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# Average effective tax rates on consumption for Turkey: New data and a comparative analysis

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## Abstract

Consumption taxes are the most important source of revenues used to finance public spending in Turkey, where the share of taxes on consumption (general and specific) is more than 40%. This study computes the average effective tax rates on consumption for Turkish economy and provides a glimpse of how Turkey stands in comparison with other OECD countries. We provide new estimates, in a comparative perspective, using national income accounts and tax revenue statistics. Average effective tax rates on consumption increased from around 10.5% in 1998 to around 15.5-16.5% in 2012. Turkey has one of the lowest average effective tax rates on consumption in the OECD and the calculated tax rates are very similar to those for Greece in recent years. We present an exercise and show the importance of time-variant consumption taxes to understand the changes in aggregate labor supply in Turkey. We also note that the revision to the national accounts has effects on the calculated tax rates.


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## 1. Introduction

This study computes the average effective tax rates (AETR) on consumption for Turkish economy and provides a glimpse of how Turkey stands in comparison with other OECD countries. This topic is timely and important for academics and for policy for at least two reasons. First, consumption taxes are the most important source of revenues used to finance public spending in Turkey, where the share of taxes on consumption (general consumption taxes plus specific consumption taxes) is more than 40% (Table 1). Therefore, computing the AETR on consumption in a comparative perspective may provide insightful information for public finance discussions. Second, while there are many detailed studies reporting such series for many OECD countries, data for Turkey are limited. We aim to fill this gap reporting such tax series for Turkey in comparison with other OECD countries.

Today, fiscal issues and sustainability are prominent worries in many advanced countries, since the 2007-09 Recession has led to an unprecedented increase in public debt in many advanced countries. The publicly held debt-to-GDP ratio in the U.S. rose from 36% in 2007 to 68% in 2011 (Chen and İmrohoroğlu, 2013); and in the countries of the European debt crisis (Greece, Ireland, Italy, Portugal, and Spain) gross public debt as a share of GDP rose 30 percentage points during 2008-2011, reaching 105% of GDP by 2011 (Mendoza et al., 2013). Such fiscal issues are not major worries of Turkey, since the total central government debt as percentage of GDP decreased from 74.1% in 2001 to 42.9% in 2010 (OECD).

One particular issue that is very important in fiscal policy discussions in Turkey is the structure of tax revenues. Historically, Turkey has one of the lowest ratios of total tax revenue to GDP in the OECD. The share of tax revenue in GDP was 10.6% in 1965 and 10.7% in 1984. The value added tax (VAT) was introduced in 1985 and the share of tax revenue in GDP increased from 11.5% in 1985 to 26.1% in 2001 and to 27.8% in 2011.[1] In 2011, Denmark had the highest ratio of tax to GDP at 47.7% and Mexico had the lowest ratio at 19.7% in the OECD. When all of the 34 OECD countries are ranked by their average total tax revenue to GDP ratios during 1995-2011; Turkey has the fourth lowest ratio after Mexico, Chile, and Korea (OECD Revenue Statistics). Table 1 presents the tax structure in Turkey. The tax revenue share of consumption (general consumption taxes and specific consumption taxes) increased from 27.5% in 1990 to 43.2% in 2012.[2] This share varies over countries and over time and Turkey has the third highest share in the OECD.[3] The share of specific consumption taxes in total tax revenue increased from 7.3% in 1990 to 22.4% in 2012 in Turkey, whereas the same share decreased from 13.2% in 1990 to 10.7% in 2011 in the OECD.

This study contributes to the literature on the cross-country estimates of the AETR on consumption presenting new estimates for Turkey, using the revised version of the national accounts. We construct the time series for the AETR on consumption following the

[1] Çulha (2012) argues that tax revenues in Turkey are procyclical and are affected from business cycles to a great extent.

[2] Taxes on consumption are mainly of two types: (i) general consumption taxes, which are levied on a broad range of goods and services. These are usually levied in the form of VAT or sales tax; and (ii) taxes on specific goods and services, such as excise duties on items like vehicle fuels, tobacco and alcoholic drinks as well as import duties on goods coming into the country (see Ardic et al. (2010) for an evaluation of indirect taxes in Turkey).

[3] As of 2011, the U.S. had the lowest tax revenue share of consumption (15.3%), whereas Mexico had the highest share (53.3%), Chile had the second highest share (46.4%) and Turkey had the third highest share (43.5%) in the OECD.

methodologies of Mendoza et al. (1994) and Carey and Rabesona (2002). In addition, we compute the related tax series for 27 other OECD countries and discuss how Turkey stands within the OECD. The presented tax rates can be used for several questions in different applied studies. As an illustration, we center on one particular question and quantitatively investigate the importance of time-variant AETR on consumption on the changes in aggregate hours worked studying the intratemporal equilibrium condition of a general equilibrium model.

