

Some Thought Experiments on the Changes in Labor Supply in Turkey

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Abstract

Turkey has the lowest hours worked (the product of total employment and annual hours per worker, divided by the size of the working-age population) among the OECD countries. We study the changes in hours of work following Ohanian, Raffo, and Rogerson (Journal of Monetary Economics, 2008) and find that the intratemporal first-order condition from the neoclassical growth model accounts for the decline in total hours worked during 1998-2009 in Turkey. Hours worked increased in Turkey since 2009 and the model accounts for half of that increase between 2009 and 2011. Our findings suggest that time-varying taxes on consumption and labor play significant roles in explaining the hours worked in Turkey. The subsistence term is quantitatively important during 2003-2011. The presence of government consumption in the utility function does not seem very important.

JEL classification: E13, E20, E60, J22, O50.

Keywords: Labor supply; employment; hours of work; growth model; taxes; Turkey.

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Erdős first did mathematics at the age of three, but for the last twenty-five years of his life, since the death of his mother, he put in nineteen-hour days...

— Paul Hoffman (1998, p.7)

1 Introduction

The recent literature documents large differences in hours of work across OECD countries, and presents evidence on how they have evolved over time.¹ For example, Rogerson (2006) studies 21 OECD countries and argues that changes in technology and government are promising candidates to explain the broad changes over the period 1956-2003.² Ohanian et al. (2008) study the same countries between 1956 and 2004 using the intratemporal first-order condition from the neoclassical growth model, augmented with taxes on labor income and consumption expenditures. They find that the model closely accounts for changes in hours worked.³ We study one country in depth that has not been covered by the studies mentioned above: Turkey. The reason is that Turkey has the lowest hours worked among the OECD countries. Figure 1 illustrates this point.

Figure 1 shows the distribution of hours worked across OECD during 1998-2010. For each country, the measure of aggregate hours of work is the product of employment and annual hours of work per person in employment. To take into account the fact that countries differ in population size, our statistics are then normalized by the size of population aged 15-64.⁴

¹Most of the discussion on this topic has been centered around the decline in aggregate hours of market work in Europe, particularly relative to the United States. The question, *Why have Europeans worked less than Americans since the 1970s?*, has led to many studies exploring the changes in aggregate hours of work (see, for example, Bell and Freeman, 2001; Blanchard, 2004; Prescott, 2004; Alesina et al., 2005; Rogerson, 2008; Olovsson, 2009; Koyuncu, 2011; Erosa et al., 2012 and the references therein).

²Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Ireland, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

³McDaniel (2011) constructs a growth model extended to include home production and subsistence consumption to study differences in market hours worked for 15 OECD countries and finds that the forces influencing market hours in the selected OECD countries to be changes in labor income tax rates and productivity growth in the home and market sectors over the period 1960-2004. Ngai and Pissarides (2011) find that the large differences in the allocation of market work across the countries of the OECD can be attributed to the differences in taxation, the subsidization of social work, and the market-home production substitution by making use of data on taxes and social expenditure from 19 OECD countries, home production data from time use surveys, and disaggregated data on hours of work by sector. Ragan (2013) studies 13 OECD countries and show how differences in tax rates can explain much of the variation in market work, meal preparation and maintenance activities, as well as time spent in other home production activities, such as child care, across the countries.

⁴Data on civilian employment and population aged 15-64 for each country (except for Turkey) are from the OECD Annual Labour Force Statistics Summary Tables. Data on employment and population aged 15+ for Turkey are from the Ministry of Development of Turkey, Economic and Social Indicators (1950-2010), Table 8.7 (using the OECD sources for employment and population data for Turkey does not change the qualitative nature of the argument). Labor statistics for Turkey is calculated by the Ministry of Development according to labor statistics based on Address Based Population Registration System (ABPRS) covered by Household Labor Survey. We use the OECD series of average annual hours actually worked per person in total employment for each country. Missing observations are filled using the Conference Board Total Economy Database (2013).

The dispersion of hours worked across countries is very large. During 1998-2010, Korea and Luxembourg are the two countries with the highest total hours worked per annum among all other OECD countries. On the other hand, Belgium and France are the two countries with the lowest total hours worked per annum among all other OECD countries (excluding Turkey). The striking observation is that the total hours worked in Turkey is lowest among the OECD members. Total hours worked in Turkey was 47.2% of that of in Luxembourg, 55.7% of that of in Korea, 83.2% of that of in Belgium, and 86.2% of that of in France in 2010.⁵

This paper tries to determine the possible factors that are important for labor supply in Turkey. Specifically, we study the changes in hours of work following Ohanian et al. (2008) and use a variant of the neoclassical growth model, augmented with government consumption, subsistence consumption, and taxes on labor income and consumption, to provide an explanation for the observed changes. To do so, we focus on the key equation that determines the equilibrium worked hours: a static optimality condition that equates the marginal rate of substitution of consumption for leisure with the marginal product of labor. In our benchmark model, private and government consumption, without subsistence consumption, enter into the household's utility function. In addition, there are taxes on consumption and labor income.

We find that our benchmark model accounts for the decline in total hours worked during 1998-2009 in Turkey. Hours worked increased in Turkey since 2009 and the model accounts for half of that increase between 2009 and 2011. We next explore the quantitative roles of the subsistence term, taxes and government consumption; and consider several variations and robustness checks to show which aspects of the model are important for our quantitative results. We show that if the model ignores taxes on labor income and consumption, then its explanatory power decreases significantly. In other words, the primary force driving changes in hours is the changes in the tax wedge. On the other hand, the presence of government consumption in the utility function does not seem very important. We find that inclusion of the subsistence term does not change the results during 1998-2003. However, the subsistence term is quantitatively important during 2003-2011.

We emphasize that our labor supply measure is hours worked per working-age person. The two principal margins of work effort are hours actually worked by employees (intensive margin) and the fraction of the working-age population that works (extensive margin). Figure 2 shows the two margins of work effort for Turkey between 1998 and 2011. Panel (a) in Figure 2 shows the behavior of the intensive margin in Turkey. We plot the data from the OECD (the series used in this paper) and from the Conference Board Total Economy Database (TED). The reason we include the TED data here is that this source is used in previous studies for Turkey (Adamopoulos and Akyol, 2009; Çiçek and Elgin, 2011; Elgin and Çiçek, 2011). Therefore, a comparison is useful. These two sources have differences before 2003 because of the TED methodology, in which average hours worked per person series for Turkey is approximated by that of Greece until 2003: trend for 1950 and 2003

⁵We note that the data for hours actually worked per person are intended for comparisons of trends over time; they may not be suitable for comparisons of the level of average annual hours of work for a given year because of differences in their sources, i.e., each country collects its own data, and their methods may be not always be perfectly comparable.

assumed equal to Greece.⁶ Data from the OECD and the TED coincide starting with 2003 since the TED uses the OECD sources to report average hours worked per person series for Turkey. According to the OECD data, an average Turkish worker worked 1,877 hours in 2010 and in 2011.⁷

Panel (b) in Figure 2 depicts the time path for the extensive margin.⁸ Employment to working-age population ratio in Turkey decreased from 47.0% in 1998 to 41.2% in 2009. There were increases recently and employment to working-age population ratio was 43.0% in 2010 and 45.0% in 2011. Turkey has the lowest employment rate among all the OECD countries; and very low employment rate is responsible for the observation that Turkey has the lowest hours worked among all other OECD countries as shown in Figure 1.⁹

One direction for future research is to disentangle the intensive margin of the total hours worked from the extensive margin. This could have important applications since Turkey has the lowest employment rate among all the OECD countries and low employment to population ratio may have significant effects on the aggregate economic activity (Conesa et al., 2002; Rogerson, 2004). A related issue is the labor input by gender.¹⁰ The low level of female employment in Turkey has attracted a great deal of attention by academics and policy makers in recent years (Tansel, 2002; World Bank, 2009b; Goksel, 2012; Karaoglan and Okten, 2012). Adamopoulos and Akyol (2009) argue that the bulk of the decline in aggregate hours is accounted for by the decline in female hours over 1960-2003. According to the World Bank (2009b) study, as of January 2009, female labor force participation rate in Turkey was 23.5%. As a comparison, this rate among the OECD averaged 62% in 2007.¹¹

⁶See the detailed data sources reported by the Conference Board Total Economy Database, which is available at: <http://www.conference-board.org/data/economydatabase/>. The point that the TED approximates the hours for Turkey by those for Greece until 2003 is also mentioned by Altuğ et al. (2008).

