2005a, 28), disabled and elderly individuals were out of the targeted groups. The first social service institution, Social Service and Children Protection Institution, was formed in 1983 (Metin, 2012). The first social assistance institution, Fund for the Encouragement of Social Cooperation

and Solidarity, was established in 1986 under the administration of Prime Ministry and was tasked with performing social assistance programs. The fund's organizational structure was based on Social Assistance and Solidarity Foundations in all counties and provinces. The board of trustees of these foundations in provinces constitute several provincial public authorities (governor is head of the board), representatives of two NGOs and two philanthropists. Şenses (1999), in his analysis of the first decade of the Fund emphasizes that introduction of poverty alleviation into the policy agenda to increase living conditions of poor households is important but its effectiveness against changing structure of the economy in terms of technological improvements and the composition of employment i questionable.

There were several institutions to conduct social policies with different areas of responsibilities. As mentioned by Yentürk (2013), collection of data on social protection expenditures (the central government's expenditures on health, social security, social services and social assistance) required to trace 55 different institutions' budgetary figures and activity reports. This non-unity was a political choice to avoid transparency and accountability in public fund usage Buğra and Adar (2007), which caused accusations of the administrations as being politically prejudiced Şenses (2010). The unification of several administrations under the Ministry of Family and Social Policies (MoFSP) took place in June 2011. The welfare regime of the last decade is at the center of political as well as economic debates. The following quotation is a brief comparison of the pre- and post-2002 welfare regimes;

> This new welfare regime has been arising upon new principles like selective coverage, informal transfer mechanism, discretion, private initiative and irregularity. These principles are in direct contradiction with the principles of former state-centric and state-funded welfare system like regularity, constitutionally guaranteed non-selective transfer mechanism, full coverage objective, and rule based distribution. The new welfare regime provides a very crucial tool for the redistributive politics, Bahçe and Köse (2014, 27).

Figure 1 shows the share of cash social benefits receiver households' income quintile and provides a proof for the quotation above. Turkey, after Mexico and Portugal, occupies the third rank in the skewed distribution of cash benefit payments in favor of the richest income quintile. The figure also confirms the observation of Buğra and Keyder (2003); Turkey is followed by Italy, Greece and Spain, with Portugal, which constitute the major prototypes of the Southern welfare regime. The report highlights that this is the result of social transfer scheme in which payments heavily depend upon working history in formal jobs and pension payments OECD (2014, 5).

11

Figure 1: Who are the receivers of cash benefits?
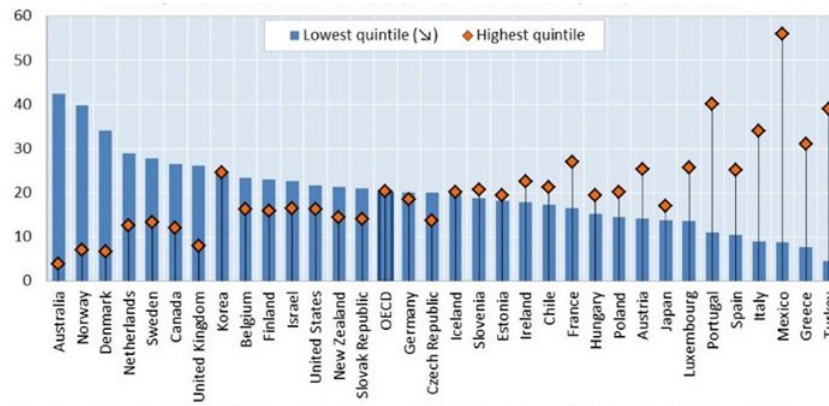
2.2   Current Social Programs

The current framework puts the family into the center of social transfers but it also comprises several types of transfer programs that are designed for elderly, disabled individuals. On the other hand, some of the transfers are paid conditionally for educational and health-care purposes.

Table 1: Aggregate Figures on Social Policies

	2013	2014	2015
Total Social Transfer Expenditures, as of GDP (%)	1.35	1.38	1.33
Number of Regular Aid Receiver Families	1,099,183	1,113,242	1,093,320
Number of Temporary Aid Receiver Families	837,755	731,716	699,927
Number of Both Types of Aid Receiver Families	1,159,551	1,160,940	1,224,722
Total Number of Aid Receiver Families	3,096,489	3,005,898	3,017,969
Number of Old-age and Disabled Pension Receiver Individuals	1,222,748	1,300,377	1,272,038
Population under $2.15 Daily Purchase by Current PPP, %	0.06	0.06	0.03
Population under $4.30 Daily Purchase by Current PPP, %	2.27	2.06	1.62

Table 1 provides selected figures to summarize the Turkish social policy scheme. Total social transfer expenditures to GDP ratio is stable in 2013-5. Number of families that receive a transfer payment, either cash or in-kind, is also stable around 3 million while the number of households that receive temporary aid such as food, shelter, fuel etc. decreases gradually.

There are six types of social transfers in the system; transfers to families, transfers for educational purposes, transfers for health purposes, transfers for special purposes, transfers to old and disabled, and transfers to support projects and employment. Families are eligible to receive cash or in-kind transfers if per capita household income is below one third of the net minimum wage.

Transfers to families include food aid, shelter aid, fuel aid, orphan aid, birth aid, and social house-dwelling. Transfers for educational purposes cover provisions of course materials, lunch, course book, transportation of disabled students. Moreover, there is also a conditional cash transfer (CCT) program which aims to increase school enrollment of children in needy families. The payments differ by the level of the school (primary, middle and high school) and by gender (payments to girls are higher). Transfers for health purposes, general health insurance[3] payments are covered by MoFSP, any equipment necessities of disabled individuals are provided, and also a CCT program is implemented. The first objective is to ensure that children younger than six of needy families are eligible to the basic health services on a regular basis. The second aim is to ensure that pregnant women get regular health check and give birth at a health-care institution. The payments are made during pregnancy and there is a lump-sum payment if the delivery takes place in a hospital. Soup-kitchens and disaster or emergency aids are classified as transfers by special purposes, which also cover payments to Syrian refugees. In order to support elderly and disabled individuals, transfer payments are structured by the Law no. 2022 which enacts cash payments to needy Turkish citizens and covers three groups of individuals. The first group that receives old-age annuity covers individuals who are older than 65, do not have social security and per capita household income is below one third of the net minimum wage. Disabled individuals who are older than 18 and relatives who are taking care of the disabled people are covered in the second group. Third group contains individuals who lost his/her workforce by at least 15% due to silicosis disease and do not get any income. Moreover, the entire necessities of disabled individuals such as personal care and psycho-social support services on 7/24 basis are covered. The eligibility conditions are having high-degree disability approved by a health report, having a per capita household income below **two thirds** of the net minimum wage and one of the family member has to spend his/her time with disabled individual at least 8 hours per day. Lastly, revenue generating projects (plant and animal productions, agricultural product process, hairdressing, tailoring, restaurants, plumber, etc.) and agricultural activities (sheep breeding, greenhousing, etc.) are supported.

The major problem of the recent social programs is to establish links between the programs and employment. Since April 2010, social transfer recipients have been registered to database of the Turkish Labor Agency (İŞKUR) which is responsible to implement active labor market policies to improve the employability of workforce. In 2015, the recipients are supported in several ways to lead them to labor market participation. For instance, the recipients are paid (max.) 100 TL in three times per year for the costs of job interviews, medical reports, and other necessary documents. If

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[3] As of January 2012, General Health Insurance (Law no. 5510) was enacted and individuals who do not have a social security have an obligation to pay general health insurance premium.

the recipient can find a job, one third of gross minimum wage is paid once as a job replacement aid. If her/him labor market participation is continuous, she/he is considered to be preferential for coal, education, and food aids. As a sanction of not to participate into labor market, cash benefits -excluding regular aids- of household are canceled. According to ASPB (2013), in the period of 2011-13, 43,054 recipients were directed to employment. İŞKUR (2015) states that total number of job replacements between 2011-15 is 65,260. In 2014 and 2015, 509 and 1,584 recipients benefited from leading to employment and job placement aids, respectively, whereas the costs of these two programs were 51,316 TL and 357,920 TL, in nominal terms. These figures relative to the total number of beneficiary families are too small. This indicates that these policies are not implemented effectively, despite the importance of the issue.

3   A Dynamic General Equilibrium Analysis

In most of CGE analyses on the income distribution, multiple representative agent (RA) approach is a common way to incorporate household and firm structures. de Santis (2000) and Harrison et al. (2003) analyze the welfare effects of Turkey's accession to Customs Union (CU) where the former emphasize the importance of the labor market treatment when the concern is income distribution and welfare. According to gender-based analysis of Latorre (2016), foreign direct investment and tariff reform in Tanzania lead to productivity gains which increase factor incomes while the effects are the lowest for less skilled females. Cloutier et al. (2008) and Jung and Thorbecke (2003) show the importance of budgetary allocations to education and supporting human capital accumulation in poverty alleviation. Increasing public investment expenditures on the infrastructure affects the productivity of private capital, Dissou and Didic (2011), while allocating government expenditures to a mix of infrastructure and education has positive impacts on poverty reduction, and distribution of income gains across classes, Buffie and Atolia (2012).

   Due to over-aggregation of the micro behavior, RA approach limits the analysis and a RA-CGE model can make conclusions on the between-group inequalities. One approach to endogenize the within-group income distribution is assigning a functional form for each representative household group (RHG). Here, the results of RA-CGE model is used to produce income of each RHG and poverty line endogenously for each policy scenario and to calculate several poverty and distribution indicators. Derviş et al. (1982), de Janvry et al. (1991), Decaluwé, Patry, et al. (1999), and Boccanfuso et al. (2008) provide examples of this methodology.

   The frontier of enriching a CGE analysis in terms of household heterogeneity is incorporation of all households individually into a CGE model, i.e. fully integrated approach. The first

attempt of such an analysis, Decaluwé, Dumont, and Savard (1999), postulates that endogenizing intra group distributional effects is important although it makes the modeling exercise cumbersome. Bourguignon et al. (2003) compares the results of fully integrated and RA-CGE approaches by conducting the same set of experiments and concludes that the former reveals increasing inequality while the latter shows no change and the magnitude of changes in the poverty measures are relatively higher in the former. Cogneau and Robilliard (2000) and Coady and Harris (2001) provide other examples of this methodology by using static CGE models. Annabi et al. (2005) shows the importance of the growth component in poverty reduction, especially for households who are around the poverty line. Agénor et al. (2003) provides one of the most detailed model for poverty analysis by utilizing so-called "simple micro-accounting method" in which growth rates of per capita disposable income and consumption are used to produce post-shock values in order to evaluate changes in the income distribution.

In the Turkish case, the majority of income distribution analyses are based on the descriptive statistics produced by using micro-level data sets and utilize reduced-form econometrics. Although the availability of data increased since the beginning of 2000s, absence of reliable statistical data for long time series is a major problem, especially in the policy evaluation. Therefore, the quantitative analysis of the income distribution has mostly been based on the data collected by researchers' themselves. Yükseler (2005, Table 1, p. 58) compares eight different income distribution analyses for Turkey between 1963 and 2003[4]. According to the results, Gini coefficient was higher than 0.5 until mid of 1980s and it dropped to 0.43 in 1987, while it was 0.49 in 1994 and 0.42 in 2003. On the other hand, Gürsel et al. (2000) highlights the importance of adjustment of household income according to the size and the composition of household, i.e. the importance of using equalized household income, and concludes that exact conclusions on increasing income inequality between 1987 and 1994 may be misleading.

Boratav and Yeldan (2001) states that historical problems (oligopolistic industry and banking sector, huge and low-productive rural population employed in agriculture and invoked migration) could not be solved during 1980s due to clientelistic allocation of export subsidies and grants. The findings of Özmucur (1996) support deterioration in functional income distribution. The share of total wage income in GDP was almost stable around 30% until the end of 1980s. Between 1991 and 1993, it increased to 35% and crashed to 26.5% in 1994. Güneş (2007) analyzes the functional income distribution for 1987Q1-2005Q4 and concludes that, on the contrary to the general belief as

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[4] Three of the surveys (1963-68-86) were conducted by academics, by the State Planning Organization (predecessor of today's Ministry of Development) in 1973, and by the State Statistical Institute (predecessor of today's Turkish Statistical Institute - TURKSTAT) in 1987-94-2002 and 2003.

he mentioned, it has not been changed significantly. The analyses of 1994-2011 HBSs by Filiztekin (2015) suggest that, on the contrary to the common findings of the literature, income inequality in Turkey improved throughout 1990s due to declining within-group inequalities despite unstable macroeconomic environment. Gender-based income inequality analyses of Güven et al. (2014) provides that between-gender income inequality is high but intra-gender inequalities are superior; the role of gender in income inequality is lower.

There are relatively limited number of studies that focus on the effects of the government policies on the income distribution. Selim and Şenesen (1999) finds that progressive income taxation, enacted in 1960s, led to improvements in personal income distribution but unadjusted income brackets in 1970s, despite high inflation, vanished progressive structure, while widening exceptions and exemptions for high-income groups in 1980s deteriorated personal income distribution. Gürsel et al. (2000) states that the majority of public transfers are devoted to the richest households but analyses of pre- and post-transfer equalized household income postulate that these transfers reduced Gini coefficient by 5.3% in 1994. Yükseler and Türkan (2008) mentions that between 1994 and 2002, income tax and transfer policies of the government affected the income distribution in a positive manner, although their total effect is less than half of the major EU and Nordic countries[5]. In the aftermath of 2002, the effects of these policies decline since the share of indirect taxes in GDP grew faster than that of social and health expenditures.