**Table 1. Turkey: Percentage share of major tax categories in total tax revenue**

| Tax / Year | 1990 | 1995 | 2000 | 2005 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Personal income tax | 26.8 | 21.6 | 22.2 | 14.7 | 14.0 | 13.5 | 14.4 |
| Corporate income tax | 6.7 | 6.7 | 7.3 | 7.1 | 7.3 | 7.5 | 7.4 |
| Social security contributions | 19.7 | 12.1 | 18.7 | 22.4 | 24.9 | 27.9 | 27.2 |
| *Employees* | 7.4 | 4.7 | 6.7 | 7.7 | 9.4 | 10.0 | 10.2 |
| *Employers* | 11.0 | 6.3 | 9.0 | 10.2 | 13.7 | 14.7 | 15.0 |
| *Self-employed or non-employed* | 1.3 | 1.1 | 3.0 | 4.5 | 1.9 | 3.1 | 1.9 |
| Property taxes | 2.3 | 3.0 | 3.2 | 3.3 | 4.1 | 4.1 | 4.2 |
| General consumption taxes | 20.1 | 31.1 | 24.2 | 21.8 | 21.7 | 21.8 | 20.8 |
| Specific consumption taxes | 7.3 | 6.0 | 16.4 | 25.5 | 24.1 | 21.7 | 22.4 |
| Other taxes | 17.2 | 19.5 | 8.0 | 5.0 | 3.9 | 3.6 | 3.6 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: OECD Revenue Statistics-Comparative Tables (online access: December 22, 2013).

The main findings are summarized as follows: (i) the AETR on consumption increased from around 10.5% in 1998 to around 15.5-16.5% in 2012 (Figure 1); (ii) although the tax revenue share of consumption in Turkey is one of the highest among all the OECD countries, the AETR on consumption in Turkey is one of the lowest in the OECD (Tables 2 and A.3); (iii) calculated tax rates for Turkey are very similar to those for Greece in recent years (Figure 2); (iv) the revision to the national accounts in Turkey has effects on the calculated tax rates (Appendix A.3); and (v) the time-variant consumption taxes are important to understand the changes in aggregate labor supply in Turkey (Figure 3).

## 2. Average Effective Tax Rates on Consumption

### 2.1. A Brief Literature Review

Applied dynamic general equilibrium (ADGE) models have become the tools in modern macroeconomics and policy work. Fiscal policy issues, among many other cases, have been analyzed in such models, since fiscal policy may affect macroeconomic stability and income distribution. One particular research area is the macroeconomic effects of distortionary taxation, i.e., a quantitative assessment of aggregate macroeconomic variables associated with government policies involving different combinations of taxes on capital and labor income, and consumption (Cooley and Hansen, 1992; McGrattan, 1994; Ljungqvist and Sargent, 2004, Ch. 11).

One particular concern for calibrating/estimating such models is measurement for taxes, such as taxes on capital and labor income, and consumption. Mendoza et al. (1994) propose methods for estimating such taxes. Their methods yield estimates of effective tax rates on factor incomes and consumption consistent with the tax distortions faced by a representative agent in ADGE models. Their formulas are the most well-known measures of the effective

tax rates on factor incomes and consumption, since they do not rely on data from individual tax returns or taxes paid by income bracket. Specifically, Mendoza et al. (1994) use two main sources: the OECD Revenue Statistics and the National Accounts.[4] Mendoza et al. (1994) compute time series of AETR on capital, labour and consumption for G7 countries between 1965 and 1988.[5] Mendoza et al. (1997) provide an update for the G7 by adding 3 years and 11 countries. Carey and Tchilinguirian (2000) update the Mendoza et al. (1994) estimates and extend coverage from G7 countries to most OECD countries and present new estimates based on modifications to the methodology. OECD (2001) reviews the methods of Mendoza et al. (1994) with alternative comparisons, and calculates tax ratios between 1965 and 1996, for as many OECD countries as possible, to compare the results with those reported by Mendoza et al. (1997). Following OECD (2001), Volkerink et al. (2002) criticize Mendoza et al. (1994) in calculating labour and capital income tax ratios. Carey and Rabesona (2002), in line with OECD (2001), provide a detailed discussion of the Mendoza et al. (1994) methods and propose modifications. Recently, Trabandt and Uhlig (2011), following Mendoza et al. (1994), report new data from 1995 to 2007 for the U.S. and 14 of the EU-15 countries (excluding Luxembourg). Trabandt and Uhlig (2012) provide an update by including the additional years 2008-2010 and by refining the methodology to calculate effective tax rates on labor and capital income.

As stated above, the estimates of AETR on consumption and factor incomes are available for many OECD countries. On the other hand, for some OECD countries, time series data of the AETR on labor and capital income are very limited due to the lack of data on national income accounts. Turkey is such a country. For example, OECD studies do not report the AETR on labor and capital income for Turkey (see, for example, Carey and Tchilinguirian, 2000, Table 1). In this study, taxes on factor income are not our concern.[6] To the best of our knowledge, there are some estimates for the AETR on consumption for Turkey. Carey and Tchilinguirian (2000) report averages of 1980-85, 1986-90, and 1991-97. Ünlükaplan and Arısoy (2010, 2011) report time series between 1980 and 2006. Çiçek and Elgin (2001) mention such estimates for the period of 1968-2004. These studies use the previous version of the national accounts. Recently, Üngör (2013) calculates the time series of the AETR on consumption during 1998-2011, based on the revised national accounts.