⁷As noted before, it may not be suitable to compare the level of average annual hours of work for a given year. Having this in mind we observe that, Turkey is ranked ninth among the OECD countries in 2011 after Mexico, Korea, Chile, Greece, Hungary, Poland, Estonia, and Israel. An average Mexican worker worked 2,250 hours in 2011.

⁸Data on employment and population aged 15+ for Turkey are from the Ministry of Development of Turkey, Economic and Social Indicators (1950-2010), Table 8.7 and from the “Labour Force Status By Non-Institutional Population, Years And Sex” tables by TurkStat.

⁹Another dimension of Turkey’s labor market problems, which we do not deal in this paper, is the large share of employment in the informal sector. The World Bank (2009a) reports that, in 2005, one-half of the employed labor force is not registered with a social security institute; this figure is about one-third even when agriculture is excluded. Betcherman et al. (2010) argue that the empirical findings for Turkey support the view that in countries with weak enforcement institutions, high labor taxes on low-wage workers may lead to substantial incentives for firms and workers to operate informally.

¹⁰The increasing female labor force participation rates during the 20th century have created an extensive literature on the possible causes of this phenomenon (see, for example, Greenwood et al. (2005, 2012) and the references therein).

¹¹There has been an increase in the labor force participation of women in recent years. According to the “Labour Force Status By Non-Institutional Population, Years And Sex” tables by TurkStat, female labor force participation rate was 30.7% as of October 2012 (based on not seasonally adjusted data). Using a structural model, Ozturk (2009) finds that the presence of minimum wages, combined with inflexibility in work hours, resulted in a much lower level of female labor force participation than would otherwise have transpired. Başkaya and Şengül (2012) study the cyclical characteristics of the key labor market indicators in Turkey with respect to gender decomposition and observe opposite movements in female and male employment and qualitative and quantitative differences in labor force participation across gender groups.

This paper complements the studies focusing on the productivity growth in Turkey from a historical perspective, since understanding the evolution of labor supply in Turkey is relevant, given the importance of labor input on the productivity measurement and on the catching-up process of the Turkish economy to the frontier.¹² For example, Adamopoulos and Akyol (2009) state that the proximate explanation for Turkey’s underperformance to the United States and Southern Europe, from 1960 to 2003, lies in the relative deterioration of aggregate labor input and the less than stellar rise in relative labor productivity.

This paper, with results on the importance of taxes on aggregate labor supply, also complements the econometric studies, which focus on the effect of changes in labor costs on employment levels in Turkey. For example, Betcherman et al. (2010) study the effects of a series of regional incentive schemes (subsidizing employers’ social security contributions, employee personal income taxes, energy consumption and land) legislated through, aimed at increasing investments and employment opportunities in low-income provinces. They find that these schemes lead to significant increases in employment among firms registered with the social security system; however, much of this increase appears to be the result of existing firms registering rather than the creation of new jobs. Papps (2012), using longitudinal data from the Turkish Household Labor Force Survey for 2002 to 2005, reports evidence that an increase in labor costs caused by a rise in social security tax rates results in greater job loss than an equal-sized increase in costs brought about by a rise in the minimum wage.

This paper also contributes to the literature on the cross-country estimates of tax rates on factor incomes and consumption presenting new estimates of the tax rates on labor income and consumption for Turkey.¹³ We calculate the tax wedge, using the tax rates on labor and consumption, during 1998-2011 using the revised national accounts for Turkey. The tax wedge provides information on labor and consumption tax rates combined and it is of interest because this measures the relevant tax burden for choices between supplying labor or enjoying leisure. In addition, we calculate the corresponding tax rates during 1987-2006 using the previous version of the system of national accounts; and repeat the calculations for which we compare the model to the data. We note that the actual tax systems are much more complicated than what we have in this paper. Nevertheless, our calculations provide comparable tax rates and complement some studies regarding the Turkish economy, such as Adamopoulos and Akyol (2009); Ünlükaplan and Arısoy (2010); and Çiçek and Elgin (2011).

The paper is organized as follows. Section 2 presents the model economy and the key equation of interest following Ohanian et al. (2008). Section 3 presents a quantitative analysis with several experiments. Section 4 concludes with a brief discussion.

¹²See Altuğ et al. (2008); Adamopoulos and Akyol (2009); Ismihan and Metin-Ozcan (2009); Çiçek and Elgin (2011); İmrohoroğlu et al. (2012) and the references therein for some recent studies investigating the evolution of aggregate growth and productivity in Turkey from a historical perspective.

¹³Mendoza et al. (1994) propose a method for estimating effective tax rates on factor income and consumption, by combining the *Revenue Statistics of OECD* with data from the *OECD National Income Accounts*. Their formulas are the most well-known measures of the effective tax rates on labor, capital, and consumption. For example, Trabandt and Uhlig (2011), following Mendoza et al. (1994), calculate and provide new data for these tax rates in the United States and individual EU-14 countries during 1995-2007. Carey and Rabesona (2002) provide a detailed discussion of the Mendoza et al. (1994) formulas and propose a number of modifications to them (see, also, OECD, 2001; McDaniel, 2007).

2 Model Economy

The model is a variant of the neoclassical growth model and it follows Ohanian et al. (2008). It considers the decision of consumption, labor and savings of an employed worker; but does not consider the decision of entering or not in the labor force as a job searcher.¹⁴ The economy consists of a representative household with utility defined over streams of private consumption (C_t), government consumption (G_t), and leisure time ($\bar{H} - H_t$):

$$\sum_{t=0}^{\infty} \beta^t U(C_t + \lambda G_t, \bar{H} - H_t), \quad 0 < \beta < 1. \quad (1)$$

The utility function is specified as:

$$U(.) = \alpha \log(C_t + \lambda G_t - \bar{C}) + (1 - \alpha) \frac{(\bar{H} - H_t)^{1-\gamma} - 1}{1 - \gamma}, \quad (2)$$

where $\gamma \geq 0$, $0 \leq \alpha \leq 1$, $0 \leq \lambda \leq 1$, and $\bar{C} \geq 0$. \bar{H} denotes the number of hours available for work. The parameter λ measures how households value government consumption, \bar{C} is a subsistence consumption term, and the parameter γ governs the elasticity of substitution between leisure and consumption.¹⁵ Note that $C_t + \lambda G_t$ denotes a linear combination of private consumption and government goods and services. The constant marginal rate of substitution implies that a unit of government goods and services yields the same utility as λ units of private consumption. The greater λ is, the better government spending substitutes for private spending.¹⁶

Technology is given by:

$$Y_t = A_t F(K_t, H_t) = A_t K_t^\theta H_t^{1-\theta}, \quad (3)$$

where A_t is efficiency, and K_t and H_t are capital and labor. Output is divided between consumption and investment and capital depreciates at rate δ . The government levies proportional taxes on labor income and consumption given by $\tau_{h,t}$ and $\tau_{c,t}$, respectively. In addition to government consumption G_t , the government also uses its revenues to finance a lump-sum transfer T_t .