Yakut-Çakar et al. (2012) asks the question of "what would be the poverty rate if there exist a minimum income scheme?". The results of SILC-2007[6] reveal that the cost of covering households whose median-equalized household disposable income is below 40% (60%) of median income is equal to 0.33% (2.7%) of GDP, while changes in the Gini coefficient is limited in the first case but it drops to 0.359 in the latter scenario. SILC analyses of Başlevent (2014) reveals that social assistance payments have strictly positive impacts on the income distribution but it is very small since the share of these payments, including disability benefits, is not larger than 0.5% in total household income. The author also highlights that inter-household transfers play a non-negligible role in enhancing social justice. Bahçe and Köse (2014) provides a class-based analyses of HBSs for 2002-10. They assign each household into a unique class and examine within and between classes effects of changing public transfer policy. Changes in the class composition (increasing size of labor classes and decreasing peasantry and petite bourgeoisie) negatively effected the income distribution, while the selective social assistance payments hindered the rise in inequality between

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[5] The results reveal that redistribution policies drop Gini coefficient almost by 50% in Sweden, Denmark, and Belgium.

[6] Survey of Income and Living Conditions (SILC), which is the first longitudinal dataset of Turkey, has been conducted by TURKSTAT since 2006. Each household participates to the annual survey for four consecutive years.

classes. More recently, Şeker and Dayıoğlu (2016) analyzes the effects of the global financial crisis by utilizing 2008-10-12 waves of SILC and shows that non-contributory transfers have negligible but enhancing effects on income inequality. Thus, they conclude that in addition to employment preservation affords, the government aimed to avoid decline in household income by increasing transfer payments to relatively poor households.

This study intends to add to the above literature via a dynamic general equilibrium model with heterogeneous households and firms in a small open economy framework. Seven representative household groups are chosen to reflect household characteristics and the labor market heterogeneity is exposed by the types of workers. The set of households is basically divided into two sub-groups via the saving decision. In line with the household sectoral consumption profiles, eleven sectors are represented on the production side. The model also comprises detailed government accounts and the accounts of the social security institution. One of the notable characteristic of the model is the inclusion of internal migration from rural to urban in the presence of endogenous labor supply decision of individuals. The following subsections are devoted to explain the algebraic structure of the model and the calibration process of the required parameters.

3.1 Households

The RHGs of the model economy are capitalists (CH), rural resident households (RH), skilled formal wage earners (SF), unskilled formal wage earners (USF), informal wage earners (IW), retirees (RET), and transfer receivers (TRF). The first five groups are chosen to reflect the labor market dynamics in Turkey but the latter two groups are emerged HBS is analyzed.

Each household (9,918 in total) in HBS-2011 is assigned into a unique RHG following a couple of steps by applying several criteria. If there is only one member of household (either head or non-head if the head is unemployed) with employment record, s/he is chosen to represent the household. If more than one non-head member of household has/have employment record(s), then one of these individuals is selected according to either experience (number of years worked) or the number of months worked in the survey year or age. Once a member from each household is chosen, then households are assigned into RHGs uniquely at household level (area of residence) and individual level (level of education - high school is threshold, working status and having a social security) characteristics of the chosen member of household. However, 745 households can not be assigned into the first five RHGs since their only source of income is either unilateral transfers from the government or they are retirees with negative savings. Therefore, the last two RHGs are defined and the remaining households are assigned into one of them although their share in total population

17

and total number of households is minuscule[7]. Once each household is assigned into a RHG, RHG level parameters such as the distribution of population, the shares of different income components in total RHG income, the budget shares of commodities in RHGs' total consumption, etc. are calculated.

Since the original HBS results show that Ricardian households' total share in total private savings is 99.5%, incorporating saving decisions for the remaining RHGs would be irrelevant. Private savings of these non-Ricardian households are added to *SF*'s private savings.

Table 2: Composition of Household Income

		RIC			NRIC			
		CH	**RH**	**SF**	**IW**	**USF**	**RET**	**TRF**
Panel a: Composition of Household Disposable Income (Vertical)	Wage Income	1.02	7.85	29.69	84.14	61.46	0.00	0.00
	Asset Income	89.46	75.75	58.37	0.00	0.00	0.00	0.00
	State Transfers	1.47	5.43	1.90	15.86	11.37	0.00	67.49
	SSI Transfers	8.05	10.98	10.04	0.00	27.17	100.00	32.51
	Saving Rate*	21.36	18.09	13.94	0.00	0.00	0.00	0.00
Panel b: Households' Shares in Income Sub-items (Horizontal)	Wage Income**	2.91	17.96	25.58	21.97	31.59	0.00	0.00
	Asset Income	53.36	36.15	10.49	0.00	0.00	0.00	0.00
	State Transfers	12.45	36.77	4.85	12.26	17.30	0.00	16.37
	SSI Transfers	26.56	28.96	9.98	0.00	16.11	15.33	3.07
Panel c: Households' Shares in Aggregate Variables	Disposable Income	40.86	32.69	12.31	3.73	7.34	1.90	1.17
	Total Expenditures	38.41	32.01	12.67	4.46	8.78	2.27	1.40
	Savings	53.36	36.15	10.49	0.00	0.00	0.00	0.00
	Population	14.52	31.55	9.17	13.52	27.35	2.03	1.86

Source: Based on the author's calculations from Household Budget Survey-2011 but they are not the original shares. For explanations, please follow the text.
Note: RIC (*NRIC*) stands for Ricardian (non-Ricardian) households. For definitions of RHGs, please follow the text.
*: Savings / Disposable Income.
**: These figures are distribution of net wage income among households. Shares of households in gross wage income are as follows: 3.42; 13.85; 31.87; 2.65; 48.21, respectively.

HBS includes data on weekly hours of work, wage income (cash or in-kind), sector and occupation, etc. but it is not suitable to draw conclusions about the labor market outcomes of individuals since its representative power is valid for the household level analyses. Therefore, to obtain true employment structure, sectoral distribution of employment is obtained from Household Labor Force Survey (HLFS-2011). In HLFS, individual level data is collected and it provides information about supply side of the labor market. In this survey, working individuals are divided into groups which are consistent with constructed RHGs. From HLFS, total labor supply and its distribution among sectors, composite wage rates and sectoral wage rates are calibrated for each RHGs[8].

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[7] Since they survive solely by public funds, their welfare and living standards are purely determined by the fiscal policy. Therefore, any change in the framework of the fiscal policy directly affect these households' standards of living and thus the income distribution.

[8] However, it should be noted that the adjusted labor market figures do not reflect the informality phenomenon in the Turkish economy because informality and being an unpaid family worker are common in rural areas but in the model economy, households in informal sectors are assumed to live only in the urban areas. Therefore, individuals who

The set of households is divided into two subsets; Ricardians (shortly *RIC* thereafter) and non-Ricardians (shortly *NRIC* thereafter) in order to introduce the major heterogeneity among RHGs. Households in the former subset, the first three of RHGs, are Ramsey type individuals who maximize present discounted value of their lifetime utility, which is a multiplicatively separable constant relative risk aversion (CRRA) type, and they have savings. On the contrary, households in the latter subset, the last four of RHGs, have no saving decision and they maximize their intratemporal, Cobb-Douglas type, utility function. The basic reason of dividing the households into two subsets comes from the HBS results in which *NRIC* household either have negative or negligible private savings[9].

Each representative household's problem is solved in two stages. In the first stage, households choose per capita composite consumption (tc_t^{hh}) and per capita composite labor supply (ls_t^{hh}). This stage is different for *RIC* than for *NRIC* households, obviously. The solution of the problem for households in the first subset has dynamic features while it is static for the latter subset. The utility function of *RIC* households is chosen as a constant relative risk aversion (CRRA) type. The utility function of a typical *RIC* household is constructed as follows:

$$\max_{tc_t^{RIC}, ls_t^{RIC}} \sum_{t=1}^{\infty} \left(\frac{1}{1+\rho} \right)^t \frac{\left[tc_t^{RIC} \left(1 - ls_t^{RIC} \right)^{\mu^{RIC}} \right]^{(1-\theta^{RIC})}}{1 - \theta^{RIC}} \tag{1}$$

where μ shows the intensity of households' preferences for leisure. Another basic feature of the utility function is that it comes in a multiplicatively separable form which has two outcomes. Firstly, it introduces the labor/leisure choice into the consumption Euler and makes these two decisions directly related in an intertemporal manner. Secondly, the intratemporal substitution between consumption and leisure is no longer a function of IES. In per capita terms, linear budget constraint of *RIC* households is provided in equation (2). They get wage income and pay wage tax to the government (at rate $wagt^{RIC}$) and social security premium to the SSI (at rate ssp^{RIC}); get net-of-tax dividend income from the enterprises, receive unilateral transfers form the government, gtr_t^{RIC}, and from the SSI[10], str_t^{RIC}. They allocate their disposable income between consumption and saving:

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work informally but live in the rural areas are included in the group of *RH* to keep total rural employment constant.

[9] Galí et al. (2004) states that if the weight of non-Ricardian households is high, their increasing consumption would offset declining consumption of Ricardian households and thus prevent fall in aggregate demand and allow to economy to sustain output growth.

[10] The transfers form the SSI may be in the form of pension and/or in the form of health benefits. Since these transfers are at household level, any member of the household can be a receiver of these transfers.

$$PTC_t^{RIC} \, tc_t^{RIC} \, + s_t^{RIC} \, \leq \, w_t^{RIC} \, ls_t^{RIC} \, (1 - wagt^{RIC} - ssp^{RIC}) \, +$$
$$cincshare^{RIC} \, \frac{DISDIV_t}{POP_t^{RIC}} \, + \, gtr_t^{RIC} + \, str_t^{RIC} \tag{2}$$

where PTC_t^{RIC} is the price of composite consumption, $cincshare^{RIC}$ is the share of household *hh* in total distributed dividends, $DISDIV_t$, of enterprises. The first order conditions for this maximization problem are the well-known consumption Euler which shows the relation between two consecutive periods' composite consumption of the household and the intratemporal choice between per capita composite labor supply and composite consumption.

In the first stage problem of the representative *NRIC* household, intratemporal utility, which is assumed to be of Cobb-Douglas type, is maximized:

$$\max_{tc_t^{NRIC}, ls_t^{NRIC}} \left(tc_t^{NRIC}\right)^{util} \left(1 - ls_t^{NRIC}\right)^{1-util} \quad s.t \tag{3}$$

$$PTC_t^{NRIC} \, tc_t^{NRIC} \, \leq \, w_t^{NRIC} \, ls_t^{NRIC} \, (1 - wagt^{NRIC} - ssp^{NRIC}) \, + \, gtr_t^{NRIC} + \, str_t^{NRIC} \tag{4}$$

The budget constraint is also linear and simpler than that of the *RIC* household but it is also different for each household type within the group of *NRIC*. The group of *USF* receives all types of incomes except asset/capital income and pays wage income tax and social security premium from gross wage income. The group of *IW* gets wage income and unilateral transfers from the government but has no tax and social security premium obligations. The group *RET* gets only retirement pension from the SSI. Lastly, the group *TRF* gets only unilateral transfers from the government. The FOC of this maximization problem shows the intratemporal substitution between per capita composite consumption and composite labor supply.

The second stage of the problem has two sub-stages. Firstly, all households disaggregate their composite consumption into commodities via Linear Expenditure System (LES) in which households pay the bill of subsistence level of consumption in the first place and then use budget, i.e. discretionary expenditure, to determine the level of consumption by commodities. Boeters and Savard (2011) states that minimum consumption expenditures *must* be covered in any case but if informality is a common phenomenon with the absence of well-organized social security system, utilizing LES becomes particularly important. The system implicitly assumes that each household has different perception which is consistent with the characteristics and the overall standard of living of the group (Decaluwé, Patry, et al., 1999, 34) but existence of subsistence consumption restricts saving capacity of households since they have to cover the bill of it (Steger, 2000, 344).

The subsistence consumption is an exogenous parameter and is calibrated[11] accordingly, income elasticity of consumption for each good *s* for each household type *hh*. These elasticities, for each household and for each commodity, are calibrated by using percentage changes in consumption expenditures of each household by each commodity and percentage changes in total household disposable income for each household. To this end, HBS-2002 is used and the same routine of household assignment is also applied to this wave. In this stage, households are assumed to maximize their intra-period utility, which is assumed to be a Cobb-Douglas form, to choose the optimal level of consumption.

In the second sub-stage, households except *RET* and *TRF* allocate their composite labor supply among different sectors. Here, since it is assumed that each sector is an imperfect substitute for one another, each household choose sectoral labor supplies by maximizing total wage income. Since there are five types of workers and eleven sectors, this labor market modeling could lead to have 55 labor market strata. However, public sector can hire neither self-employed / employer nor informal worker. Moreover, labor demand of the public sector in rural areas is set to be equal to zero due to the fact that the majority of public servants who serves in the rural areas are either skilled or unskilled who are appointed by the government. Thus, there are 52 strata.

3.2 Firms

The production side of the model economy consists of 11 representative firms that corresponds to 11 different sectors which are assumed to produce only one product by using intermediate goods, capital and labor. The labor input is a composite of different types of households who supply his labor force. The production side shows heterogeneity w.r.t investment decision. A firm is considered to be either a "dividend maximizer" or a "non-dividend maximizer". The latter subset consists of mining, coal and petroleum (*MCP*), household non-durable goods (*HNDG*), household durable goods (*HDG*), and construction (*CON*) which are the main investor sectors in Turkey. On the other hand, agriculture (*AGR*), food, beverage and tobacco (*FBT*), textile (*TEX*), shelter (house & related activities) (*SHE*), transportation (*TRP*), and other services (rest of the economy) (*OSER*) comprise the former subset. In addition, there is public services (*PSER*) sector who does not have an investment decision and operates at fixed level of capital stock.

Conventionally, firm's problem is assumed to be a static in the sense that it maximizes the current period's value added. In this structure, total investment is distributed among firms according to profit rate differentials. If investment decision and thus the firm's problem is not constructed in

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[11] The details of calibration process is available upon request.

an intertemporal manner, dynamics of the model entirely rely on the consumption smoothing of households. However, non-static behavior of firms allows the model not only to make investments endogenous but also to introduce sectoral differences into firms' investment decisions.