Our study presents the new estimates of the AETR on consumption during 1998-2012. In addition, and importantly, we provide a comparison with 27 other OECD countries to understand the relative position of Turkey regarding this measure. We also present calculations for the period of 1987-2006 using the previous national accounts and discuss the effects of the revisions on the AETR on consumption in Turkey.

[4] McDaniel (2007) develops a method for calculating average tax rates on consumption and investment expenditures and labor and capital income using national accounts only (without using information from the OECD Revenue Statistics); and constructs the tax rates for 15 OECD countries during 1950-2003. The data set is available at: http://www.caramcdaniel.com/

[5] The updated estimates are available at: http://www.sas.upenn.edu/~egme/pp/newtaxdata.pdf

[6] The lack of detailed data on operating surplus of private unincorporated enterprises, household property and entrepreneurial income or household gross operating system surplus and mixed income is a major problem. Ünlükaplan and Arısoy (2010, 2011) report taxes on factor incomes during 1980-2006 without explaining how they overcome the data problems. See Adamopoulos and Akyol (2009) and Üngör (2013) for a discussion of the calculation of AETR on labor income for Turkey.

### 2.2 Methodology à la Mendoza et al. (1994) and Carey and Rabesona (2002)

First, we construct the time series for the AETR on consumption following Mendoza et al. (1994). The following formula provides the calculation of the AETR on consumption à la Mendoza et al. (1994):

$$\tau_c^{MRT} = (5110 + 5121)/(C + G - GW - 5110 - 5121). \quad (1)$$

Specifically, $\tau_c^{MRT}$ is calculated as the sum of general taxes on goods and services (code 5110) and excise taxes (code 5121) divided by the sum of private final consumption expenditures (*C*) and government non-wage consumption expenditures (*G*-*GW*) net of these indirect taxes. Data and the definitions are in Appendix A.1. Second, we consider the method of Carey and Rabesona (2002). They argue that Mendoza et al. (1994) exclude customs and import duties on the grounds that they were not significant in G7 countries but noted that these duties should be taken into account for other countries and suggest the following formula for the AETR on consumption:

$$\tau_c^{CR} = (5110 + 5121 + 5122 + 5123 + 5126 + 5128 + 5200 - 5212)/(C + G - GW). \quad (2)$$

The new codes denote the taxes on profits of fiscal monopolies (code 5122), customs and import duties (code 5123), taxes on specific services (code 5126), other taxes on specific goods and services (code 5128) and taxes on the use of goods and performance activities (code 5200) except motor vehicle charges paid by others (code 5212). They also express the consumption tax base in gross terms (including indirect taxes).

### 2.3 Tax Series for the 1998-2012 Period and a Comparison within the OECD

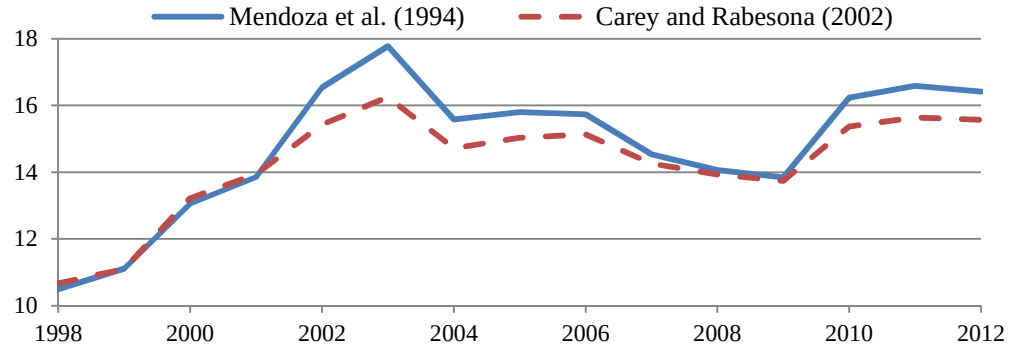
Figure 1 plots the time series of the AETR on consumption in Turkey based on the two formulas above during 1998-2012 (see Table A.3 for the reported series). We observe that the two methodologies yield very similar observations and the simple correlation is 0.99. The sample period average is 14.8% à la Mendoza et al. (1994) method and 14.3% à la Carey and Rabesona (2002) method. Figure 1 shows that the AETR on consumption increased from around 10.5% in 1998 to around 15.5-16.5% in 2012. Both series peak in 2003. This particularly reflects the effect of Special Consumption Tax (SCT). In order to simplify the indirect tax system and to align it EU rules, a unified SCT was introduced in August 2002, replacing 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.[7]

We need a comparative perspective to develop a better understanding of the AETR on consumption in Turkey. For this purpose, we calculate the AETR on consumption for 27 other OECD countries: the EU countries (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, and the U.K.), Canada, Iceland, Japan, Norway, Switzerland and the U.S. (see Table A.3). Due to the data limitations, we do not present data for all 34 OECD members. However, we believe that our analysis with 28 countries (including Turkey) provides a general picture of the AETR on

[7] Atuk et al. (2011) study the indirect taxes on tobacco products along with the implications on final consumer prices.

consumption among the OECD countries. We calculate the country averages of 1998-2012 and rank the countries by their tax rates in Table 2.