¹⁴For such models, see Shimer (2010), Rogerson and Shimer (2011) and the references therein.

¹⁵In macroeconomics, the presence of subsistence points has been studied in different contexts. For example, King and Rebelo (1993) study the impacts of the subsistence level of consumption on the Neoclassical transitional dynamics. Steger (2000) discusses the effect of the constant subsistence consumption term on economic growth for developing countries. Kongsamut et al. (2001) embed subsistence level consumption in a multi-sector model to have different income elasticities for each good. Ravn et al. (2008) demonstrate that the simple introduction of subsistence points at the level of individual goods in the context of an otherwise quite standard dynamic general equilibrium model gives rise to a theory countercyclical markups.

¹⁶See Aschauer (1985), Baxter and King (1993), Karras (1994), Amano and Wirjanto (1997), Cardia et al. (2003), Bouakez and Rebei (2007), Trabandt and Uhlig (2011) and the references therein for earlier studies that allow consumer preferences to depend on government spending.

2.1 Key Equilibrium Relation

A full solution of the model involves the equilibrium values of consumption, labor, investment, and capital. Here we are concerned with the behavior of hours worked. The key equation is the first-order condition that equates the marginal rate of substitution between consumption and leisure to the marginal product of labor. Equating the household's first-order condition for labor supply and the firm's first-order condition for labor demand yields the equilibrium hours condition:

$$\frac{U_2(C_t + \lambda G_t, \bar{H} - H_t)}{U_1(C_t + \lambda G_t, \bar{H} - H_t)} = (1 - \tau_t) A_t F_2(K_t, H_t). \quad (4)$$

Here $(1 - \tau_t)$ is the so-called tax-wedge and is given by:

$$1 - \tau_t = \frac{1 - \tau_{h,t}}{1 + \tau_{c,t}}. \quad (5)$$

We focus on consumption and labor taxes since these are the only taxes that have an impact on the theory's static condition for equilibrium work hours. High tax rates reduce the incentive to work by making consumption more expensive relative to leisure. Given our functional form we have:

$$\frac{H_t}{(\bar{H} - H_t)^\gamma} = (1 - \tau_t) \frac{\alpha(1 - \theta)}{(1 - \alpha)} \frac{Y_t}{C_t + \lambda G_t - \bar{C}}. \quad (6)$$

Given parameter values and actual data for the variables on the right-hand side of Equation (6), the model generates values for hours, which is defined as model hours. For any given country its predictive accuracy can be tested by using time series data on taxes, aggregate output and consumption to generate model predicted H_t .

It is worth to note that there is a wedge between the marginal rate of substitution and the marginal product of labor: the labor wedge. By making appropriate assumptions for the parameters of the model, and given the time series, one can back out the labor wedge from Equation (6) in assessing the extent to which this first-order condition does not hold in the data. This approach builds upon a substantial body of research, including Mulligan (2002), Chari et al. (2007), Shimer (2010) and the references therein. Instead of computing the labor wedge directly, we compare the model-predicted hours to the actual series for hours of work. This provides some perspective on the extent to which the model is able to account for the data. Moreover, it is easier to interpret a deviation between actual hours and model hours than it is to interpret the significance of a wedge of a given magnitude (Ohanian et al., 2008).

3 Quantitative Analysis

Since α and θ enter the right-hand side of Equation (6) as a constant of proportionality, then the values of these variables are irrelevant for accounting for changes in hours relative to a base year. We choose the value of $\frac{\alpha(1-\theta)}{(1-\alpha)}$ so that the model hours are equal to the data for

a base year.

3.1 Data and Parameterization

Sample period and base year. Our sample period is from 1998 to 2011. The reason we choose 1998 as the starting year is to study the revised national accounts in Turkey. The Turkish Statistical Institute released the revision to GDP data in 2008. The main reason for this revision was to account for the structural changes in the economy since 1987 and to harmonize Turkey’s GDP estimates with the European System of Accounts (ESA 95). This revision updates the base year to 1998 from 1987, and includes both changes in methodology and coverage. With this revision, historical GDP series, both in real and nominal terms, as well as key macroeconomic ratios of Turkey such as shares of expenditure components in GDP have changed significantly (World Bank, 2008).¹⁷ We choose 1998 as base year and that means that the model-predicted hours are equal to the data in 1998.

C_t , G_t , Y_t , H_t . We use the time series of “Final Consumption Expenditure of Resident Households” for C_t ; “Government Final Consumption Expenditure” for G_t ; and “Gross Domestic Product” for Y_t . National accounts are obtained from the Turkish Statistical Institute, Expenditure on the Gross Domestic Product Tables (at 1998 prices). H_t denotes hours worked per working-age person and it is the product of total employment and annual hours per worker, divided by the size of the working-age population. Data on employment and population aged 15+ for Turkey are from the Ministry of Development of Turkey, Economic and Social Indicators (1950-2010), Table 8.7. We use the OECD series of average annual hours actually worked per person in total employment for Turkey. The concept used in the OECD is the total number of hours worked over the year divided by the average number of people in employment. Part-time workers are covered as well as full-time workers.

$\tau_{c,t}$. We construct the time series for the tax rate on consumption, $\tau_{c,t}$, following Mendoza et al. (1994). Specifically, it is calculated as the sum of general taxes on goods and services and excise taxes divided by the sum of private final consumption expenditures and government non-wage consumption expenditures net of these indirect taxes. We also consider an alternative method of Carey and Rabesona (2002). Although Mendoza et al. (1994) formula is the one that is mostly used in the literature, Carey and Rabesona (2002) argue that a number of other indirect taxes should also be taken into account in computing the consumption tax. These are taxes on profits of fiscal monopolies, customs and import duties, taxes on specific services, other taxes on specific goods and services and taxes on the use of goods and performance activities except motor vehicle charges paid by others.¹⁸

Panel (a) in Figure 3 plots the tax rate on consumption based on these two formulas during 1998-2011. We observe that the two methodologies yield very similar observations. For example, the sample period average is 14.7% based on the calculations following Mendoza et al. (1994), while applying the Carey and Rabesona (2002) method yields the sample period

¹⁷Turkey’s national accounts were compiled on the basis of the *1968 SNA* before the revision. The national accounts were restated according to the *ESA 95* which comprises a more comprehensive and integrated set of accounts than the *1968 SNA*. We repeat our calculations, in Section 3.4, using the pre-revision data for the period 1987-2006.

¹⁸Data for indirect taxes are from the OECD Revenue Statistics. National accounts are obtained from the Turkish Statistical Institute, Expenditure on the Gross Domestic Product Tables (at current prices).

average as 14.2%.¹⁹ We use the series based on the Mendoza et al. (1994) method for our benchmark and perform sensitivity analysis in Section 3.3.