A *DM* firm maximizes the value of the firm that is equal to the present discounted value of its dividends by choosing investment, $I_{DM,t}$, capital stock, $K_{DM,t}$, and composite labor, $CLD_{DM,t}$. In this problem, the Lagrange multiplier is Tobin's q, i.e. the marginal value of capital. Sectoral dividend is equal to the net-of-corporate tax sectoral profit minus the cost of new investment equipments and adjustment cost which is an increasing and convex function of investment; for a given level of sectoral capital stock, the cost of installing new capital equipments will be greater.

$$\max_{I_{DM,t},K_{DM,t},CLD_{DM,t}} V_{DM,t} = \sum_{t=1}^{\infty} \left(\frac{1}{1+r_t}\right)^t DIV_{DM,t} \quad s.t \tag{5}$$

$$K_{DM,t+1} = (1-\delta_{DM}) K_{DM,t} + I_{DM,t} \tag{6}$$

$$DIV_{DM,t} = (1-corptax) WK_{DM,t} K_{DM,t} - INV_{DM,t} \tag{7}$$

$$INV_{DM,t} = PI_t I_{DM,t} + PVA_{DM,t} ADJ_{DM,t} \tag{8}$$

$$ADJ_{DM,t} = \phi_{DM} \frac{I_{DM,t}^2}{K_{DM,t}} \tag{9}$$

Sectoral dividend, (7), is equal to net-of-corporate tax sectoral profit minus total value of sectoral investment expenditures which has two parts; the cost of new investment equipments and adjustment cost. Adjustment cost, (9), is an increasing and convex function of investment; for a given level of sectoral capital stock, the cost of installing new capital equipments will be greater. Adjustment cost is measured by the price of the value added, $PVA_{DM,t}$ (net-of-production tax producer price), because it is assumed that installation of new capital requires the resources of firm which leads to interruption of production process and thus losses of output. Sectoral profit is equal to deduction of total labor cost, including social security contribution paid by firm, from the sectoral value added. Firms in the subset of *NDM*, however, maximize the value of current period's value added. Each of such firm's investment is a fixed share of current period's GDP and its capital stock evolves according to the following capital accumulation rule[12].

Each firm, either *DM* or *NDM*, disaggregates its sectoral composite labor demand into each type of labor. In this set up, sectoral composite labor is assumed to be a constant elasticity of substitution (CES) aggregate of each type of labor by minimizing total labor cost. It is assumed

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[12] Firms in *NDM* sectors are not subject to calibration process for sectoral depreciation rates which are chosen arbitrarily.

that each firm has Leontief type production function, which means that intermediate goods and the real value added are complements. The level of sectoral real value added is equal to predetermined fraction of firm's gross production level. By definition, public services have no inter-sectoral relation with the rest of the economy, i.e. its products can't be used as intermediate inputs or it can't demand any intermediate input.

TURKSTAT announces total investment expenditures and changes in inventories, including the statistical discrepancy, as a part of the national accounts. On the other hand, the distribution of total investment expenditures among sectors, i.e. "investment by destination", by major sectors and in distinction between private sector and public sector is announced by the Ministry of Development. Since these sectors are not sufficient to obtain investment by destination figures for each sector in the model economy, another survey conducted by TURKSTAT, namely Annual Industry and Service Statistics is utilized. The survey contains data on the fixed capital investment statistics at 2-digit level by NACE Rev.1 (2003-2008) and by NACE Rev.2 (from 2009 and onward) classifications. Each sector in the survey is assigned to unique activity used in the model economy and then sectoral shares in the total investment expenditures are calculated.

Table 3: Firm Heterogeneity

Sector	Investment Decision		Foreign Trade	
	Dividend Maximization	Fixed Share of GDP	Export	Import
Agriculture (AGR)	●		●	●
Mining, Coal, and Petroleum (MCP)		●	●	●
Food, Beverage, and Tobacco (FBT)	●		●	●
Textile (TEX)	●		●	●
Household Non-Durable Goods (HNDG)		●	●	●
Household Durable Goods (HDG)		●	●	●
Shelter and Related (SHE)	●			
Construction (CON)		●	●	
Transportation (TRP)	●		●	●
Public Services (PSER)				
Other Services (OSER)	●		●	●

To conduct the calibration process of sectoral parameters and forming a Social Accounting Matrix (SAM), inter-sectoral flows and magnitudes about supplies and demands of commodities are obtained by using the input-output table of 2002, which is the latest version. From this table, 59 sectors which are classified by NACE Rev.1 at 2-digit level are aggregated. This aggregation is performed to obtain a production side that is consistent with the composition of household consumption compiled from the HBS. Then, this aggregated I/O table is updated by assuming that the shares of activities in total value added and the shares of intermediate inputs in total production are constant. This means that sectoral composition of total value added and more importantly the

production technologies have not been changed.

3.3 Government and Social Security Institution

The SSI collects social security premium from employees from their gross wage income and social security contribution from activities from the gross wage cost and makes payments to households in terms of retiree pensions or health benefits which, as a sum, is considered to be a fixed fraction of current period's GDP. This total amount is distributed across households via fixed shares. The difference between income stream and expenditures of the institution, deficit if negative, is covered by transfers from the government. Intertemporal budget constraint of the government looks like

$$GOVREV_t + GFDS_{t+1} = GFDS_t + GOVEXP_t + GFINT_t \tag{10}$$

The government collects wage tax from households from their gross wage income, production tax from activities from total value of production, value added tax from domestic trade and tariffs from imports, and corporate tax income from enterprises from sectoral profits.

$$GOVREV_t = \sum_s (TARIFS_{s,t} + VATREV_{s,t} + PRODTAXS_{s,t}) +$$
$$\sum_{hh} wtax_t^{hh} POP_t^{hh} + CORPTAXS_t \tag{11}$$

The government devotes fixed fractions of GDP to consumption and unilateral transfer payments to households, makes transfer payments to enterprises which is assumed to be constant, and covers the SSI deficits. Total government consumption is allocated among commodities according to pre-determined budget shares and transfers payments to households are distributed among households by fixed shares.

$$GOVEXP_t = GOVCON_t + GTRENT_t + GTRHH_t + SSDEF_t \tag{12}$$

Government transfers to enterprises figure is almost equal to sum of transfers/lending to enterprises and interest payments on the domestic debt stock. After the crisis in 2001, in line with the stand-by agreement with the International Monetary Fund (IMF), the government focused on the primary balance, i.e. government expenditures expect interest payments over outstanding (domestic and foreign) debt stock, to reduce public indebtedness and its negative consequences on domestic interest rate and inflation. In addition to this stabilization program, the global economy faced enormous increases in the global financial liquidity from 2003 until 2007-8. After the global financial crisis,

the major central banks started to apply the strategy of quantity easing to stimulate the economic growth and employment. Increasing foreign exchange inflows caused to appreciation in Turkish Lira, which resulted in increased imports and lowered domestic interest rate, and, in turn, expanded private consumption expenditures. In addition to increased tax collections of the government from domestic and international trade, aggressive privatization strategy led to increases in revenues and primary balance objectives were reached. Thus, in this period, borrowing from the international markets, by the help of lower international interest rates, allowed the government to control the domestic debt stock. On the other hand, due to records of the Undersecretary of Treasury, interest payments over domestic foreign debt stock is almost stable. Therefore, the value of government transfers to enterprises is assumed to be fixed.

In the model economy, the government can borrow from abroad as much as needed at world interest rate. If government savings increase in the period t, debt stock of the the period $t+1$ is lower than that of the period t. Most studies in the literature assume zero government savings which lead non-growing debt stock in the steady state. However, in this model economy, the foreign debt stock and thus interest payments of the government grow, since government savings on the SAM is negative, in turn, increases the foreign saving necessity of the economy.

3.4   Internal Migration

For the Turkish economy, internal migration from rural areas to urban areas or from less developed provinces to developed provinces is a phenomenon. According to the results of Bülbül and Köse (2010), the Northeast Anatolia, the Southeast Anatolia, and the Blacksea regions are consistently emigrants regions while İstanbul, the Mediterranean region, the Marmara region, and the East Anatolia region are stable immigrant-receiving regions. TGYONA (2006), which is the most comprehensive study on internal migration in Turkey, states that the major reasons of migration are marriage, education, job change, appointment, family issues, etc.

Migration flows change not only the demographic structure but also wage rates, total private savings, total private consumption and its distribution among commodities, etc. Therefore, this demographic transformation affects the income distribution even if there is no other change in the internal and external circumstances. Since it is a phenomenon in Turkey, the model economy described above is extended to incorporate migration. In this study, Cole and Sanders (1985) approach is used with some different features due to indigenous characteristics of the model economy describe above[13].

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[13] In the migration literature that uses CGE approach, such as Calvo (1975); Fields (2005); Genç İleri (2015), per capita

Existence of labor-leisure choice not only affects migration function that determines the number of immigrants but also convergence of migration to its steady state level. As migration occurs, labor supply (wage rate) in urban areas will be higher (lower) which invokes individuals to increase their labor supply to compensate the decline in their wage income. On the contrary, migration leads to decrease (increase) in labor supply (wage rate) in rural areas which, in turn, leads to decrease in labor supply. Endogeneity of labor supply dumps the convergence between urban "expected" wage and rural wage and thus migration declines slowly.

Another indigenous characteristic of the migration modeling is the absence of involuntary unemployment in urban areas. Hoopengardner (1974) defines the original Harris-Todaro framework as a **_stable dynamic disequilibrium_** in which the employment rate will remain constant. The author's strategy, which is also utilized in this study, is solving all wages endogenously which allows the wage rates in the urban labor markets to adjust freely to aspire the migration inflows.

It is assumed that an immigrant works either as a unskilled formal wage earner, i.e. USF, with probability α or as a informal wage earner, i.e. IW, with probability $(1-\alpha)$. The migration function looks like

$$MIG_t \; = \; \left[\frac{\alpha \; rnw_t^{USF} \; + \; (1-\alpha) \; rnw_t^{IW} \; - \; rnw_t^{RH}}{rnw_t^{RH}} \right]^{migres} LSUP_{t-1}^{RH} \tag{13}$$

$$rnw_t^{hh} \; = \; \frac{w_t^{hh} \, (1 - wagt^{hh} - ssp^{hh})}{PTC_t^{hh}} \tag{14}$$

where rnw_t^{hh} is real net wage of household hh, $migres$ is migration elasticity parameter, and $LSUP_{t-1}^{RH}$ is the remaining total labor supply in rural areas. Real net wage, rnw_t^{hh}, is calculated by dividing wage tax and social security premium net of composite per capita wage rate by household-specific price of composite consumption. It is evident that, migration declines as net wage differential and labor supply in rural area shrink. Migration function is chosen in a nonlinear form in order to achieve smooth pattern for migration[14].

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labor supply is assumed to be perfectly inelastic, i.e. there is no labor-leisure decision. Genç İleri (2015) explains the reasoning by referring the results of Heckman et al. (1998); "intertemporal elasticity of labor supply is too low". For the Turkish economy, a recent study of Ünveren and Sunal (2015) finds that this elasticity varies between 0.27 and 1.39, due to the choice of instrumental variable used in GMM estimations. Since the authors constructs a CGE model for single household - multiple sectors, their results can not be generalized for the Turkish economy. Therefore this study, to our best knowledge, will be the first attempt to analyze the migration phenomenon in the existence of labor-leisure choice.

[14] By choosing a linear form of migration function, the algorithm also achieves an optimal solution but the volatility in some variables, especially sectoral ones, is relatively bigger.

TURKSTAT provides migration in and out figures for each province for each year in the aftermath of 2007. From these figures, provinces are classified as either less developed or developed. The former (latter) group is called as rural (urban) and migration figures are aggregated based on this classification. Accordingly, the net average migration figure is calculated as 140.181 for the period of 2007-2014 and 63.991 for the year of 2011. However, to obtain gradual decrease in migration figures along the base-path, the initial level of migration is chosen as 99.186 which is coherent with the real net wage differential and total labor supply in rural areas. Once wage income and price of composite consumption are initialized, real net wage differential is calculated and by using migration value and total labor supply in rural areas, the value of parameter *migres* is calibrated by using equation (13). For an immigrant, the probability of being unskilled formal (informal) wage earner is arbitrarily set to 30% (70%).

3.5 Equilibrium and the Steady State

At the steady state, since the level of sectoral capital stock is constant, $K_{s,t} = K_{s,t+1} = K_s^{ss}$, capital accumulation function implies that each sectors' investment is just sufficient to cover sectoral depreciation;

$$I_s^{ss} = \delta_s K_s^{ss} \tag{15}$$

At the steady state, a sector's dividend is equal to the risk-free asset's yield. This means that each sectors' dividend is equal to the value of the firm times interest rate;

$$DIV_s^{ss} = r^{ss} V_s^{ss} = r^{ss} q_s^{ss} K_s^{ss} \tag{16}$$

The third and the last terminal condition is about the government foreign debt stock. When the steady state is reached, the foreign debt stock of the government has to remain constant, i.e. $GFDS_{T+1} = GFDS_T$ where T is the end of horizon. From the intertemporal budget constraint of the government at the end of the horizon,

$$GFDS_{T+1} = GFDS_T - GSAV_T \tag{17}$$

it is evident that the government's savings has to be equal to zero, i.e. $GSAV_T = 0$. In other words, total value of expenditures and interest payments over the foreign debt stock have to be equal to total revenues.

$$GOVREV_T = GOVEXP_T + GFINT_T \tag{18}$$

Since terminal conditions are equivalent to steady state conditions, the third condition can be written as $GSAV_{ss} = 0$.