**Figure 1. AETR on consumption (%), Turkey: 1998-2012**




Source: OECD Revenue Statistics; TURKSTAT.

Among the 28 countries reported, the U.S. has the lowest and Denmark has the highest AETR on consumption during 1998-2012 (sample period averages). Consumption tax ratios are well below the OECD average in the U.S., Japan, and Switzerland and higher in the Nordic countries. 11 countries' tax rates lie between 15-20% on average during 1998-2012. Panel (a) in Figure 2 shows the relative position of Turkey in comparison with the U.S. and Denmark in terms of the AETR on consumption. Turkey ranks similar to the three Southern European countries: Greece, Italy and Spain. Panel (b) displays that AETR on consumption are very similar for Turkey and Greece in recent years: for 2010, it is 16.2% in each country. In 2011, the corresponding figures are 16.6% for Turkey and 16.7% for Greece.

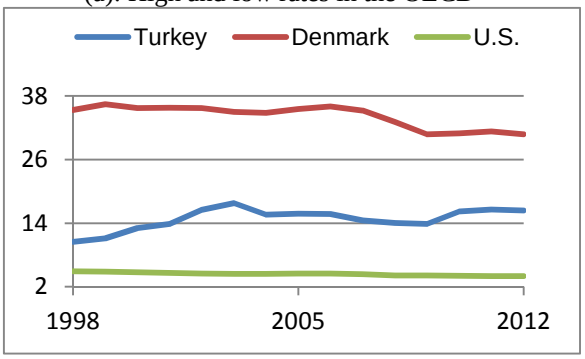
**Table 2. AETR on consumption in the OECD, 1998-2012 averages**

| **Panel (a): à la Mendoza et al. (1994)** | | **Panel (b): à la Carey and Rabesona (2002)** | |
|---|---|---|---|
| *Tax* | *Country* | *Tax* | *Country* |
| $\tau \in (0, 0.05)$ | U.S. | $\tau \in (0, 0.05)$ | - |
| $\tau \in (0.05, 0.1)$ | Japan, Switzerland | $\tau \in (0.05, 0.1)$ | U.S., Japan, Switzerland |
| $\tau \in (0.1, 0.15)$ | Canada, Spain, Italy, Turkey | $\tau \in (0.1, 0.15)$ | Canada, Spain, Turkey, U.K., Greece |
| $\tau \in (0.15, 0.2)$ | U.K, Greece, Germany, Belgium, Slovak, France, Czech, Portugal, Poland, Netherlands, Austria | $\tau \in (0.15, 0.2)$ | Germany, Italy, Slovak, France, Czech, Belgium, Poland, Portugal, Netherlands, Austria, Ireland |
| $\tau \in (0.2, 0.25)$ | Ireland, Estonia, Slovenia, Iceland | $\tau \in (0.2, 0.25)$ | Estonia, Sweden, Slovenia, Finland, Iceland, Luxembourg, Hungary, Norway |
| $\tau \in (0.25, 0.3)$ | Sweden, Finland, Hungary, Norway, Luxembourg | $\tau \in (0.25, 0.3)$ | Denmark |
| $\tau \in (0.3, 0.35)$ | Denmark | | - |

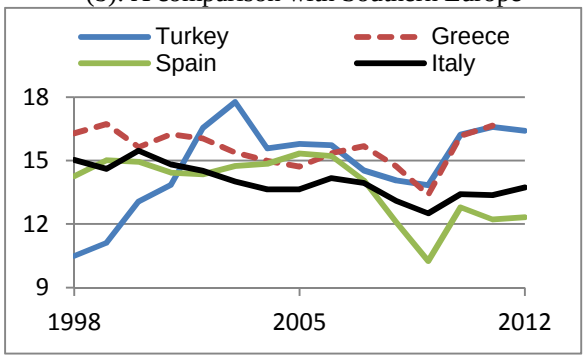
Source: Appendix A.1-A.2. Countries are ranked by their AETR on consumption.

**Figure 2. AETR on consumption (%): Cross-country comparisons, 1998-2012**

(a): High and low rates in the OECD




(b): A comparison with Southern Europe




Source: Appendix A.1-A.2. The series in Figure 2 are based on Mendoza et al. (1994) method.