$\tau_{h,t}$. We follow Prescott (2004) to construct the time series for the tax rate on labor income.²⁰ Prescott's calculation of the marginal labor income tax rate is given by:

$$\tau_{h,t} = \tau_{ss,t} + \eta \bar{\tau}_{inc,t}. \quad (7)$$

There are two taxes on labor income ($\tau_{h,t}$): the social security tax with marginal rate ($\tau_{ss,t}$) and the income tax with marginal rate ($\tau_{inc,t}$). The parameter η is the factor indicating to what extent the marginal income tax rates are higher than the average tax rates. The average, not marginal, income tax rate ($\bar{\tau}_{inc,t}$) and the social security tax rate ($\tau_{ss,t}$) are calculated as follows:

$$\bar{\tau}_{inc,t} = \frac{Direct\ Taxes_t}{GDP_t - IT_t - Depreciation_t}, \quad \tau_{ss,t} = \frac{Social\ Security\ Taxes_t}{(1 - \theta)(GDP_t - IT_t)}. \quad (8)$$

Direct taxes are those paid by households and do not include corporate income taxes. Indirect taxation, IT_t , is given by the sum of general taxes on goods and services and excise taxes. Data for direct taxes, indirect taxes, and social security contributions are from the OECD Revenue Statistics. Data for GDP are obtained from the Turkish Statistical Institute, Expenditure on the Gross Domestic Product Tables (at current prices). We obtain the consumption of fixed capital series (current US\$) and the official exchange rate series from the *World Bank Development Indicators* to calculate depreciation series in local currency.²¹ The labor cost share parameter $(1 - \theta)$ is set equal to 0.5.²² Prescott (2004) sets $\eta = 1.6$ based on the data for the United States. We also use the following numbers as a part of our sensitivity analysis: 1.4 and 1.8. Panel (b) in Figure 3 plots the tax rate on labor series with three different values of η . The qualitative nature of the results are similar. We use $\eta = 1.6$ for our benchmark.²³

¹⁹Both series peak in 2003. This may reflect the effect of Special Consumption Tax that was introduced in August 2002. This tax replaced a range of selective taxes on oil products, vehicles, alcohol and tobacco products and a range of luxury consumer goods into a one single tax. The indirect tax revenue (the sum of general taxes on goods and services and excise taxes) increased from 6.7% of GDP in 1998 to 11.4% of GDP in 2003.

²⁰We cannot use the methods discussed by Mendoza et al. (1994) and Carey and Rabesona (2002) because of the lack of detailed data on national accounts. Specifically, data for *Operating surplus of private unincorporated enterprises (OSPUE)*, *Household property and entrepreneurial income (PEI)*, or *Household gross operating system surplus and mixed income* are not reported. Having in mind that there are measurement problems regarding the effective tax rates on factor incomes for Turkey, we continue with the method of Prescott (2004).

²¹The observation for 2011 is missing. We assume that the GDP share of depreciation in 2011 is equal to that of in 2010.

²²See Altuğ et al. (2008); Ismihan and Metin-Ozcan (2009); and Tiryaki (2011) for a discussion on the values of factor income shares in Turkey. Chen et al. (2010), among many other studies, use 0.5 as the labor share for emerging and developing economies, because capital is relatively scarce in most of those remaining economies, and thus its return is high, while labor is cheap compared to advanced countries, leading to a lower labor share.

²³The declines in $\tau_{h,t}$ in recent years are consistent with the declining tax burden in Turkey as reported in OECD (2012a). OECD (2012a) reports the evolution of the tax burden series for the eight family types and provides information on income tax paid by workers and social security contributions levied on employees and

Parameters. The value of \bar{H} is set to $14 \times 365 = 5110$. In our benchmark, preferences are logarithmic in consumption and leisure, i.e., the limiting case as γ tends to one. Government consumption is a perfect substitute for private consumption, $\lambda = 1$. We set $\bar{C} = 0$, that is, that benchmark results are obtained in the absence of subsistence consumption. We provide sensitivity analysis in Section 3.3.

3.2 Benchmark Results

Panel (a) in Figure 4 compares model hours to actual hours during 1998-2011. The data are plotted as a solid line and the model results are plotted as a dashed line. The model accounts for 96.7% of the decline in total hours worked between 1998 and 2009.²⁴ The model under predicts the hours worked by around 3% on average during 1999-2006. Then, it over predicts the hours worked by around 1.3% on average during 2007-2009. Hours worked increased in Turkey since 2009 and the model accounts for around 49.4% of the increase during 2009-2011.

Panel (b) in Figure 4 decomposes the relative importance of tax wedge, τ_t , and the presence of government consumption in the utility function, λ . If tax wedge is ignored, then the model's explanatory power decreases significantly. For example, the model can only explain 42.3% of the decline in total hours worked over 1998-2009 if there is no tax in the model ($\tau_{h,t} = \tau_{c,t} = 0$, for all $t = 1998, 1999, \dots, 2011$) and it over predicts the hours worked by more than 6% on average during 2001-2011.²⁵

We next explore the quantitative role of government consumption. While the assumption that private and public consumption are additive is somewhat restrictive, consideration of the two extreme cases, $\lambda = 0$ and $\lambda = 1$, is informative to understand the importance of the government consumption for the analysis. Panel (b) in Figure 4 shows that the presence of government consumption in the utility function does not seem very important in terms of capturing the secular changes in hours worked in Turkey. For example, the model explains 92.5% of the decline in total hours worked during 1998-2009 if government consumption is not in the utility function, i.e., $\lambda = 0$, which is very close to the benchmark results (when $\lambda = 1$).

their employers in OECD countries. For example, the tax wedge between total labor costs to the employer and the corresponding net take-home pay for single workers without children, at average earnings levels, varied widely across OECD countries in 2011. The highest tax wedge rate is observed in Belgium (55.5%) and the lowest in Chile (7%). The corresponding figure for Turkey is 37.7%. The tax wedges increased in twenty-six countries and fell in six between 2010 and 2011; and the decrease in Turkey was 0.16 percentage points.

²⁴We compute this statistics as follows. The model predicts that total hours worked decreased from around 886 hours in 1998 to around 778 hours in 2009, a $100 \times \ln(886/778)/11 = 1.18\%$ annual decrease. In the data the decrease is 1.22% (from around 886 hours to around 774 hours, a $100 \times \ln(886/774)/11 = 1.22\%$ annual decrease. Thus, the model accounts for $100 \times 1.18/1.22 = 96.7\%$ of the decline in total hours worked during 1998-2009.

²⁵We also look at the importance of the individual tax series. The model can explain 60.9% of the decline in total hours worked over 1998-2009 if we allow only consumption tax in the model ($\tau_{h,t} = 0$, for all $t = 1998, 1999, \dots, 2011$). On the other hand, it can explain 77.9% of the decline in total hours worked over 1998-2009 if there is only labor tax in the model ($\tau_{c,t} = 0$, for all $t = 1998, 1999, \dots, 2011$).

3.3 Sensitivity

Figure 5 display sensitivity analysis. Panel (a) shows the sensitivity analysis regarding \bar{C} . In the benchmark, $\bar{C} = 0$ and our experiments consist in increasing the value of the subsistence term. In particular, we report the results of two cases: \bar{C} is equal to (i) 5% and (ii) 10% of total consumption in 1998. Inclusion of the subsistence term does not change the results during 1998-2003 and the results of the experiments are very close to those of the benchmark. The subsistence term is quantitatively important during 2003-2011, although the qualitative nature of the results do not change. The benchmark model, with $\bar{C} = 0$, accounts for 74.7% of the increase in total hours worked during 2003-2011, while the model with \bar{C} being equal to 5% of total consumption in 1998 accounts for 49.8% of the increase in total hours worked during 2003-2011. Our findings indicate that a low value (or zero) of the subsistence term in our model provides a better fit compared to a high value of this term in the model after 2003.²⁶

Panel (b) shows the sensitivity analysis regarding λ . We plot the benchmark and two alternative cases: (i) consumers do not value government consumption at all ($\lambda = 0$), (ii) consumers do value government consumption less than the private consumption ($\lambda = 0.5$). The model-predicted hours are very similar in each case. There are some differences for the years 2004 through 2007. However, these differences are not that big. For example, the benchmark ($\lambda = 1$) predicts that hours worked in 2005 is 800, whereas the corresponding figures for case (i) and case (ii) are 791 and 796, respectively. These findings imply that the presence of government consumption in the utility is not quantitatively very important.