3.6 Solution Strategy

In order to explain the model dynamics, definitions of three different paths should be provided:

- **base-run steady state** is a path on which all variables except the following four are exactly equal to their values shown in the SAM. On the contrary, negative government savings causes increasing government foreign debt stock and thus interest payments over the outstanding debt stock. Since the government finances her increasing debt stock via foreign borrowing, foreign savings also grows. Notice that this situation is independent of migration flows.
- **base-path** defines the path of the variables that includes migration flows. Migration inflows is the major source of the demographic change and it represents the dynamics in the Turkish economy. Along the base-path, there is no any policy change. In other words, it shows the "business-as-usual" case.
- **experiment path** is a path which shows the effects of change in the values of one (or more) parameter / exogenous variable on the overall economic environment in the presence of migration. In other words, it describes the answer of "what if" question.

Unconventionally, i.e. in a model without any growth component, the base-path of the model economy described above does not follow a constant path; it rather follows a dynamic path due to the way of incorporation of migration flows with endogenous labor / leisure decision. As mentioned before, migration changes only total labor supplies of migration-related households but wage rates in each labor market stratum. As populations change in the migration-related households, their per capita transfer receipts also change. Wage income and transfer receipts affect disposable income and thus composite consumption, composite labor supply, and savings. Therefore, initialization of the variables requires to solve the entire model itself[15]. Therefore, the base-path of the model economy is designed as migration is part of the economic dynamics, although the calibration and the initialization processes have been completed ***as if*** the migration flow is equal to zero.

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[15] By assuming a constant migration rate and perfectly inelastic labor supply or utilizing wage elasticity of labor supply to calculate labor supply responses w.r.t changes in wage rates in each labor market stratum, model initialization would be done. However, in the former case, labor supply does not respond to wage changes while the latter implies constant relationship between labor supply and wage rate. This hinders the analyses in which one of the major concern is to analyze the relation between the government transfers and labor supply decision of the recipients.

4 Policy Analyses

The first question asked in this study is "what if the government devotes a larger portion of gross domestic product to unilateral transfer programs?" Turkey is criticized for the fact that the share of social assistance expenditures in gross domestic product is very low among OECD member countries. In 2012, the OECD average of this ratio was 21.5% while it was 12.3% in Turkey. Despite the small share in total household income, Başlevent (2014) states that these expenditures have positive impacts on the size distribution of income. The aim of such an experiment is to postulate the effects of changing budgetary figures of welfare transfers without altering the policy framework. Currently, welfare transfers constitute unilateral unconditional cash and in-kind payments for which there is no officially announced time limit, i.e. transfers are paid as long as individual/household can prove her/its necessity.

The second question is related to the effectiveness of government incentive policies that aim to reduce the cost of production via tax exemptions, free land allotments for factory construction and to reduce the cost of labor via full exemption for the first five years of establishment etc. The choices of government in structuring the incentive policy framework may have important effects on the income distribution. For example, the current employment incentives aim to increase total formal employment but do not consider the composition of employment. Thus, the second question of the study is "what if the government reduces/subsidizes sectoral social security contribution rate according to the sector's share in total unskilled formal wage earner employment?"[16].

4.1 Model Dynamics: The Base Path (BP)

Along the base-path, economic dynamics are solely driven by migration flows. An immigrant becomes an *USF* with probability 0.3 or an *IW* with probability 0.7[17]. In this subsection, unless otherwise stated, the base-path *level* of each variable is depicted while percentage deviations are calculated relative to the base-run steady state.

Due to migration, per worker composite wage rate of *RH* (*USF* and *IW*) increases (decreases) as total labor supply(ies) decreases (increase). Therefore, the real net wage differential (deviation of expected real net wage rate in the urban area from rural real net wage rate, Figure 2-right axis) declines from 0.45 to 0.31 (30.7%) and the level of migration declines from 99,186 to 11,170 at the end of the horizon.

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[16] In the following subsections, the base-path and two experiment paths are described in detail. For the sake of space-saving, sectoral results are not mentioned. An interested reader can see Yakut (2016).

[17] As a sensitivity analysis, the value of the probability is set to 40% but the major variables show negligible responses.

Figure 2: Migration (BP)
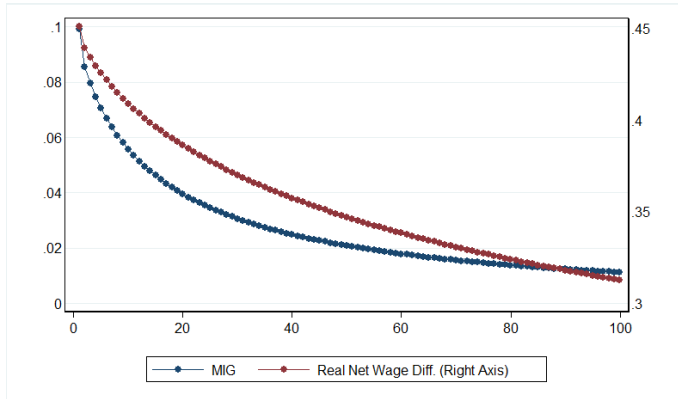
Since each type of labor is imperfect substitute for one another, substitution effects cause to lower wage rates of *SF* and *CH*. Decreasing wage rates in all labor market strata, excluding *RH*, lower the cost of labor for the majority of the sectors in which the shares of *USF* and / or *IW* in sectoral composite labor input are high. Decreasing labor cost increases the labor demand which in turn invokes increases in production and the value added. As output increases, both export supply and supply to the domestic market increase and thus prices of domestically produced commodities go down. As a result, GDP decreases from 1,297.7 billion TL to 1,276.9 billion TL (1.6%), Figure (3a). Decreasing domestic prices causes and increase (decrease) in the export (import) demand at the constant world prices, which leads to an increase in the trade balance, i.e. net exports. The figures on SAM shows that imports exceeded exports in 2011 and the net export was -112.5 billion TL. In the first period of the BP, it drops to -114.5 billion TL and then, as price adjustments occur, it shrinks to -91.4 billion TL (18.8%).

As labor supply of *RH* who pays social security premium decline and the majority of immigrants become *IW* who does not pay social security premium. Thus, total social security premium collection of the SSI declines by 3.4%. Moreover, decreasing wage rates induce composite labor demand of firms but social security contribution collection of the SSI declines by 0.94%. Since the total amount of the SSI transfers to households is fixed fraction of GDP, it also shrinks. As a result, the deficit of SSI immediately shrinks by 1.7% and then, as labor markets and production adjustments take place, it slightly increases by 0.04%, at the end of the horizon.

Decreasing prices lower profits of firms and thus corporate tax payment of the enterprises account decreases (1.57%). For the constant level of government transfers to enterprises, total distributed dividends, Figure (3b), also decline from 756 million TL to 745.6 million TL (1.44%).

As informality increases, not only the SSI's premium income but also the government's wage tax collections shrink (3.37%). Due to declining imports, total tariff revenues (2.77%) and total value added tax collections (2.01%) also decline. As a result, total government revenues, Figure (3c), decrease from 326.9 million TL to 319.7 million TL (2.2%). On the expenditure side, transfers to households (a fraction of GDP) and government consumption expenditures decline. As a

(a) GDP and Trade Balance

(b) Distributed Dividends

(c) Government Revenues

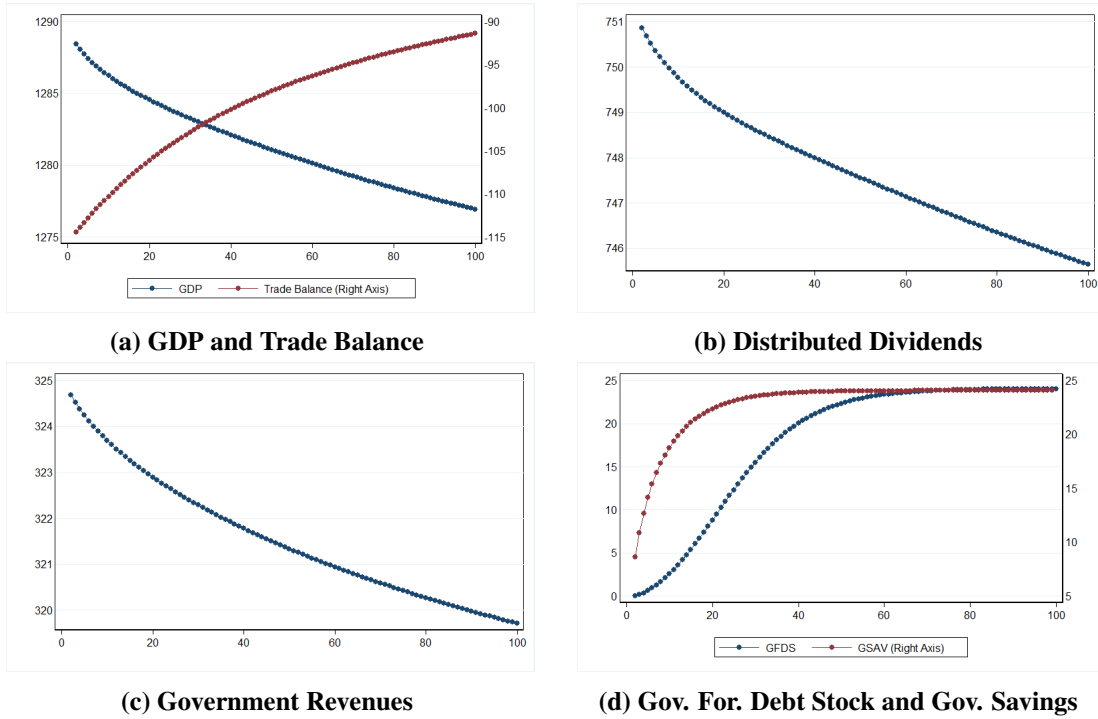(d) Gov. For. Debt Stock and Gov. Savings

Figure 3: Macroeconomic Environment (BP)

result, the primary balance deteriorates which causes an increase in the foreign debt stock. Interest payments over the outstanding debt stock also increase and government savings decline. At the end of the horizon, increase in the foreign debt stock and the government savings, Figure (3d), are equal to 24.05%[18]. Since increasing foreign debt stock is financed by foreign savings, change in the foreign savings is equal to 23.9%. Notice that, change in the foreign savings is also affected by net exports to ensure the equilibrium in the rest of the world account, i.e. foreign exchange in and out flows.

One of the major consequences of migration inflows is increasing informality in the labor market. According to the base-run steady state values, *IW* constitutes 13.2% of total employment while it follows an increasing path along the base-path and reach to 15.7%[19]. Total labor supply

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[18] Notice that, in the base-run steady state, i.e. on the SAM, government has negative savings, by 2.5 billion TL. Thus, even there exist no demographic change via migration, the foreign debt stock increases. Therefore, rather than their levels, percentage changes in the foreign debt stock and savings of the government are depicted.

[19] It should be noted that working as an unpaid family worker without a social security coverage is a common phenomenon in rural areas of Turkey but since all informal workers are assumed to live in urban areas, the informality in this study is almost one third of the real data of 2011.
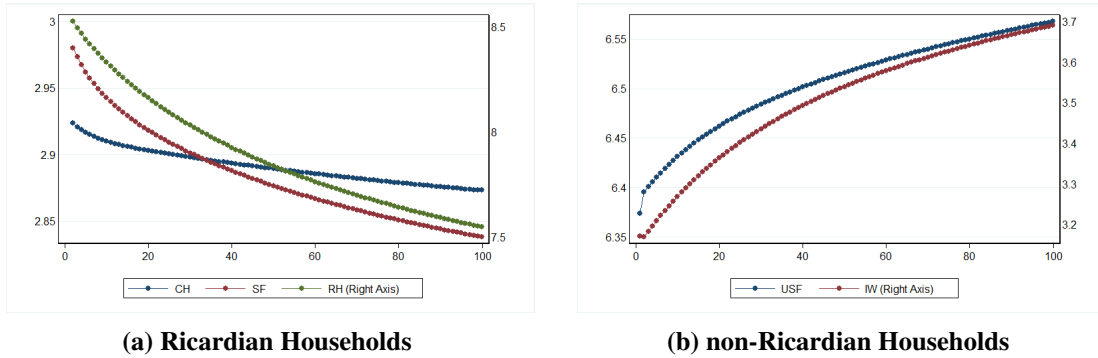
(a) Ricardian Households   (b) non-Ricardian Households

Figure 4: Total Labor Supply (BP)

is equal to sum of per capita sectoral labor supply times population. Thus, for migration-related households, changes in total labor supply include both migration and changing per capita sectoral labor supply effects. In addition, since there is no involuntary unemployment, these figures are also equal to total employment of RHGs. According to the results, along the base path, total labor supply of *CH* and *SF*, Figure (4a)-left axis, decrease by 2.76% and 5.6%, respectively. Total labor supply of *RH* shrinks from 8.6 million to 7.54 million (12.3%), Figure (4a)-right axis. As migration occurs, total labor supply of *RH* declines and thus wage rate goes up which, in turn, invokes increases in per capita sectoral labor supplies.

Total labor supply of non-Ricardian households increase due to both migration and changing labor supply behavior. Along the base-path, since 30% of immigrants become *USF*, total labor supply increases from 6.37 million to 6.56 million (3.04%) while change in population is equal to 4.17%. For *IW*, on the other hand, total labor supply (population) increases from 3.17 million to 3.69 million (16.35%) (9.78 millions to 11.71 million, 19.7%). The overall effect is 2.46% increase in total employment within the economy.

4.2   Increasing Transfers (EXP-1)

The effects of increasing unilateral transfers of the government to households are considered as a first experiment which is labeled as ***EXP-1***. To conduct such an analysis, transfers to GDP ratio is increased by 20%. Unless otherwise stated, the **% deviation** of each variable relative to its **base-path** level is depicted.