## 3. A Quantitative Exercise

We focus on a specific exercise and investigate the role of consumption taxes on aggregate labor supply, since 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) in the OECD (Üngör, 2013). Ohanian et al. (2008) study the intra-temporal first-order condition from the neoclassical growth model, augmented with taxes on labor income and consumption expenditures for 21 OECD countries (without Turkey) during 1956-2004 and show the importance of the tax rates to account for changes in hours. Üngör (2013) follows that study and shows that time-varying taxes on consumption and labor income play significant roles in explaining the hours worked in Turkey during 1998-2011. In the exercise below, we only focus on the effects of the consumption tax on the aggregate labor supply for Turkey during 1998-2012. Economic environment follows Ohanian et al. (2008) and Üngör (2013).

### 3.1 Economic Environment

The economy consists of a representative household with utility defined over streams of private consumption ($C_t$), government consumption ($G_t$), and leisure time ($\bar{H} - H_t$):

$$\sum_{t=0}^{\infty} \beta^t \, U(C_t + \lambda G_t, \bar{H} - H_t), \qquad 0 < \beta < 1. \tag{3}$$

The utility function is specified as:

$$U(.) = \alpha log(C_t + \lambda G_t - \bar{C}) + (1-\alpha)\frac{(\bar{H} - H_t)^{1-\gamma} - 1}{1-\gamma}, \gamma \geq 0, 0 \leq \alpha \leq 1, 0 \leq \lambda \leq 1, \bar{C} \geq 0. \tag{4}$$

$\bar{H}$ denotes the number of hours available for work; $\lambda$ measures how households value government consumption, $\bar{C}$ is the subsistence consumption term, and $\gamma$ governs the elasticity of substitution between leisure and consumption. Technology is given by:

$$Y_t = A_t K_t^{\theta} H_t^{1-\theta}, \quad 0 < \theta < 1. \tag{5}$$

$A_t$ is efficiency; $K_t$ and $H_t$ are capital and labor. Output is divided between consumption and investment and capital depreciates at rate $\delta$. The government levies proportional taxes on consumption, $\tau_{c,t}$ and it uses its revenues to finance lump-sum transfer $T_t$.

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. Equating the household's first-order condition for labor supply and the firm's first-order condition for labor demand yields, given our functional forms, the equilibrium hours condition:

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

Given parameter values, its predictive accuracy can be tested by using time series data on taxes, aggregate output and consumption to generate model predicted $H_t$.

## 3.2 Calibration and Results

Since $\alpha$ and $\theta$ enter the right-hand side of (6) as a constant of proportionality, then the values of them are irrelevant for changes in hours relative to a base year. We choose the value of $\alpha(1-\theta)/(1-\alpha)$ so that the model hours are equal to the data for a base year. Our sample period is from 1998 to 2012. We choose 1998 as the base year and that means that the model-predicted hours are equal to the data in 1998. Data details are given in Appendix A.1. The value of $\bar{H}$ is set to 5110 (=14*365). In our benchmark, preferences are logarithmic in consumption and leisure, i.e., the limiting case as $\gamma$ tends to one. Government consumption is a perfect substitute for private consumption: $\lambda = 1$ and $\bar{C} = 0$ so that benchmark results are obtained without the subsistence consumption.[8]

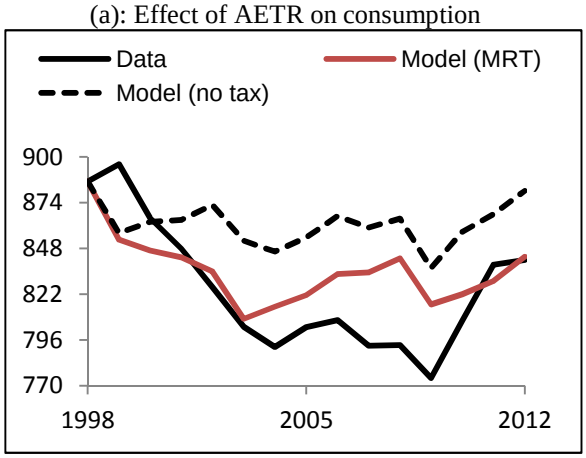
Panel (a) in Figure 3 compares the model hours to actual hours during 1998-2012. Recall that, in the data, $H_t$ denotes hours worked per working-age person and it is the product of total employment and annual hours per worker, divided by the size of the working-age population. The solid black line shows the data and the model results without taxes ($\tau_{c,t} = 0, \forall\, t$) are plotted as a dashed line. The model without consumption taxes over-predicts the hours worked by 4.96% on average during 1999-2012. The model results with taxes are plotted as a solid red line. Here we use the taxes based on the Mendoza et al. (1994) method. The difference between the dashed black line and the red line shows the gap explained by the inclusion of the consumption tax to the model. The model with consumption tax over-predicts the hours worked by only 1.46% on average during 1999-2012 and the presence of the consumption taxes significantly improves the model's performance.[9]

[8] We do not provide the full discussion regarding the model and the calibration; and we do not report the exercises for robustness and sensitivity for the sake of saving place. All the details are available in Üngör (2013).