Panel (c) shows the implications of different values for labor supply elasticity ($\gamma = 1$, $\gamma = 2$).²⁷ The qualitative nature of the results are similar. However, the model with $\gamma = 2$ predicts higher hours worked than the benchmark, around 11.5 hours on average during 1999-2011. Panel (d) shows that our findings are robust to the value of \bar{H} . Decreasing the time endowment from 5110 to 4914 or to 4718 does not significantly change the results. Panel (e) shows the sensitivity analysis for the base year choice. We repeat our calculations having 2005 as the base year instead of 1998 and observe that the results are very similar.

Panel (f) shows the sensitivity analysis regarding $\tau_{c,t}$ and $\tau_{h,t}$. We display the results of two alternative cases: first, the hours generated by the model using Carey and Rabesona (2002) method for $\tau_{c,t}$ (instead of Mendoza et al. (1994) method, which is used in benchmark), labeled “With alternative $\tau_{c,t}$ ”; and, second, the hours generated by the model using

²⁶Ohanian et al. (2008) state that as countries become wealthier overtime, the impact of \bar{C} declines. This may provide an interpretation since Turkey has shown high growth rates in the last decade. The Turkish economy used to experience boom-and-bust cycles throughout the 1990s. The economic crisis in 2001 was the low point of this period, when the economy contracted more than 5%. After that, Turkey has put in place a structural reform agenda, coupled with sound monetary and fiscal policies, to establish macroeconomic and financial stability and to improve the business environment (OECD, 2006). McDaniel (2011) argues that while subsistence consumption is not likely a major factor influencing hours in the United States over the period 1960-2004, the income per capita in many European countries in 1960 was less than half of the United States’ income per capita.

²⁷There is an immense literature on the value of the labor supply elasticity. Macroeconomic models of fluctuations in hours of work over the business cycle or across countries imply much larger labor supply elasticities than microeconomic estimates of hours elasticities. See Chetty et al. (2011, 2012) for recent detailed studies and Prescott and Wallenius (2012) for a review of the debate regarding the magnitude of the aggregate labor supply elasticity.

using $\eta = 1.4$ to calculate $\tau_{h,t}$ (instead of $\eta = 1.6$, which is used for benchmark), labeled “With alternative $\tau_{h,t}$ ”. The results are similar.

3.4 Results for the 1987-2006 Period

As noted before, the Turkish Statistical Institute, in 2008, introduced a revision to Turkey’s GDP series and updated the base year to 1998 from 1987. This revision brought significant changes to national accounts series both in real and nominal terms. This motivates us to repeat our calculations using 1987 based series as well.²⁸ It is also helpful to repeat the calculations with longer series to increase the number of observations for which we compare the model to data. National accounts (at 1987 prices) are obtained from the Turkish Statistical Institute. Data sources for hours worked, employment, and revenue statistics are the same as in Section 3.1.

We also calculate $\tau_{c,t}$ and $\tau_{h,t}$ between 1987 and 2006. Ünlükaplan and Arısoy (2010) report the time series for $\tau_{c,t}$ during 1980-2006 using both Mendoza et al. (1994) and Carey and Rabesona (2002) formulas. Our calculated series for $\tau_{c,t}$ do almost coincide with their reported series between 1987 and 2006. Ünlükaplan and Arısoy (2010) also report time series for $\tau_{h,t}$ (without explaining how they overcome the data problems that we mention in Section 3.1 and the value they set for labor income share parameter). Panel (a) in Figure 6 displays our series, labeled as “This Study”, and compare with the series reported by Ünlükaplan and Arısoy (2010), labeled as “ÜA (2010)”. We observe that our calculated series goes parallel with their reported series and the simple correlation between these two series is 0.97. However, their labor income tax rates are higher than our rates by around 30% on average during 1987-2006. Panel (a) in Figure 6 also displays the series reported by Adamopoulos and Akyol (2009, Table 3), labeled as “AA (2009)”. Adamopoulos and Akyol (2009, Table 3) report the marginal tax rate on labor income, using Prescott (2004) method, for Turkey over 1965-2003, at five year intervals. They also have higher labor taxes than our calculations.

Panel (b) in Figure 6 compares model hours to actual hours between 1987 and 2006 (using 1987 based series). We choose 1987 as base year and that means that the model-predicted hours are equal to the data in 1987. The model captures the declines in annual hours worked. The model predicts that total hours worked decreased from around 940 hours in 1987 to around 760 hours in 2006, whereas in the data the decrease is from around 940 hours to around 807 hours. The model under predicts the hours worked by around 4.2% on average during 1988-2006. Alternatively, we report the model results using the labor tax series of Ünlükaplan and Arısoy (2010), labeled as “Model (with ÜA)”. The results are similar.²⁹

²⁸Aldan and Üngör (2012) argue that 1998 based series estimates corresponding real income better than 1987 based series does.

²⁹We also compare the model results using the system of two national accounts between 1998 and 2006. We choose 1998 as base year for comparison and observe that the simple correlation between the model-predicted hours using 1987 series and using 1998 series is 0.81 during 1998-2006.

4 Conclusion

This paper, following Ohanian et al. (2008), focuses on the static first-order condition implied by equilibrium and assess the extent to which this condition holds at each point in time in the data for Turkey. While this is only one of the conditions imposed by equilibrium, it has proven to be a useful and widely-used diagnostic both to assess the model's ability to account for observed changes in hours, and to provide information as to what types of additional factors would allow the model to better account for the data (Prescott, 2004; Ohanian et al., 2008). Our results indicate that this methodology is able to capture the changes in hours worked in Turkey, both in terms of the overall change in hours, and the timing of the changes. We show the quantitative importance of the tax wedge for explaining the secular changes in annual hours worked in Turkey. This finding is important because of the other possible effects of the tax wedge on the overall economic activity. For example, Prescott and Ohanian (2012) state that higher labor-income and consumption taxes also have consequences for entrepreneurship and risk-taking by discouraging new business creation.

Focusing on the business cycle movements in the labor market, and progressing to increase the quality and the availability of data in Turkey could be a topic for future studies. For example, Ohanian and Raffo (2012) construct a new data set for total hours worked at the quarterly frequency, which covers several OECD countries (without Turkey) and spans the last 50 years. Using the new data, they document a large number of stylized facts regarding the business cycle properties of total hours and its components. Similar studies for Turkey and other emerging market economies may shed light on a number of questions, including how changes in specific policies impact fluctuations overtime.

References

- Adamopoulos, T., Akyol, A. 2009. Relative underperformance *Alla Turca*. *Review of Economic Dynamics*, 12, 697-717.
- Aldan, A., Üngör, M. 2012. A study on real income, GDP, and terms of trade. *METU Studies in Development*, 39, 179-196.
- Alesina, A. F., Glaeser, E. L., Sacerdote, B. 2005. Work and leisure in the United States and Europe: Why so different?, in: M. Gertler, Rogoff, K. (Eds.), *NBER Macroeconomics Annual 2005*, Volume 20, Cambridge, MA: The MIT Press, pp. 1-64.
- Altuğ, S., Filiztekin, A., Pamuk, Ş. 2008. Sources of long-term economic growth for Turkey, 1880-2005. *European Review of Economic History*, 12, 393-430.
- Amano, R. A., Wirjanto, T. S. 1997. Intratemporal substitution and government spending. *Review of Economics and Statistics*, 79, 605-609.
- Aschauer, D. A. 1985. Fiscal policy and aggregate demand. *American Economic Review*, 75, 117-127.