At the end of the horizon, total value of government transfers to households increases by 20.08% due to increasing GDP by 0.066%, Figure (6a)-left axis. Moreover, increasing GDP also

affects the SSI transfers to households positively. Overall, each RHG's disposable income rises. Since *USF* and *IW* decrease their per capita composite labor supplies, wage rates of these two households and expected wage in urban areas increase. Net wage differentials between urban and rural widens by 1.9% immediately and thus migration is invoked, Figure (5).

Figure 5: Migration (EXP-1)
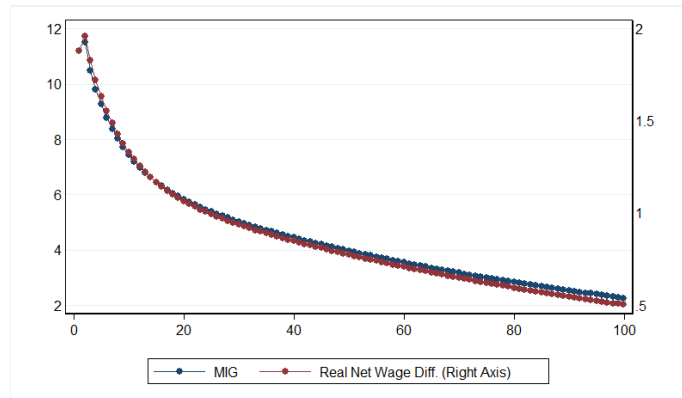
Macroeconomic Environment

As wage rates of migration-related urban resident households increase, due to imperfect substitution among different labor types, wage rates in all labor market strata increase. Thus, sectoral composite labor demands and productions shrink. Since outputs decrease, export supplies and supplies to domestic market decline and domestic prices go up. For fixed world prices, increasing domestic prices lead to substitution of domestically produced goods with imported goods, which increases the total bill of imports. Since decreasing exports also lead to decrease in income from exports, trade balance worsens relative to the base-path by almost 5.9%, Figure (6a)-right axis.

As migration inflows increase relative to the BP, informality also increases and there is further decline in wage income tax collection of the government (0.1%) and in social security premium income of the SSI (0.11%). Decreasing composite labor demands also lower social security contribution receipts of the SSI (0.2%). As GDP increases, total SSI transfers to households increase and as a result, deficits of the institution increase by 1.98% along the EXP-1, Figure (6c)-right axis.

For the majority of the sectors, the effects of decreasing sectoral outputs are compensated by increasing prices and thus total sectoral profits increase which also induce corporate tax collections of the government by 0.14%. For the fixed level of government transfers to enterprises, total amount of distributed dividends increases by 0.13%, Figure (6b).

As sectoral outputs decline, total value of tax collections from production activities decreases by 0.05%. On the other hand, increasing imports lead to increasing tariff revenues (0.38%) and increasing domestic trade activities increases value added tax collections (0.11%). By considering decreasing (increasing) wage income taxes (corporate taxes), total revenues of the government

increase by 0.09%, Figure (6c)-left axis. On the expenditure side, total public consumption also increases as revenues increase and total amount of unilateral transfers to households increase by both the policy change and increasing GDP. For fixed level of transfers to enterprises and increasing SSI deficits, total expenditures (except interest payments over outstanding foreign debt stock) of the government increases. Since increase in the expenditures are much higher than revenues, the primary balance of the government worsens. Therefore, foreign debt stock starts to increase. As it increases, interest payments also increase which feeds the decrease in government savings and the debt stock follows a path in which it grows like a snowball. At the end of the horizon, government savings (foreign debt stock) are 3.53 (3.41) times higher than its base-path level, Figure (6d).

(a) GDP and Trade Balance

(b) Distributed Dividends

(c) Government Revenues and SSI Deficit

(d) Gov. For. Debt Stock and Gov. Savings
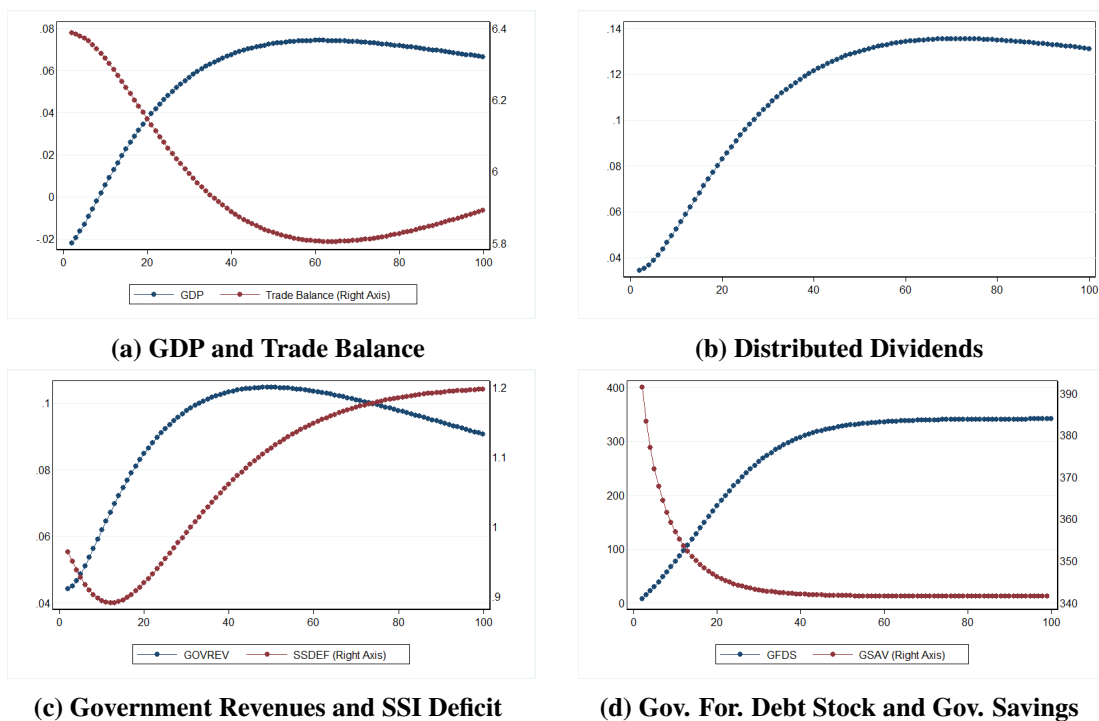
Figure 6: Macroeconomic Environment (EXP-1)

For dividend maximizer firms, increasing profits induce sectoral investment expenditures, including the convex adjustment cost. On the other hand, since sectoral investment expenditures of non-dividend maximizer sectors are determined as fixed fractions of GDP, they also increase but due to the effects of price of investment which is product of composite prices of domestic goods, changes in real investments are negative. Therefore, nominal value of total investment increases by 0.12% while total capital stock of the economy shrinks by 0.11%, at the end of the horizon.

(a) Ricardian Households   **(b) non-Ricardian Households**
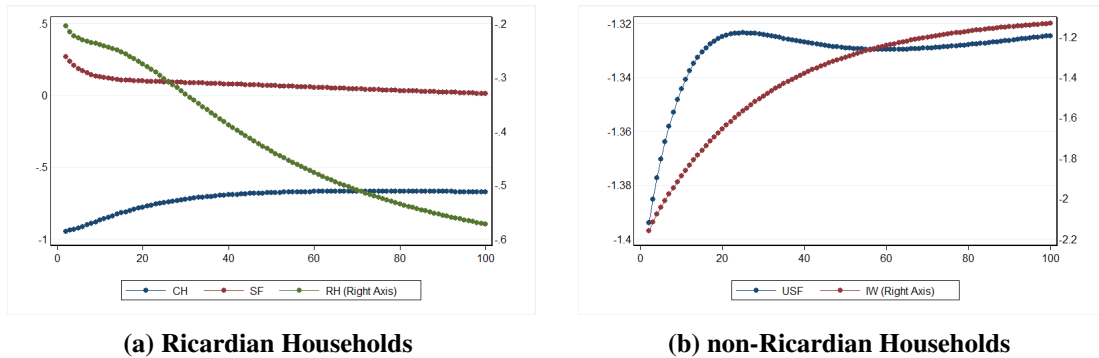
Figure 7: Total Labor Supply (EXP-1)

Since increasing unilateral transfers have adverse effects on the non-Ricardian households' labor supply decisions, the effects of higher migration inflows on total labor supply are partially compensated. Total labor supply of USF sharply decreases by 1.76%, then starts to increase and as price adjustments occur, and its level becomes 1.32% lower, relative to the base-path. For IW, total labor supply decreases by 1.13%, Figure (7b).

For the Ricardian households, the adverse effects on the labor market outcomes are relatively lower than those of the non-Ricardian households. For CH and SF, since populations are constant, change in their total labor supply is exactly equal to the change in their per capita composite labor supply, which are -0.67% and 0.01%, respectively. On the other hand, for RH, total labor supply also shrinks by 0.57%, at the end of the horizon, Figure (7a)-right axis. As a result, the economy-wide employment shrinks by 0.81% relative to the base-path and the share of informal employment in the total employment becomes 15.64%. This means that increasing government transfers reduce the informality by five percentage points (0.32%).

Households

The results of EXP-1 are provided in Table A.1. Increasing total budget of unilateral transfers to households increases disposable incomes of all households. The effect is the highest (lowest) for RH (USF and IW) in per capita terms since population(s) decreases (increase) due to migration. In addition, wage incomes of all households increase due to wage effect but the labor market responses of households differ due to their respective budget constraints.

CH's and SF's disposable incomes increase by 0.42% and 0.6%, respectively. In addition to increasing government transfers, their dividend income (0.13%) and transfers from the SSI (0.066%) also increase. Since the share of dividend income in total disposable income is higher for the for-

35

mer, they can reduce their per capita composite labor supply (0.24%). On the other hand, the latter group increases per capita composite labor supply since wage income is a more important source of income. Although household-specific price of composite consumption increases due to increasing prices of domestic composite commodities, higher level of disposable income allows them to increase per capita composite consumption and also savings. The behavior of *RH* differs from the other Ricardian households since their population is not constant but decreases due to migration. Their total transfer income, both from the government and from the SSI, and dividend income rise and thus their disposable incomes increase. However, as population decreases, per capita disposable income increases faster than those of other Ricardian households. Their per capita composite consumptions also increase but per capita savings raise by 6.17%, at the end of the horizon. As total labor supply declines, wage rate increases and affects per capita composite labor supply positively, i.e. the substitution effect is superior[20].

For the non-Ricardian households, the results of EXP-1 in terms of the labor market outcomes are not unexpected but obviously undesired. For *USF* and *IW*, although the effects of increasing transfers are partially reduced by increasing populations, per capita disposable incomes increase by 1.7% and 1.6%, respectively. For the former, disposable income is constituted by wage income, unilateral transfers from the government, and from the SSI and they have wage tax and social security premium obligations. On the other hand, the latter's disposable income is equal to sum of wage income and unilateral transfers from the government. Since both of them do not have saving decisions, increasing disposable incomes allow them to decrease their labor supplies, the income effect is superior. Therefore, their total labor supplies increase via migration while decrease by distorted individual labor supply behavior. The second effect suppresses the first; total labor supplies decrease by 1.45% and 1.04%, respectively. Increasing disposable incomes are entirely devoted to consumption; per capita composite consumptions increase by 1.33% and 1.14%, respectively.

The results of EXP-1 for the remaining non-Ricardian households also differ since the compositions of their disposable incomes are different. Increasing transfers from the government makes *TRF* strictly better off in terms of consumption among all households. Their total and per capita disposable income, since there is no population change, increase by 13.57% along the EXP-1, relative to the base-path[21]. Although household-specific price of composite consumption increases,

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[20] The labor market theory suggests that increasing income leads to an increase in **leisure** that is the income effect. On the other hand, increasing wage rate leads to an increase in **labor supply** that is the substitution effect.

[21] Along the base-path, due to decreasing GDP, disposable income of this households has a decreasing trend. Moreover, two third (one third) of their disposable income, according to the calibration made by using the Household Budget Survey, comes from the unilateral transfers from the government (SSI). Therefore, change in their disposable income is weighted average of changes in these two transfer incomes.

per capita composite consumption increases by 13.21%. On the other hand, for *RET*, the unique source of income is transfers from the SSI. As it increases by 0.066% along the EXP-1, their disposable income also increases by exactly the same rate while due to increasing prices, per capita composite consumption shrinks by 0.27%.

4.3 Employment Subsidy (EXP-2)

In this experiment, so-called ***EXP-2***, the employment subsidy policy of the government is assumed to be altered as follows[22]. As summarized by Yeldan (2015), after the global financial crisis of 2008-9, Turkey introduced 10 different employment subsidy programs. The main aim of them is to increase the total employment but some of the programs target specific groups such as young, women, handicapped and some of them have regional aspects. These programs are mainly financed via reductions in the social security contribution (*ssc*) rates. The main program was enacted by the Law no. 5510 on October 2008 which reduced the *ssc* rates by five percentage points. The cost of this program constitutes almost 90% of the total cost of the programs. In this experiment, rather than treating all sectors homogeneously and reducing the *ssc* rates by the same amount, each sector's employment subsidy rate, $es_{s,t}$, is assumed to be a positive function of its share in total unskilled formal wage earner employment.

$$es_{s,t} = \omega \frac{LD_{s,t}^{USF}}{\sum_s LD_{s,t}^{USF}} \tag{19}$$

In the experiments with $\omega = 1$, the cost of program, i.e. total value of forgone social security contribution collection to GDP ratio, becomes 0.78, on average. However, this figure is higher than the average realized cost of the programs, which is 0.5 between 2009 and 2013, as reported by Yeldan (2015, 38). Therefore, the value of ω is arbitrarily set to 0.7 to produce the same amount of total cost. In the application, *ssc* rates are multiplied by $(1 - es_{s,t})$; as the sector *s*'s share in the total unskilled formal wage earner employment increases, the sectoral subsidy rate also increases and decline in the sectoral *ssc* rate becomes higher.