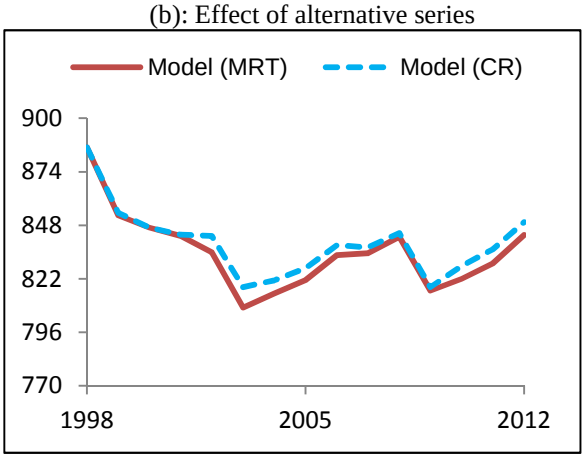
[9] Many other variables (such as tax on labor income) that are not present in the analysis may explain the remaining gap that cannot be explained by the model with the consumption taxes (see Üngör, 2013). Here we do not analyze how additional factors might account for these discrepancies between theory and data, since our aim is solely to present the effects of the consumption taxes.

**Figure 3. Annual hours worked in Turkey: Model versus data, 1998-2012**

(a): Effect of AETR on consumption




(b): Effect of alternative series




Source: Appendix A.1.

Panel (b) in Figure 3 compares the model results with alternative tax rates. In Panel (a), we use the tax rates à la Mendoza et al. (1994) method. We repeat our calculations using the tax rates à la Carey and Rabesona (2002) method and observe that the model predictions are very similar. As stated above, we have presented a particular quantitative exercise to show the effects of the AETR on consumption on a particular macroeconomic variable. We note that different research questions can be studied using the AETR on consumption data.

## 4. Concluding Remarks

There has been a renewed interest in the macroeconomic effects of fiscal policy after the recent global financial crisis. We study one particular aspect of the related subject for Turkey, which is the calculation of the AETR on consumption. Our calculations provide comparable tax rates across countries and complement the related studies with new estimates of the AETR on consumption. We report our estimates and expect them to be used by researchers studying different applied models for Turkey in a comparative perspective. In addition, we report the time series for the AETR on consumption for 27 other OECD countries during 1998-2012, updating the cross-country studies with new estimates of these series. There is a lot of work still to be done for future research. In particular, careful calculations are needed for tax rates on factor incomes to complement our calculations for consumption tax rates. There are certain data problems and challenges to estimate the AETR for capital and labor income for Turkey (and for many developing countries), since it is necessary to calculate the AETR on total household income in order to calculate the AETR on labor or on capital income. It is difficult to measure household income (and the related factor income shares) in developing countries because of the data problems for operating surplus of the unincorporated sector, property income, and self-employment income.

# Appendix A

## A.1. Data Sources and Explanations

**Section 1:** The four-digit codes listed below explain the different categories of tax revenue (used in Table 1). Note that 2012 estimates are provisional.

**Table A.1. Variables used in Table 1**

| *Tax* | *Code* | *Explanation* |
|---|---|---|
| Personal income tax | 1100 | Taxes on income, profits, and capital gains of individuals |
| Corporate income tax | 1200 | Taxes on income, profits, and capital gains of corporations |
| Social security contributions | 2000 | Social security contributions |
| *Employees* | 2100 | Social security contributions of employees |
| *Employers* | 2200 | Social security contributions of employers |
| *Self-employed or non-employed* | 2300 | Social security contributions of self-employed or non-employed |
| Property taxes | 4000 | Taxes on property |
| General consumption taxes | 5110 | General taxes |
| Specific consumption taxes | 5120 | Taxes on specific goods and services |
| Other taxes | 5200 plus 6000 | Taxes on use of goods and perform activities plus other taxes |

Source: OECD Revenue Statistics.

**Section 2: Tax Revenues:** The OECD collects data on tax revenue for member countries. Note that 2012 estimates are provisional.

**Table A.2. Tax revenues used in calculations**

| *Code* | *Explanation* | *Code* | *Explanation* |
|---|---|---|---|
| 5110 | General taxes | 5126 | Taxes on specific services |
| 5121 | Excise taxes | 5128 | Other taxes |
| 5122 | Profits of fiscal monopolies | 5200 | Taxes on use of goods and perform activities |
| 5123 | Customs and import duties | 5212 | Paid by others: motor vehicles |

Source: OECD Revenue Statistics.

**National accounts for the OECD countries:** We use the AMECO database of the European Commission for the national accounts of the OECD countries.[10] We use the following series from this database: (i) Private final consumption expenditure at current prices (UCPH); (ii) Final consumption expenditure of general government at current prices (UCTG); (iii) Compensation of employees: general government:- ESA 1995 (UWCG).

**National accounts for Turkey:** TurkStat, Expenditure on the GDP (at current prices).

**Section 3:** 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). 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 and from the "Labour Force Status By Non-Institutional Population, Years And Sex" tables by TurkStat. We use the OECD series of average annual hours actually worked per person in total employment.