- Başkaya, Y. S., Şengül, G. 2012. Analyzing the cyclical movements of labor markets in Turkey by gender. CBT Research Notes in Economics No. 12/09 (in Turkish). <http://www.tcmb.gov.tr/research/ekonominotlari/2012/eng/EN1209eng.pdf>
- Baxter, M., King, R. G. 1993. Fiscal policy in general equilibrium. *American Economic Review*, 83, 315-334.
- Bell, L. A., Freeman, R. B. 2001. The incentive for working hard: explaining hours worked differences in the US and Germany. *Labour Economics*, 8, 181-202.
- Betcherman, G., Daysal, N. M., Pagés, C. 2010. Do employment subsidies work? Evidence from regionally targeted subsidies in Turkey. *Labour Economics*, 17, 710-722.
- Blanchard, O. 2004. The economic future of Europe. *Journal of Economic Perspectives*, 18, 3-26.
- Bouakez, H., Rebei, N. 2007. Why does private consumption rise after a government spending shock? *Canadian Journal of Economics*, 40, 954-979.
- Cardia, E., Kozhaya, N., Ruge-Murcia, F. J. 2003. Distortionary taxation and labor supply. *Journal of Money, Credit and Banking*, 35, 351-373.
- Carey, D., Rabesona, J. 2002. Tax ratios on labor and capital income and on consumption. *OECD Economic Studies*, 35, 129-174.
- Chari, V. V., Kehoe, P. J., McGrattan, E. R. 2007. Business cycle accounting. *Econometrica*, 75, 781-836.
- Chen, V., Gupta, A., Therrien, A., Levanon, G., van Ark, B. 2010. Recent productivity developments in the World economy: An overview from the Conference Board Total Economy Database. *International Productivity Monitor*, 3, 3-19.
- Chetty, R., Guren, A., Manoli, D., Weber, A. 2011. Are micro and macro labor supply elasticities consistent? A review of evidence on the intensive and extensive margins. *American Economic Review Papers and Proceedings*, 101, 471-475.
- Chetty, R., Guren, A., Manoli, D., Weber, A. 2012. Does indivisible labor explain the difference between micro and macro elasticities? A meta-analysis of extensive margin elasticities. http://obs.rc.fas.harvard.edu/chetty/ext_margin.pdf
- Conesa, J. C., Díaz-Moreno, C., Galdón-Sánchez, J. E. 2002. Explaining cross-country differences in participation rates and aggregate fluctuations. *Journal of Economics Dynamics and Control*, 26, 333-345.
- Çiçek, D., Elgin, C. 2011. Not-quite-great depressions of Turkey: A quantitative analysis of economic growth over 1968-2004. *Economic Modelling*, 28, 2691-2700.
- Elgin, C., Çiçek, D. 2011. Accounting for Turkish business cycles. *İktisat İşletme ve Finans*, 26, 9-32.

- Erosa, A., Fuster, L., Kambourov, G. 2012. Labor supply and government programs: A cross-country analysis. *Journal of Monetary Economics*, 59, 84-107.
- Goksel, I. 2012. The reasons of decreasing trend of female labour force participation in Turkey: The role of conservatism. Izmir University of Economics Working Paper No. 12/05. <http://eco.ieu.edu.tr/wp-content/wp1205.pdf>
- Greenwood, J., Seshadri, A., Yorukoglu, M. 2005. Engines of liberation. *Review of Economic Studies*, 72, 109-133.
- Greenwood, J., Guner, N., Kocharkov, G., Santos, C. 2012. Technology and the changing family: A unified model of marriage, divorce, educational attainment and married female labor-force participation. NBER Working Paper No. 17735.
- Hoffman, Paul. 1998. *The Man Who Loved Only Numbers: The Story of Paul Erdős and the Search for Mathematical Truth*, Hyperion, New York.
- Ismihan, M., Metin-Ozcan, K. 2009. Productivity and growth in an unstable emerging market economy: The case of Turkey, 1960-2004. *Emerging Markets Finance & Trade*, 45, 4-18.
- İmrohoroğlu, A., İmrohoroğlu, S., Üngör, M. 2012. Agricultural productivity and growth in Turkey. <http://www-bcf.usc.edu/~aimrohor/research.htm>
- Karaoglan, D., Okten, C. 2012. Labor force participation of married women in Turkey: Is there an added or a discouraged worker effect? IZA Discussion Paper No. 6616.
- Karras, G. 1994. Government spending and private consumption: Some international evidence. *Journal of Money, Credit and Banking*, 26, 9-22.
- King, R. G., Rebelo, S. T. 1993. Transitional dynamics and economic growth in the Neo-classical model. *American Economic Review*, 83, 908-931.
- Kongsamut, P., Rebelo, S., Xie, D. 2001. Beyond balanced growth. *Review of Economic Studies*, 68, 869-882.
- Koyuncu, M. 2011. Can progressive taxation account for cross-country variation in labor supply? *Journal of Economic Dynamics and Control*, 35, 1474-1488.
- McDaniel, C. 2007. Average tax rates on consumption, investment, labor and capital in the OECD 1950-2003. <http://www.caramcdaniel.com/researchpapers>
- McDaniel, C. 2011. Forces shaping hours worked in the OECD, 1960-2004. *American Economic Journal: Macroeconomics*, 3, 27-52.
- Mendoza, E. G., Razin, A., Tesar, L. L. 1994. Effective tax rates in macroeconomics: Cross-country estimates of tax rates on factor incomes and consumption. *Journal of Monetary Economics*, 34, 297-323.

- Mulligan, C. B. 2002. A century of labor-leisure distortions. NBER Working Paper No. 8774.
- Ngai, L. R., Pissarides, C. A. 2011. Taxes, social subsidies, and the allocation of work time. *American Economic Journal: Macroeconomics*, 3, 1-26.
- OECD. 2001. Tax ratios: A critical survey. OECD Tax Policy Studies, No 5.
- OECD. 2006. OECD Economic Surveys: Turkey, OECD Publishing.
- OECD. 2012a. Taxing Wages 2011, OECD Publishing.
- OECD. 2012b. Labour Force Statistics, OECD Publishing (online access).
- OECD. 2012c. Revenue Statistics-Comparative tables, OECD Publishing (online access).
- Ohanian, L. E., Raffo, A., Rogerson, R. 2008. Long-term changes in labor supply and taxes: Evidence from OECD countries, 1956-2004. *Journal of Monetary Economics*, 55, 1353-1362.
- Ohanian, L. E., Raffo, A. 2012. Aggregate hours worked in OECD countries: New measurement and implications for business cycles. *Journal of Monetary Economics*, 59, 40-56.
- Olovsson, C. 2009. Why do Europeans work so little? *International Economic Review*, 50, 39-61.
- Ozturk, O. D. 2009. Employment effects of minimum wages in inflexible labor markets. MPRA Paper No. 16233, Munich Personal RePEc Archive, Munich.
- Papps, K. L. 2012. The effects of social security taxes and minimum wages on employment: Evidence from Turkey. *Industrial & Labor Relations Review*, 65, 686-707.
- Prescott, E. C. 2004. Why do Americans work so much more than Europeans? *Federal Reserve Bank of Minneapolis Quarterly Review*, 28, 2-13.
- Prescott, E. C., Ohanian, L. E. 2012. Taxes are much higher than you think. *Wall Street Journal*, December 11, 2012.
- Prescott, E. C., Wallenius, J. 2012. Aggregate labor supply. *Federal Reserve Bank of Minneapolis Quarterly Review*, 35, 2-16.
- Ragan, K. S. 2013. Taxes and time use: fiscal policy in a household production model. *American Economic Journal: Macroeconomics*, 5, 168-192.
- Ravn, M. O., Schmitt-Grohé, S., Uribe, M. 2008. Macroeconomics of subsistence points. *Macroeconomic Dynamics*, 12, 136-147.
- Rogerson, R. 2004. Two views on the deterioration of European labor market outcomes. *Journal of the European Economic Association*, 2, 447-455.
- Rogerson, R. 2006. Understanding differences in hours worked. *Review of Economic Dynamics*, 9, 365-409.