The figures in Table 4 show sectoral subsidy rates. The subsidy rates are lowest for *AGR* while the highest for *OSER* along the experiment path. These figures also indicate that how employment subsidies affect the sectoral composition of total *USF* employment. Apparently, *USF* employment shifts from the dividend maximizer sectors to the non-dividend maximizer sectors.

As social security contribution rates decline in all sectors via employment subsidies, the unit

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[22] Unless otherwise stated, the **% deviation** of each variable relative to its respective **base-path** level is depicted.

Table 4: Employment Subsidy Rates

	DM Sectors						NDM Sectors			
T	AGR	FBT	TEX	SHE	TRP	OSER	MCP	HNDG	HDG	CON
10	0.0061	0.0567	0.0739	0.0157	0.0404	0.1883	0.0073	0.0505	0.1093	0.0791
30	0.0053	0.0532	0.0721	0.0147	0.0400	0.1841	0.0075	0.0522	0.1123	0.0794
50	0.0049	0.0515	0.0710	0.0144	0.0398	0.1839	0.0076	0.0525	0.1136	0.0788
75	0.0047	0.0502	0.0702	0.0141	0.0396	0.1835	0.0076	0.0527	0.1151	0.0780
100	0.0045	0.0492	0.0697	0.0139	0.0395	0.1829	0.0076	0.0530	0.1165	0.0773

costs of labor shrink and the labor demands are stimulated in several sectors. Increasing sectoral labor demands invoke wage rates in all labor market strata, except *RH* and *IW*. As sectoral employments increase, output prices decline. Thus, real net wage rates in all labor market strata increase and the real net wage differential between rural and urban areas widens by 17.8%, Figure (8)-right axis. Therefore, migration flows sharply increase by 180%, Figure (8)-left axis. As wage adjustments occur, wage rate differential and thus migration flows decline along the experiment path and these two variables are higher relative to their base-path levels, at the end of the horizon.

Figure 8: Migration (EXP-2)
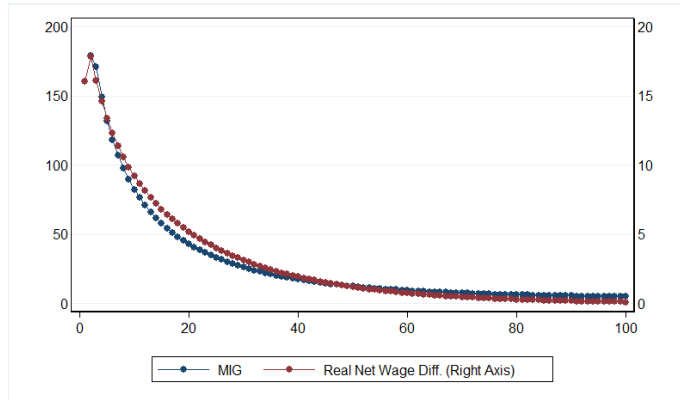
Increasing sectoral labor demands lead to increasing productions and sectoral value added. As sectoral outputs increase, supplies to domestic and international markets increase but the former reduce domestic prices. For given levels of the world prices, since exports become relatively more profitable, the majority of increasing outputs are devoted to exports. Moreover, as domestic prices decline, foreign goods become relatively expensive and consumption demands shift from imports to domestically produced commodities and thus imports shrink. As a result, net exports improve by 42.29%, at the end of the horizon, Figure (9a)-right axis. Increasing productions and improvement in trade balance lead to an increase in GDP by 2.19%, Figure (9a)-left axis.

Macroeconomic Environment

The induced sectoral labor demands lead to increases in wage rates (except *RH* and *IW*) and thus in wage income (except *IW*) of households. Total social security premium income of the

38

SSI increases by 7.26%. Increasing composite labor demands and sectoral composite wage rates increase the total bill of employment but subsidized social security contribution rates imply that total amount of the SSI's revenues from firms shrinks by 1.35%. As GDP increases, total value of transfer payments made by the SSI to households also increases. These changes in income and expenditure items of the SSI imply that deficits of the institution increases by 4.72% in the medium-run. As wage adjustments occur in all labor market strata, the deficit increases by 2.95%, at the end of the horizon, Figure (9c)-right axis. Increasing sectoral productions and exports improve profits of the sectors and thus corporate tax payments of enterprise, the owner of all production activities, by 1.37%. For the fixed level of transfer receipt from the government, distributed dividends increase by 1.26%, Figure (9b).

(a) GDP and Trade Balance

(b) Distributed Dividends

(c) Government Revenues and SSI Deficit

(d) Gov. For. Debt Stock and Gov. Savings
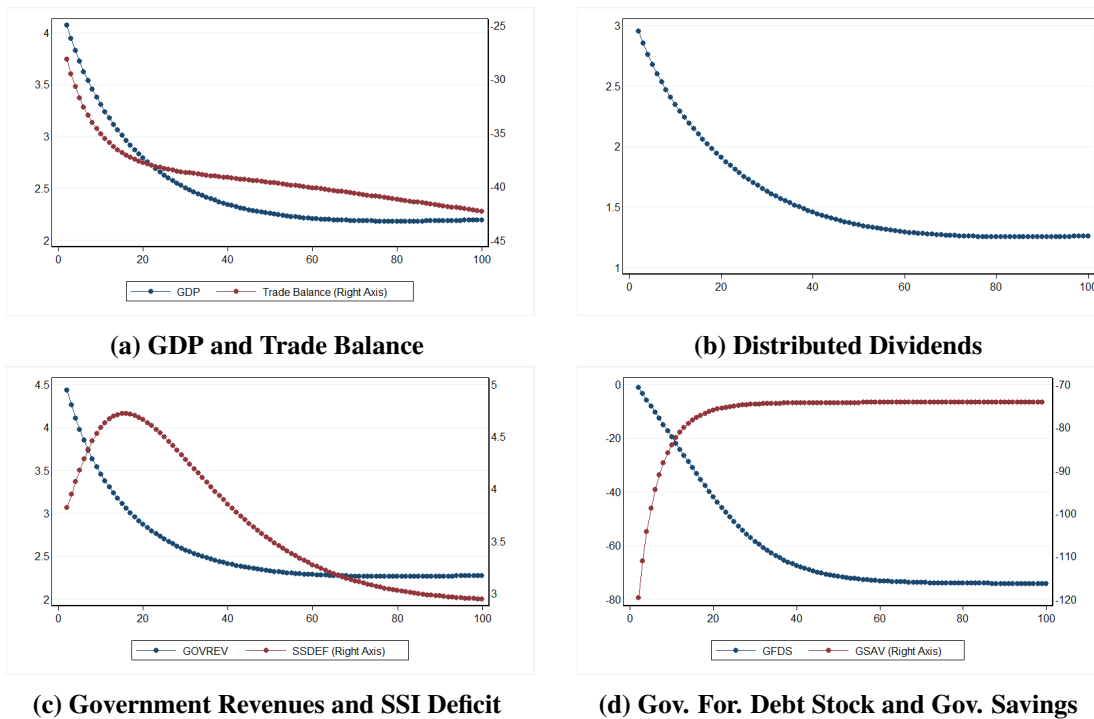
Figure 9: Macroeconomic Environment (EXP-2)

As sectoral outputs increase, total tax collection of the government from production activities increases by 2.5%. As imports decline, demands shift to the domestically produced commodities and the total value added tax collection increases by 0.93% but tariff revenues decrease by 1.14%, at the end of the horizon. Increased wage income induces wage tax collections of the government by 7.2%, relative to the BP. The major source of increasing wage tax collections is increased wage

income of *SF*. Moreover, migration flows reduce (increase) total labor supply(ies) of *RH* (*IW*) households who (do not) have wage tax and social security premium obligations. Along the EXP-2, it would be expected that total values of these two payments of households to the government and the SSI, respectively, decline. However, although the employment subsidy increases migration, its labor demand effects suppress decreasing labor supply effect and wage income of *RH* increases and thus it makes positive contributions to wage tax and social security premium revenues of the government and the SSI, respectively.

In sum, government's total revenues increase along the EXP-2. The transitional growth rate of government revenues starts from 4.43%, relative to the BP, and drops to 2.27% at the end of the horizon, the Figure (9c)-left axis. On the other hand, total public consumption on commodities (due to increasing revenues), unilateral transfers to households (due to increasing GDP) and transfers to the SSI to cover the institution's deficits increase. For the given level of transfers to enterprise, total government expenditures also increase, except interest payments over the existing foreign debt stock. Since the transitional growth rate of the revenues is greater than that of the total expenditures, the primary balance improves and allows the government to reduce its foreign debt stock. Along the EXP-2, the government savings also improve by 74%, at the end of the horizon. Thus, the foreign debt stock also shrinks, Figure (9d).

Investment expenditures of the *DM* firms (due to increasing profits) and of the *NDM* sectors (due to increasing GDP) increase. Therefore, total investment expenditures and total capital stock of the economy increase by 1.67% and 2.74%, respectively, at the end of the horizon.

As GDP increases, unilateral transfer receipts of households from the government and from the SSI increase as well. Moreover, for the Ricardian households, increasing total value of distributed dividends induce their per capita dividend income. The effects of these three income items are higher for *RH*, relative to the other two Ricardian households, due to population effect. On the contrary, the same effect works inversely for *USF* and *IW* as their populations increase. Therefore, household disposable incomes of all but *IW* increase. Under this particular set of calibrated / chosen parameters, increasing wage rates (except *RH* and *IW*) and per capita labor supplies show that the substitution effect suppresses the income effect for all households. As prices of domestic composite goods decline, household-specific prices of composite consumption also decline and decreases in the latter are greater than increases in wage rates, in absolute terms, for the aforementioned two households. Thus, their real wages increase and they respond by increasing their per capita composite labor supplies.

The Ricardian households' labor supplies change along the EXP-2 as depicted in Figure (10a). Due to migration, total population in rural areas shrinks by 6.6% while total labor supply increases
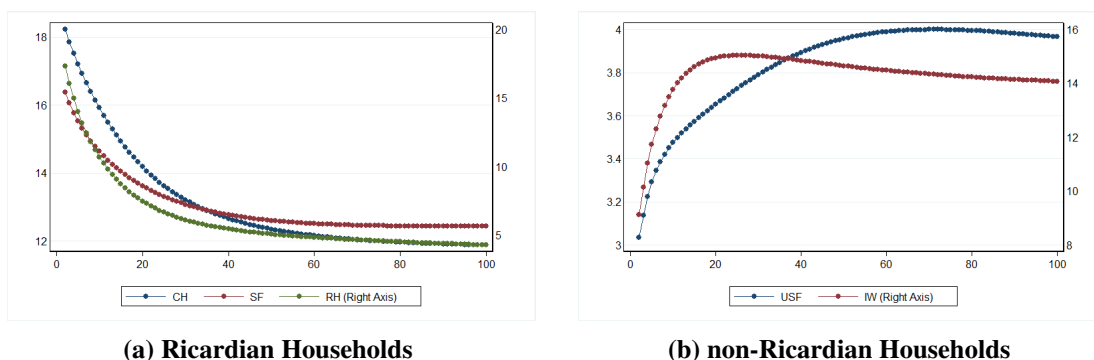
(a) Ricardian Households　　　　　　　　**(b) non-Ricardian Households**

Figure 10: Total Labor Supply (EXP-2)

by 4.3%. On the other hand, CH's (SF's) total labor supplies increase by 11.8% (12.4%), relative to the BP. On the contrary, for USF, population increases by 1.93%, while total labor supply increases by 3.96%. For IW, these two figures are 7.9% and 14.07%, respectively. Total labor supplies of these two households are depicted in Figure (10b). In sum, the employment subsidy program leads to an increase in total labor supply by 7.65%, while the informality (total IW employment in total employment) becomes 16.63% which corresponds to an enlargement by 5.97%, relative to the BP.

Households

Households results are provided in Table A.2. Changes in households' behaviors are also closely related with labor market outcomes. The Ricardian households benefit from the employment subsidy program extensively in three aspects. First, their labor demands and thus wage incomes increase. Secondly, as employment increases, total output increases and prices decline which allow them to increase their consumptions. Thirdly all households, especially SF, increase their savings, relative to the BP.

For instance, except FBT, TEX, SHE, and TRP, sectoral wage rates of CH decrease. Since the shares of SHE and TRP sectors in composite per capita labor supply are relatively high, wage rate of CH increases. Their total labor supply also increases by 11.9%, at the end of the horizon. As GDP increases, total and per capita unilateral transfer incomes also increase. In addition, increasing distributed dividends also affect per capita dividend income positively. Thus, per capita disposable income increases by 1.38%. Decreasing prices of domestic composite commodities decrease household-specific price of composite consumption. As a result, CH increase their per capita composite consumption by 1.1%. Declining prices lower total consumption expenditures which allow them to increase their savings by 11.4%, relative to the BP.

41

For *RH*, since the shares of *AGR* and *MCP* sectors in composite labor supply are relatively high, declining sectoral wage rates in those sectors lower the composite wage by 0.38%, relative to the BP. The reason is that as their population decline due to migration, they have to increase their per capita sectoral labor supplies in those sectors to meet the increase in demands. Since per capita supplies grow faster, per capita wage rates drop larger. Increasing total labor supply compensates the decreasing wage rate and total wage income increases by 1.26%. Since total values of transfer receipts form the government and the SSI and also total value of dividends increase, their per capita counterparts increase at a higher rate due to declining population. Thus, per capita disposable income increases by 8.05%, relative to the BP. Due to decreasing prices, per capita composite consumption increases by 0.91% but their per capita savings rise by 34.1%.