[10] http://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm

## A.2. Cross-Country Comparisons

**Table A.3. AETR on consumption for 28 OECD countries**

Panel (a): à la Mendoza et al. (1994) method

| Year | AUT | BEL | CAN | CZK | DNK | EST | FIN | FRA | DEU | GRC | HUN | ISL | IRE | ITA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1998 | 0.208 | 0.169 | 0.123 | 0.160 | 0.354 | 0.207 | 0.285 | 0.194 | 0.153 | 0.163 | 0.263 | 0.262 | 0.262 | 0.150 |
| 1999 | 0.214 | 0.178 | 0.123 | 0.173 | 0.364 | 0.194 | 0.289 | 0.196 | 0.162 | 0.167 | 0.271 | 0.277 | 0.265 | 0.146 |
| 2000 | 0.205 | 0.177 | 0.123 | 0.167 | 0.357 | 0.216 | 0.280 | 0.186 | 0.163 | 0.156 | 0.280 | 0.254 | 0.256 | 0.155 |
| 2001 | 0.201 | 0.166 | 0.120 | 0.167 | 0.358 | 0.216 | 0.267 | 0.179 | 0.159 | 0.162 | 0.264 | 0.230 | 0.224 | 0.148 |
| 2002 | 0.206 | 0.171 | 0.122 | 0.162 | 0.357 | 0.218 | 0.267 | 0.179 | 0.158 | 0.161 | 0.251 | 0.238 | 0.238 | 0.145 |
| 2003 | 0.200 | 0.169 | 0.122 | 0.165 | 0.350 | 0.213 | 0.271 | 0.175 | 0.159 | 0.154 | 0.257 | 0.242 | 0.235 | 0.140 |
| 2004 | 0.201 | 0.177 | 0.121 | 0.192 | 0.348 | 0.215 | 0.262 | 0.176 | 0.155 | 0.150 | 0.287 | 0.261 | 0.253 | 0.136 |
| 2005 | 0.198 | 0.181 | 0.119 | 0.198 | 0.356 | 0.245 | 0.261 | 0.176 | 0.153 | 0.147 | 0.277 | 0.277 | 0.263 | 0.136 |
| 2006 | 0.190 | 0.182 | 0.113 | 0.192 | 0.360 | 0.251 | 0.257 | 0.175 | 0.155 | 0.153 | 0.268 | 0.287 | 0.262 | 0.142 |
| 2007 | 0.195 | 0.177 | 0.107 | 0.199 | 0.353 | 0.256 | 0.247 | 0.172 | 0.170 | 0.157 | 0.284 | 0.265 | 0.246 | 0.139 |
| 2008 | 0.195 | 0.167 | 0.098 | 0.202 | 0.331 | 0.218 | 0.238 | 0.167 | 0.169 | 0.147 | 0.279 | 0.228 | 0.214 | 0.131 |
| 2009 | 0.192 | 0.163 | 0.095 | 0.196 | 0.308 | 0.279 | 0.228 | 0.159 | 0.168 | 0.134 | 0.295 | 0.206 | 0.195 | 0.125 |
| 2010 | 0.191 | 0.168 | 0.097 | 0.197 | 0.309 | 0.272 | 0.225 | 0.160 | 0.165 | 0.162 | 0.298 | 0.213 | 0.191 | 0.134 |
| 2011 | 0.191 | 0.166 | na | 0.207 | 0.313 | 0.281 | 0.243 | 0.162 | 0.166 | 0.167 | 0.292 | 0.216 | 0.188 | 0.134 |
| 2012 | 0.192 | 0.166 | na | 0.213 | 0.308 | 0.284 | 0.242 | 0.163 | 0.164 | na | 0.324 | 0.217 | 0.127 | 0.137 |