- Rogerson, R. 2008. Structural transformation and the deterioration of European labor market outcomes. *Journal of Political Economy*, 116, 235-259.
- Rogerson, R., Shimer, R. 2011. Search in macroeconomic models of the labor market, in: O. Ashenfelter, Card, D. (Eds.), *Handbook of Labor Economics*, Volume 4, Part A, Elsevier, pp. 619-700.
- Shimer, R. 2010. *Labor Markets and Business Cycles*. Princeton University Press, New Jersey.
- Steger, T. M. 2000. Economic growth with subsistence consumption. *Journal of Development Economics*, 62, 343-361.
- Tansel, A. 2002. Economic development and female labor force participation in Turkey: Time-series evidence and cross-province estimates. Middle East Technical University Economic Research Center Working Paper No. 01/05.
- The Conference Board. 2013. Total Economy Database. <http://www.conference-board.org/data/economydatabase/>
- Tiryaki, S. T. 2011. Interest rates and real business cycles in emerging markets. *The B.E. Journal of Macroeconomics*, 11, Article 41.
- T. R. Ministry of Development. 2012. Economic and Social Indicators (1950-2010). http://www.mod.gov.tr/en/SitePages/mod_easi.aspx
- Trabandt, M., Uhlig, H. 2011. The Laffer curve revisited. *Journal of Monetary Economics*, 58, 305-327.
- Turkish Statistical Institute (TURKSTAT). Statistics. <http://www.turkstat.gov.tr>
- Ünlükaplan, İ., Arısoy, İ. 2010. Türkiye ekonomisi için efektif vergi oranlarının hesaplanması. <http://www.tek.org.tr/dosyalar/ARISOY-UNLKAPTAN-E-VERGI.pdf> (in Turkish)
- World Bank. 2008. Turkey country economic memorandum titled sustaining high growth: Selected issues. Worldbank Report No: 39194.
- World Bank. 2009a. Estimating the impact of labor taxes on employment and the balances of the social insurance funds in Turkey. Worldbank Report No: 44056-TR.
- World Bank. 2009b. Female labor force participation in Turkey: Trends, determinants, and policy framework. Worldbank Report No: 48508-TR.
- World Bank. 2012. World Development Indicators Database. <http://databank.worldbank.org/data/home.aspx> (online access).