Due to employment subsidy program, all sectors try to change their compositions of composite labor inputs across different household types. This process affects *SF* remarkably since their demand for labor increase in all but the public services sector. It should be noted that, 55.6% of *SF* are employed in *PSER* and another 23% in *OSER*, in the base-run steady state. For instance, *AGR* and *MCP* sectors' *SF* demands almost double along the EXP-2 but these sectors' shares in total *SF* employment are only 0.29% and 0.34%, respectively. Thus, relatively huge increases in *SF* employment affect this households' labor market outcomes but there is no noteworthy change in the overall outlook; the share of *SF* employment in total employment becomes 12.07% along the EXP-2 but this ratio is 12.47% in the base-run steady-state and 12.06% along the BP. To sum up the developments for this household, per capita wage income (14.02%) and per capita disposable income (4.99%) increase, which allow them to increase per capita composite consumption by 1.2% and per capita savings by 55%, at the end of the horizon.

Total labor demand to *USF* increases by 3.97%, at the end of the horizon. Due to increasing sectoral wage rates, per capita wage income increases by 2.5%. Total values of the government and the SSI transfers increase but increasing population reduce their per capita values and thus, increase in per capita disposable income becomes 1.65%, relative to the BP. Decreasing prices increase per capita composite consumption by 3.86%.

The sectoral labor demands of *IW* also increase in all but *SHE* and *TRP* sectors. Since the sectoral shares of *OSER*, *TRP*, and *SHE* in per capita composite labor supply are the highest, changes in these sectors' labor demands determine the wage rate of *IW*. As a result, per capita composite wage rate declines by 0.99% and total labor supply increases by 14.07%. In addition to decreasing per capita wage income, since the growth rate of population exceeds the growth rate of increasing government transfers, per capita disposable income decreases by 1.21%. Since decline in disposable income is lower than the decline in household-specific price of composite

consumption, in absolute terms, per capita composite consumption increases by 1.06%. The other two non-Ricardian households per capita disposable incomes grow at rate that are exactly equal to the transitional growth rate of GDP. By the help of declining prices, their per capita composite consumptions increase.

4.4   Income Distribution

This section is devoted to provide the income distribution results of the base-path and the experiment paths. The values of the variables along the base-run steady state, i.e. values on the Social Accounting Matrix, are used as benchmark. This approach allows readers also to evaluate solely the effects of migration flows. Moreover, in the tables below, the end of horizon results are provided. Per capita and total disposable income of households are used to analyze the size distribution of income and total wage income over total capital income is used to depict the change in functional income distribution.

Figures in Table 5 show per capita and total disposable incomes in the upper and middle panels, respectively. Three households' (CH, USF, and IW) per capita disposable incomes decline in all cases. For the former, since population is constant, the same pattern is also observed for total terms. In EXP-2, the decline is negligible, while it is the highest along the EXP-1. For the latter two households, populations increase due to migration, thus their total disposable incomes increase (except for USF along the BP) but per capita disposable incomes shrink. For USF, the negative effects of migration on total disposable income is compensated by increasing transfers and subsidizing employment; while as their populations increase, they are getting worse off in per capita terms. In terms of total disposable income, IW is always better off and the effect is the highest if firms are subsidized. On the other hand, in per capita terms, since employment subsidy expands migration and thus population of IW remarkably, they are strictly worse off; almost 10% reduction in per capita disposable income.

RH is worse off in all cases while the effects of migration flows (along the BP) are compensated by the government policies along the experiments. On the other hand, since population decreases along the all paths, per capita disposable income increases. Since employment subsidy induces migration, increase in per capita income along the EXP-2 reaches to 20%, relative to the base-run steady state, while total disposable income slightly declines.

For the rest of households, populations are constant along the all paths. Thus, the magnitudes of changes in per capita and total disposable incomes are exactly the same. Migration inflows from rural areas to urban areas lower disposable income of SF while this effect is partially compensated

Table 5: Income Distribution - Relative Results

		Base	BP	EXP-1	EXP-2
per capita	**CH**	1	0.9853	0.9894	0.9989
	RH	1	1.1171	1.1391	1.2070
	SF	1	0.9669	0.9727	1.0151
	USF	1	0.9555	0.9718	0.9713
	IW	1	0.9169	0.9315	0.9057
	TRF	1	0.9840	1.1175	1.0056
	RET	1	0.9840	0.9846	1.0056
Total	**CH**	1	0.9853	0.9894	0.9989
	RH	1	0.9824	0.9943	0.9913
	SF	1	0.9669	0.9727	1.0151
	USF	1	0.9954	1.0145	1.0314
	IW	1	1.0974	1.1250	1.1700
	TRF	1	0.9840	1.1175	1.0056
	RET	1	0.9840	0.9846	1.0056
RDI (% of total)	**CH**	40.86	40.79	40.54	40.51
	RH	32.69	32.54	32.59	32.17
	SF	12.31	12.06	12.01	12.40
	USF	7.34	7.41	7.47	7.52
	IW	3.73	4.15	4.21	4.33
	TRF	1.17	1.17	1.31	1.17
	RET	1.90	1.89	1.87	1.90

Note: Base stands for the base-run steady state. BP denotes the base-path, while EXP-1 (EXP-2) stand from the experiment paths, respectively. For the definitions of these paths, see the introduction of the Chapter **??**.

by increasing government transfers, along the EXP-1. On the other hand, subsidizing firms makes *SF* slightly better off. The basic determinant of the situations of *RET* and *TRF* is change in GDP, since their sources of incomes are transfers from the government and / or from the SSI. Along the BP (negative) and EXP-2 (positive), changes in disposable income of these two households are the same since GDP declines (increase). On the other hand, *RET* is worse off along the EXP-1 since GDP declines and their transfer incomes from the SSI decline. However, *TRF* is strictly better off since government transfers increase by 20%, while its effect is partially offset by decreasing transfers from the SSI.

In the bottom panel, relative disposable incomes, *RDI*, of households are displayed

$$RDI_t^{hh} = \frac{inc_t^{hh} \, POP_t^{hh}}{\sum_{hh} inc_t^{hh} \, POP_t^{hh}} \tag{20}$$

where inc_t^{hh} is per capita disposable income of household hh and POP_t^{hh} is total population. Although there is no population growth, populations of RH, USF, and IW change due to migration. Thus, changes in the RDI_t^{hh} are driven by changes in per capita disposable incomes and changes in populations. Hence, the indicator measures how total disposable income generated within the economy is distributed among households.

The results reveal that migration flows do not change the distribution of income across households substantially. It seems that the total share of Ricardian households slightly decreases by 47 percentage points which is shared by *USF* and *IW*, while the shares of *RET* and *TRF* remain stable. If migration flows are accompanied with increasing government transfers, Ricardian households become worse off, relative to the base-run steady state, whereas non-Ricardian households, except *RET*, are better off. Worsening positions of households, who hold the majority of capital in hand and have the administrative positions, emerge the political economy aspects of such a policy change. Subsidizing employment also makes Ricardian households' relative positions worse off, except *SF* while the effects for *CH* (*RH*) is lower (higher) than those of EXP-1. Along the EXP-2, relative positions of *RET* and *TRF* do not change, while *USF* and *IW* are strictly better off, by 18 and 60 percentage points, respectively. It should also be noted that the figures in the middle and bottom panels of Table 5 can also be classified as "extended" functional income distribution, by following Lofgren et al. (2003).

In order to measure the functional income distribution, *FID*, the following formula is used

$$FID_t = \frac{\sum_{hh} nwinc_t^{hh} POP_t^{hh}}{DISDIV_t} \tag{21}$$

where $nwinc_t^{hh}$ is per capita net (after wage tax and social security premium) wage income of household hh and $DISDIV_t$ is total amount of distributed dividends. Since the latter is net-of-corporate tax, net wage income is used.

The evolution of the *FID* is depicted in Figure 11 relative to the base-run steady state where $FID_{base-run} = 1$ is assumed. It seems that along the BP and EXP-1, the *FID* does not change substantially. On the other hand, wage income increases relatively higher than total distributed dividends and the effect becomes the maximum if employment subsidy policy is applied.

Change in the income distribution can be analyzed either by assigning a distribution function for each group for fixed variances or by calculating new series of incomes by applying the growth rates. The studies on the issue reveal that the second approach is superior to the first approach since it is closer to an explicit microsimulation. However, applying crude (nominal or real) growth rates without taking the other demographic or economic changes into account, the results would be misleading. The reweighting approach of Agénor et al. (2004) considers such changes. On the other hand, there are two major sources of structural change; the composition of population across households and the composition of employment across sectors. Since employing such an analysis is out-of-scope of this study in terms of the methodology, several indicators are provided to introduce the changes in the income distribution.
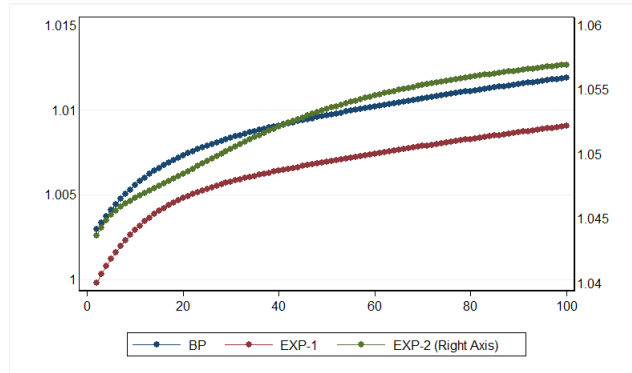
Figure 11: Functional Income Distribution

In order to calculate the indicators, the values of disposable incomes along each path are calculated as follows. The end of horizon results of the CGE model for the growth rates of per capita net wage income, per capita capital income, per capita transfer incomes (from both sources) for each RHG and household-specific prices of composite consumption are obtained. Then, the end of horizon values of each variable are calculated by using respective growth rates and deflated by household-specific price index, where its base-run steady state, i.e. calibrated, value is set to 1 for each RHG. Since HBS includes private transfers as well, RHG-level values of these transfers are assumed to be fixed and for each path, these total values are deflated and divided by the respective population figures. After generating all these values, DASP (Distributive Analysis Stata Package) is used. This package is embedded into the Stata program and allow researchers to produce several poverty and income distribution indicators easily[23].

Table 6: The Ratios of Income Shares for the Richest and the Poorest Deciles

	Group	Base	BP	EXP-1	EXP-2
	CH	8.38	-0.194	-0.183	-0.142
Ricardian	**RH**	8.34	-0.473	-0.061	-3.441
	SF	5.03	-0.956	-0.922	0.199
	USF	4.21	0.731	1.483	0.499
non-	**IW**	7.31	0.327	-0.356	0.278
Ricardian	**RET**	4.54	0.000	0.000	0.000
	TRF	8.23	1.522	-4.516	-1.421
	Population	8.28	5.329	7.102	0.888

Note: Base stands for the base-run steady state and the column shows the ratios of decile shares along the base-run steady state. BP, EXP-1 and EXP-2 denote the base-path and the experiment paths, respectively, and the columns show the percentage changes in the decile shares relative to the Base.

The basic deficiency of the income distribution analysis via CGE models is that the model

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[23] See the website of the project at `http://dasp.ecn.ulaval.ca/`

can not explore changes in within-group income distribution endogenously. Therefore, rather than assigning a functional form, another way, so-called quantile shares, is utilized to provide within-group changes. In this approach, total population of each RHG is divided into ten deciles and the shares of each decile in total RHG income is computed. Conventionally, the second richest decile's (D9) income share is divided by the poorest's decile's (D1) income share. In Table 6, the first column shows the income shares ratio (D9/D1) for each RHG along the base-run steady state and the other three columns show percentage changes in the decile ratios along the base-path and the experiment paths, w.r.t the base-run steady state. Along the base-run steady state, the richest decile's income share is 8.28 times of the poorest decile's share for the entire population. Within group income inequality is the highest within CH, RH, and TRF, respectively.

The basic reason of changing within-group inequality laid on the following fact. In the micro-level data set provided as a part of HBS, some of households may not get income from each item defined within the CGE model or the share of an income item in total household income may differ. Notice that, each household in HBS is assigned into a unique RHG and then incomes of all households are aggregated to obtain RHG level income and to conduct calibration. Let's consider two distinct households within the RHG of USF. Both of them are represented by an individual who is working as a formal wage earner whose educational attainment is high school or less. However, one of these two household may get transfer income from the SSI and the other may not. In this case, changes in the SSI transfer due to a change in GDP would affect these households differently. Moreover, if the share of wage income in total household income is higher for the second household than that of the first household, changes in wage incomes would affect household income at different rates, even the growth rate of wage incomes are equal. Therefore, the figures in Table 6 are the outcomes of the effects of experiments, the compositions of household incomes, and changes in the populations. For instance, since the income of retirees is composed by a unique source, the SSI transfers, and their population is constant along the all paths, the income share ratios and thus within group income inequality do not change.

Along the BP, the second column, due to the effects of migration, the income shares between the end tails of the distribution narrow for the Ricardian households (the highest for SF) while widen for the non-Ricardian households (the highest for TRF). If migration is accompanied with increasing total government transfers to households (EXP-1), the within-group income inequalities shrink for the Ricardian households. On the contrary, within USF, income inequality enlarges while within IW and TRF, narrowing income inequalities are observed. If migration is accompanied with employment subsidies, within-group inequalities decrease within CH and RH, while slightly increases within SF. On the contrary, income inequality widens within USF and IW.