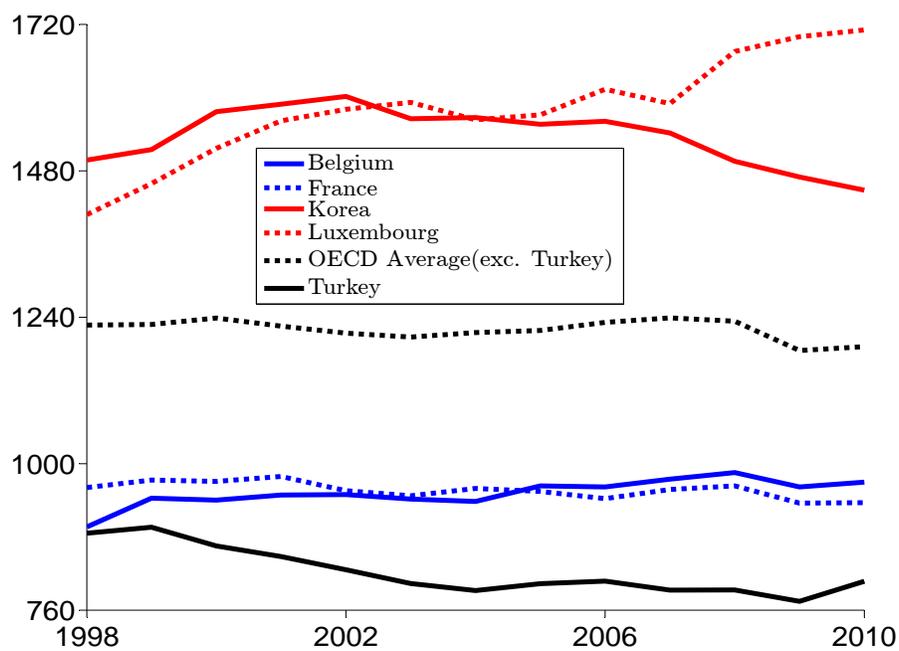


Figure 1: Hours Worked in OECD, 1998-2010



Figure 2: Two Margins of Labor Supply in Turkey, 1998-2011

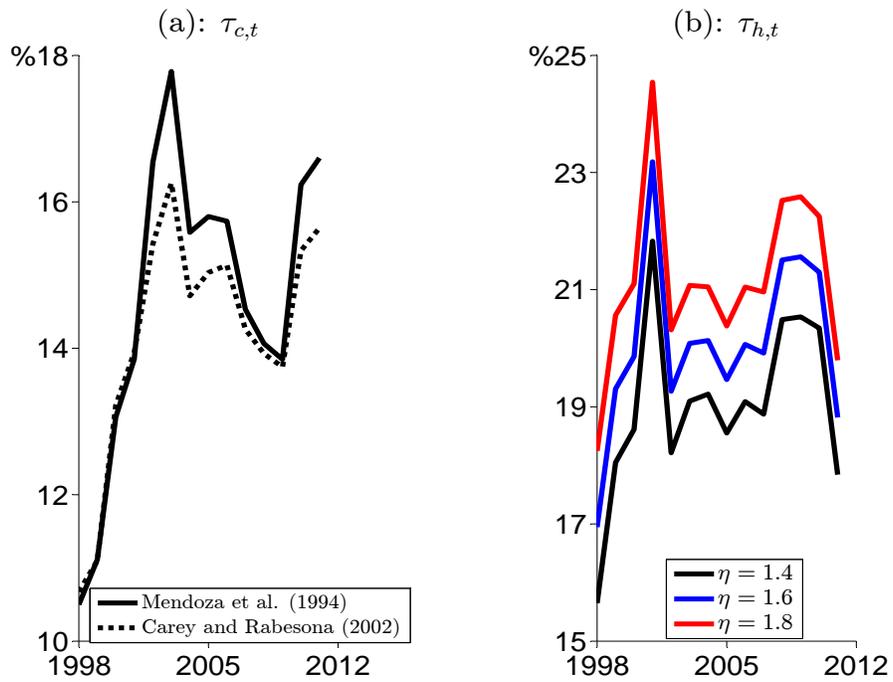


Figure 3: Tax Rates, 1998-2011

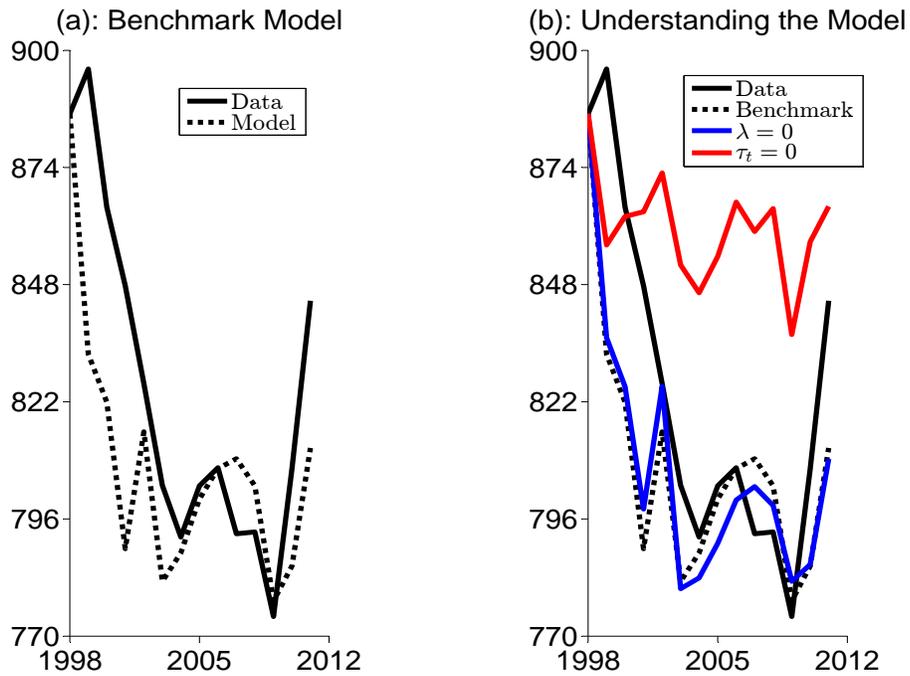


Figure 4: Annual Hours Worked, Model Versus Data

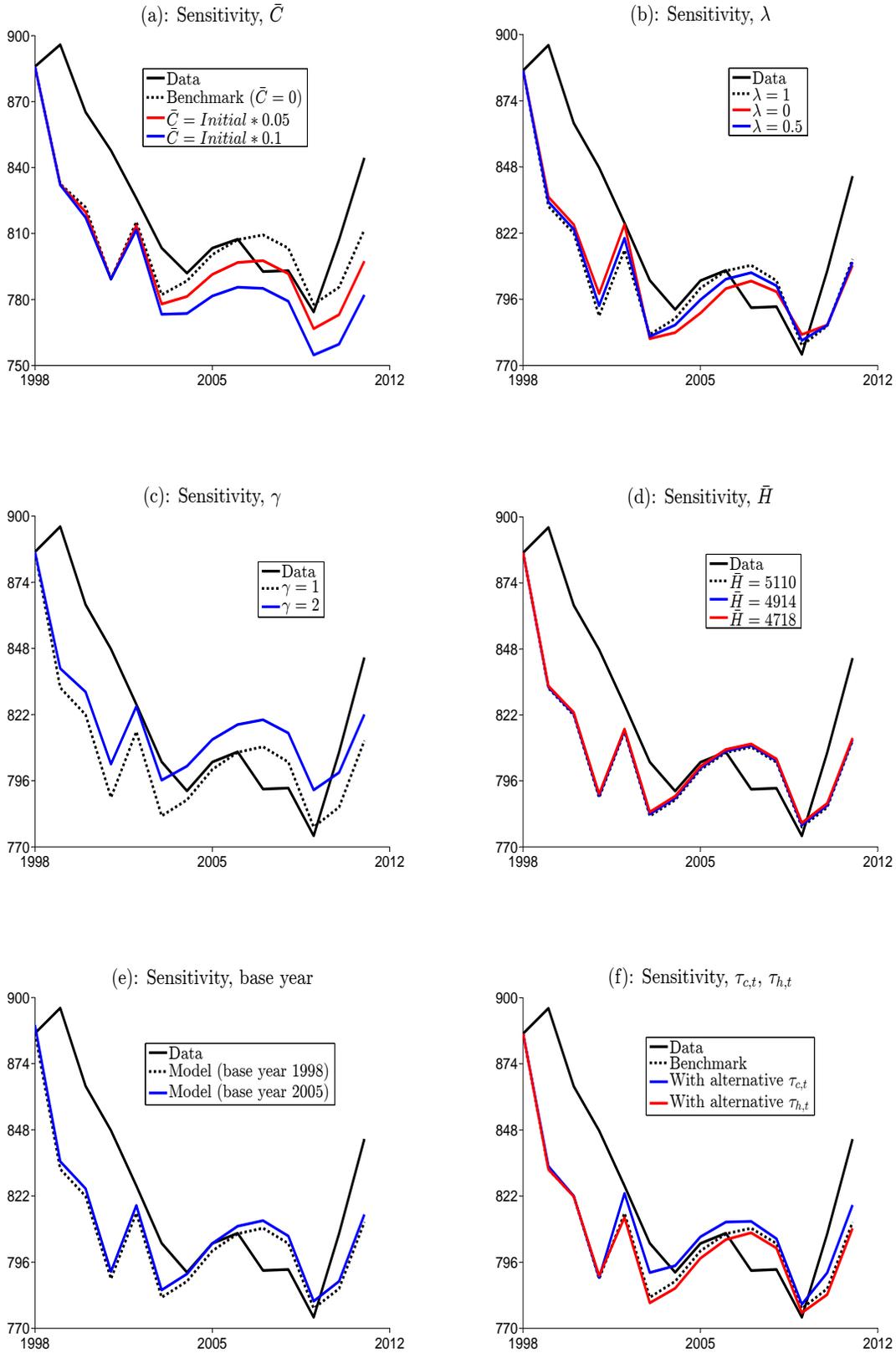


Figure 5: Sensitivity

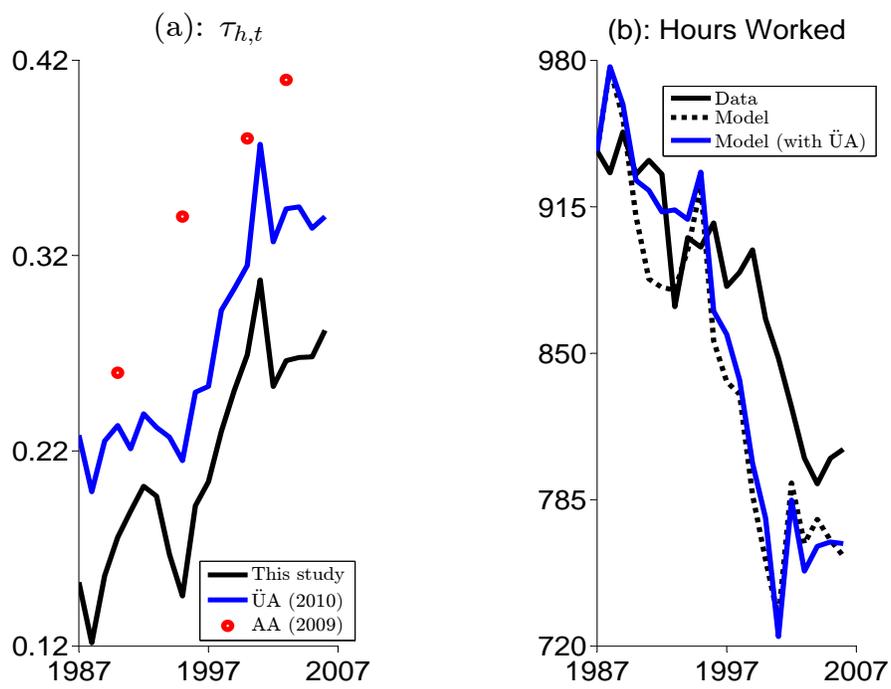


Figure 6: Results for the 1987-2006 Period

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