47
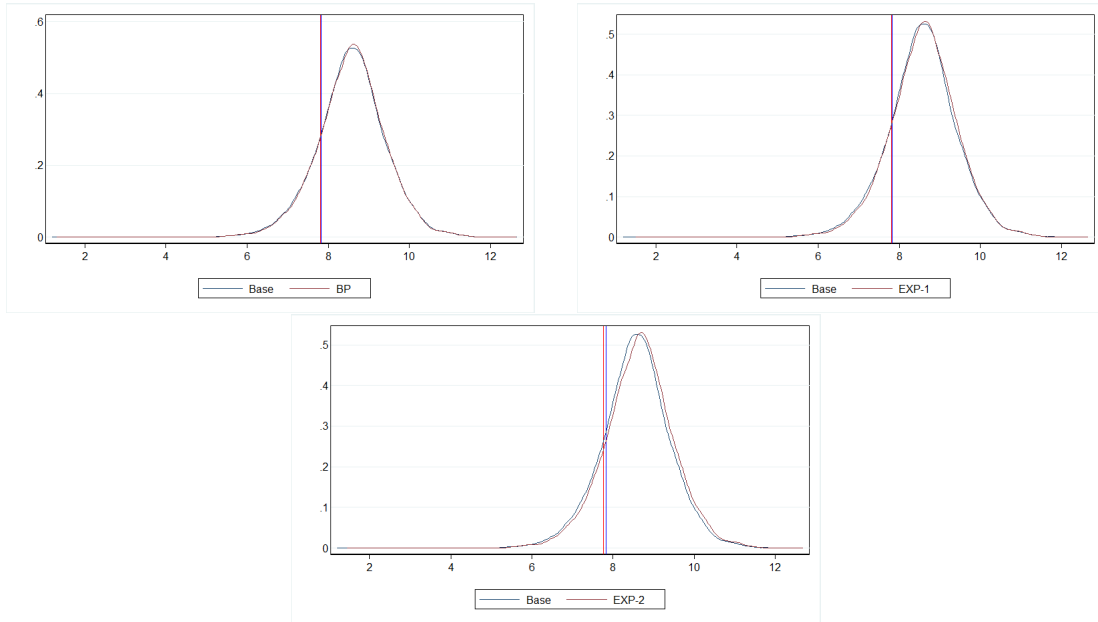
Note: Gaussian kernel estimates of per capita disposable income in natural logarithm. The vertical lines are poverty lines. For definitions, follow the text.

Figure 12: Kernel Density Estimates

Figure 12 depicts the kernel estimates[24] of (log) personal income distributions along the base-path and experiment paths w.r.t. the base-run steady state. These estimates are conducted for the whole population. For each path, the economy-wide cost of living that taken as the poverty line is calculated endogenously as follows. The per capita subsistence consumption expenditures of each commodity for each household have already been obtained in the calibration process. These per capita values for each commodity are multiplied by respective population figures and summed over households and then multiplied by domestic composite commodity prices for each path. The sum of these commodity-level subsistence consumption figures yields total value of subsistence consumption and show the economy-wide cost of living. In each case, the poverty line incorporates the effects of changing population and changing prices; as rural population decline, total value of agricultural subsistence consumption also decline. The vertical lines in Figure 12 show these poverty lines. Along the BP and EXP-1, limited changes in prices cause negligible changes in the poverty lines; they seem almost identical. Conversely, since price changes are relatively bigger

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[24] Kernel estimation provides a non-parametric probability distribution function. Kernel estimate is a smoother version of a histogram.

along the EXP-2, poverty line shifts to the left, i.e. from the blue line to the red line.

The results reveal that, relative to the base-run steady state, the effects of migration (BP) and migration plus change in the unilateral government transfers to households (EXP-1), are negligible; the probability density functions are almost same. On the other hand, along the EXP-2, i.e. migration plus employment subsidy, mean income of whole population shifts to the right and the poverty line shifts to the left, due to declining prices.

5 Conclusion

Turkish welfare regime and its transformation in social security, health system, pension system and welfare assistance programs are at the core of the debate in the last decade. As a major element of the welfare practices, social assistance programs are designed to support individuals who suffer from losses need special attention, since such programs can discourage the recipients from working or erode job search behavior of unemployed individuals. If these effects exist, then the contributions of these payments to obtain better income distribution would be negligible or even zero.

For the Turkish case, the literature reveals that social assistance program payments improve income distribution despite their relatively small shares in total household income. Total amount of welfare assistance payments is too low relative to the gross domestic product and Turkey has one of the lowest ratio among the OECD member states. Thus, the system has been criticized for not being "generous". Moreover, the distribution of these payments among households has also considered to be biased in the sense that the majority of cash payments such as pensions and unemployment benefits are devoted to relatively richer households.

This study focuses on the effects of public policies on the size distribution of income by utilizing a detailed and comprehensive intertemporal applied general equilibrium model with multiple-households and multiple-firms. The model also incorporates internal migration which is modeled as a variant of Harris and Todaro (1970) to display the demographic change. This demographic change is chosen as a base-path of the economy (labeled as BP) and two experiments are simulated and the results are depicted w.r.t. the base-path. Firstly, an increase in the government transfer expenditures to households by 20% without altering the policy framework is examined. Secondly, rather than feeding individuals with unilateral aids, the effects of reductions in the unit costs of labor via subsidizing sectoral social security contribution rates is simulated. These policy experiments are labeled as EXP-1 and EXP-2, respectively.

The major indicator of an effective public policy that aims to reduce income inequality should be improvement in the size distribution of income. In addition, such policy should not negatively af-

fect labor supply decision of individuals. The demographic change reduces total labor supply where (non-) Ricardian households choose to work (more) less and leads to limited shifts of disposable income from Ricardian households to non-Ricardian households. In the presence of demographic change, increasing unilateral transfers reduce labor supplies of all households and cause relatively higher shifts in the distribution of disposable income in favor of non-Ricardian households. On the other hand, reducing the cost of labor suppresses the negative effects of the demographic change and leads to increasing labor supplies of all households. This experiment also leads to the highest changes in the income distribution in favor of non-Ricardian households.

Along each path, informality, the share of informal employment in total employment, increases, while it reaches the highest level along the EXP-2. The are two basic reasons of such an outcome. Firstly, an immigrant is assumed to find a job as an unskilled formal wage earner with 30% probability. Since each policy shock invokes migration, total labor supply of informal workers increases faster than that of unskilled formal wage earners. Secondly, since there is no data on sectoral social security contribution payments by type of workers, the experiment is designed in such a way that *the unit cost of composite labor* is reduced. As demand of labor for all types of workers increases, in accordance with the composition of sectoral composite labor input, informality increases.

These findings indicate that the recent policy package is not sufficient to alleviate income inequality even if total government expenditures on social transfers is increased. Decreasing real GDP and discouraging effects on informal workers' labor supply decisions are negative economic consequences. Moreover, worsening position of households who hold the majority of capital implies a political-economy aspect of such a change in the composition of government expenditures.

The model economy also allows us to analyze several policy alternatives. For instance, EXP-2 is a part of the employment subsidy program of the government enacted in 2008. In addition to this, the effects of other policy tools such as subsidizing production taxes to reduce total cost of production or lowering corporate tax rate to stimulate investment can also be evaluated. Here, some sectors can be selected or each sector can be subsidized via its share in total exports and / or its share in total investment. In addition to EXP-1, increasing transfers can be accompanied with changing households' shares in total transfers or unilateral transfer framework can be altered via solving the amount of transfer payment as a function of labor supply, i.e. changing the structure into a conditional manner.

Appendix A   Household Results

Table A.1: Households Results (EXP-1)

Percentage deviations from the base-path (BP)

		T	ls	LSUP	w	winc	inc	PTC	tc	sav	POP
Ricardian	**CH**	10	-0.311	-0.870	0.312	0.000	0.342	0.409	0.023	-0.006	
		30	-0.254	-0.724	0.334	0.079	0.395	0.376	0.056	0.254	
		50	-0.236	-0.678	0.342	0.105	0.418	0.346	0.086	0.365	
		75	-0.234	-0.668	0.343	0.108	0.423	0.329	0.103	0.388	
		100	-0.239	-0.673	0.341	0.101	0.419	0.322	0.110	0.365	
	RH	10	0.115	-0.239	0.512	0.628	1.398	0.414	0.027	5.289	-0.237
		30	0.193	-0.331	0.564	0.758	1.690	0.381	0.059	5.996	-0.484
		50	0.214	-0.437	0.578	0.793	1.830	0.350	0.090	6.184	-0.607
		75	0.232	-0.523	0.592	0.825	1.920	0.332	0.108	6.215	-0.695
		100	0.247	-0.573	0.603	0.852	1.969	0.325	0.115	6.171	-0.749
	SF	10	0.062	0.128	0.516	0.579	0.583	0.414	0.052	1.388	
		30	0.055	0.088	0.510	0.566	0.617	0.381	0.085	1.719	
		50	0.038	0.068	0.496	0.534	0.624	0.350	0.116	1.823	
		75	0.016	0.038	0.478	0.494	0.616	0.332	0.133	1.796	
		100	-0.003	0.012	0.464	0.461	0.604	0.325	0.140	1.719	
non-Ricardian	**USF**	10	-1.690	-1.344	0.963	-0.743	1.776	0.406	1.364		0.079
		30	-1.679	-1.324	0.949	-0.746	1.757	0.376	1.376		0.153
		50	-1.675	-1.329	0.930	-0.761	1.737	0.344	1.389		0.186
		75	-1.671	-1.329	0.909	-0.777	1.715	0.325	1.386		0.207
		100	-1.667	-1.325	0.894	-0.787	1.699	0.318	1.376		0.219
	IW	10	-2.151	-1.889	0.870	-1.300	1.916	0.406	1.504		0.360
		30	-2.050	-1.494	0.764	-1.301	1.766	0.374	1.386		0.669
		50	-1.996	-1.301	0.717	-1.293	1.696	0.343	1.348		0.791
		75	-1.954	-1.187	0.680	-1.287	1.639	0.325	1.310		0.864
		100	-1.925	-1.135	0.654	-1.284	1.601	0.318	1.279		0.898
	TRF						13.504	0.408	13.043		
							13.562	0.376	13.136		
							13.580	0.344	13.191		
							13.580	0.325	13.212		
							13.573	0.318	13.213		
	RET						0.005	0.427	-0.420		
							0.057	0.396	-0.338		
							0.073	0.364	-0.290		
							0.073	0.345	-0.271		
							0.066	0.338	-0.271		

Note: The column variables are as follows: *ls* per capita (composite) labor supply, *LSUP* total labor supply, *w* per capita (composite) wage rate, *winc* per capita gross wage income, *inc* per capita disposable income, *PTC* price of composite consumption, *tc* per capita composite consumption and *sav* per capita savings and *POP* is total population. Notice that, along the base-run steady state, the population figures of all households are constant. Thus, changing population figure for the end of the horizon shows the cumulative change in rural population, i.e. total number of immigrants.

Table A.2: Households Results (EXP-2)

Percentage deviations from the base-path (BP)

		T	ls	LSUP	w	winc	inc	PTC	tc	sav	POP
Ricardian	**CH**	10	5.867	15.918	1.131	7.064	2.487	-2.079	0.944	16.483	
		30	4.799	13.213	0.698	5.530	1.753	-2.358	1.232	13.030	
		50	4.465	12.348	0.561	5.051	1.476	-2.295	1.167	11.742	
		75	4.353	11.997	0.512	4.887	1.382	-2.248	1.118	11.351	
		100	4.344	11.884	0.504	4.869	1.385	-2.234	1.104	11.425	
	RH	10	0.414	10.708	-1.191	-0.782	5.580	-2.175	0.747	34.150	-3.396
		30	1.039	6.124	-0.794	0.237	7.123	-2.468	1.050	36.644	-5.492
		50	1.356	5.087	-0.583	0.766	7.527	-2.400	0.980	35.656	-6.084
		75	1.548	4.593	-0.448	1.093	7.819	-2.349	0.927	34.703	-6.414
		100	1.642	4.295	-0.377	1.258	8.046	-2.335	0.912	34.135	-6.608
	SF	10	9.027	14.637	6.452	16.062	6.484	-2.301	1.019	59.986	
		30	8.167	13.078	5.514	14.131	5.354	-2.605	1.335	53.808	
		50	8.070	12.604	5.335	13.835	5.045	-2.544	1.271	53.089	
		75	8.141	12.451	5.314	13.888	4.969	-2.496	1.221	54.273	
		100	8.243	12.444	5.340	14.023	4.991	-2.481	1.206	55.990	
non-Ricardian	**USF**	10	0.412	3.475	3.362	3.788	3.159	-1.905	5.163		1.130
		30	0.496	3.790	2.205	2.711	1.963	-2.270	4.331		1.738
		50	0.544	3.957	1.974	2.528	1.709	-2.199	3.996		1.865
		75	0.565	3.999	1.922	2.498	1.646	-2.144	3.874		1.913
		100	0.568	3.966	1.928	2.507	1.650	-2.127	3.860		1.931
	IW	10	0.316	13.779	0.999	1.318	0.845	-2.080	2.988		5.144
		30	0.467	15.014	-0.559	-0.095	-0.784	-2.396	1.652		7.582
		50	0.479	14.651	-0.910	-0.435	-1.141	-2.326	1.213		7.938
		75	0.471	14.286	-1.003	-0.536	-1.231	-2.273	1.067		7.974
		100	0.460	14.075	-0.996	-0.540	-1.219	-2.257	1.062		7.931
	TRF						3.304	-2.157	5.581		
							2.506	-2.484	5.117		
							2.256	-2.406	4.777		
							2.184	-2.348	4.640		
							2.194	-2.329	4.632		
	RET						3.304	-2.265	5.698		
							2.506	-2.596	5.237		
							2.256	-2.530	4.910		
							2.184	-2.478	4.781		
							2.194	-2.462	4.774		

Note: The column variables are as follows: *ls* per capita (composite) labor supply, *LSUP* total labor supply, *w* per capita (composite) wage rate, *winc* per capita gross wage income, *inc* per capita disposable income, *PTC* price of composite consumption, *tc* per capita composite consumption and *sav* per capita savings and *POP* is total population. Notice that, along the base-run steady state, the population figures of all households are constant. Thus, changing population figure for the end of the horizon shows the cumulative change in rural population, i.e. total number of immigrants.

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