| Year | JPN | LUX | NLD | NOR | POL | PRT | SVK | SVN | ESP | SWE | CHE | TUR | UK | US |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1998 | 0.071 | 0.243 | 0.187 | 0.316 | 0.180 | 0.205 | 0.181 | 0.225 | 0.143 | 0.255 | 0.083 | 0.105 | 0.164 | 0.049 |
| 1999 | 0.072 | 0.258 | 0.195 | 0.329 | 0.192 | 0.205 | 0.172 | 0.238 | 0.150 | 0.250 | 0.090 | 0.111 | 0.165 | 0.049 |
| 2000 | 0.069 | 0.272 | 0.193 | 0.320 | 0.174 | 0.194 | 0.174 | 0.227 | 0.149 | 0.247 | 0.093 | 0.131 | 0.161 | 0.047 |
| 2001 | 0.068 | 0.255 | 0.199 | 0.305 | 0.170 | 0.194 | 0.167 | 0.227 | 0.144 | 0.251 | 0.092 | 0.139 | 0.156 | 0.046 |
| 2002 | 0.067 | 0.258 | 0.191 | 0.289 | 0.177 | 0.201 | 0.169 | 0.238 | 0.144 | 0.251 | 0.089 | 0.165 | 0.154 | 0.045 |
| 2003 | 0.067 | 0.283 | 0.192 | 0.273 | 0.181 | 0.200 | 0.183 | 0.236 | 0.148 | 0.252 | 0.090 | 0.178 | 0.155 | 0.045 |
| 2004 | 0.068 | 0.310 | 0.198 | 0.278 | 0.183 | 0.196 | 0.193 | 0.241 | 0.149 | 0.253 | 0.091 | 0.156 | 0.155 | 0.044 |
| 2005 | 0.069 | 0.315 | 0.207 | 0.285 | 0.197 | 0.204 | 0.202 | 0.243 | 0.153 | 0.257 | 0.091 | 0.158 | 0.148 | 0.045 |
| 2006 | 0.068 | 0.308 | 0.205 | 0.299 | 0.204 | 0.206 | 0.177 | 0.246 | 0.152 | 0.258 | 0.092 | 0.157 | 0.146 | 0.045 |
| 2007 | 0.067 | 0.313 | 0.205 | 0.305 | 0.219 | 0.196 | 0.182 | 0.251 | 0.141 | 0.261 | 0.089 | 0.145 | 0.144 | 0.044 |
| 2008 | 0.064 | 0.323 | 0.202 | 0.278 | 0.213 | 0.184 | 0.165 | 0.252 | 0.121 | 0.262 | 0.092 | 0.141 | 0.140 | 0.042 |
| 2009 | 0.064 | 0.316 | 0.186 | 0.267 | 0.190 | 0.160 | 0.150 | 0.242 | 0.102 | 0.256 | 0.087 | 0.138 | 0.130 | 0.041 |
| 2010 | 0.065 | 0.311 | 0.194 | 0.272 | 0.203 | 0.173 | 0.153 | 0.255 | 0.128 | 0.261 | 0.089 | 0.162 | 0.144 | 0.041 |
| 2011 | 0.065 | 0.324 | 0.186 | 0.272 | 0.210 | 0.181 | 0.166 | 0.238 | 0.122 | 0.252 | 0.091 | 0.166 | 0.157 | 0.040 |
| 2012 | na | 0.348 | na | 0.274 | na | 0.182 | 0.149 | 0.247 | 0.123 | 0.243 | 0.086 | 0.164 | 0.154 | 0.040 |

Panel (b): à la Carey and Rabesona (2002) method

| Year | AUT | BEL | CAN | CZK | DNK | EST | FIN | FRA | DEU | GRC | HUN | ISL | IRE | ITA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1998 | 0.194 | 0.167 | 0.138 | 0.157 | 0.273 | 0.178 | 0.240 | 0.180 | 0.145 | 0.148 | 0.236 | 0.240 | 0.216 | 0.160 |
| 1999 | 0.198 | 0.176 | 0.137 | 0.164 | 0.280 | 0.169 | 0.242 | 0.182 | 0.151 | 0.152 | 0.239 | 0.249 | 0.219 | 0.164 |
| 2000 | 0.193 | 0.173 | 0.138 | 0.160 | 0.277 | 0.185 | 0.237 | 0.173 | 0.151 | 0.145 | 0.243 | 0.236 | 0.212 | 0.164 |
| 2001 | 0.190 | 0.166 | 0.135 | 0.157 | 0.278 | 0.186 | 0.228 | 0.167 | 0.149 | 0.153 | 0.230 | 0.219 | 0.191 | 0.158 |
| 2002 | 0.194 | 0.168 | 0.137 | 0.155 | 0.278 | 0.188 | 0.228 | 0.167 | 0.148 | 0.150 | 0.220 | 0.223 | 0.199 | 0.157 |
| 2003 | 0.190 | 0.167 | 0.137 | 0.157 | 0.274 | 0.184 | 0.231 | 0.164 | 0.149 | 0.144 | 0.223 | 0.225 | 0.198 | 0.150 |
| 2004 | 0.189 | 0.173 | 0.136 | 0.173 | 0.273 | 0.185 | 0.226 | 0.165 | 0.146 | 0.141 | 0.236 | 0.241 | 0.209 | 0.152 |
| 2005 | 0.186 | 0.175 | 0.134 | 0.176 | 0.279 | 0.205 | 0.225 | 0.165 | 0.145 | 0.139 | 0.228 | 0.250 | 0.215 | 0.150 |
| 2006 | 0.181 | 0.177 | 0.130 | 0.171 | 0.280 | 0.210 | 0.222 | 0.163 | 0.146 | 0.145 | 0.222 | 0.261 | 0.215 | 0.155 |
| 2007 | 0.184 | 0.174 | 0.125 | 0.176 | 0.276 | 0.214 | 0.215 | 0.161 | 0.157 | 0.148 | 0.234 | 0.246 | 0.204 | 0.154 |
| 2008 | 0.184 | 0.167 | 0.117 | 0.177 | 0.264 | 0.189 | 0.209 | 0.157 | 0.157 | 0.141 | 0.232 | 0.213 | 0.183 | 0.147 |
| 2009 | 0.183 | 0.163 | 0.113 | 0.172 | 0.249 | 0.228 | 0.203 | 0.152 | 0.156 | 0.133 | 0.242 | 0.192 | 0.171 | 0.143 |
| 2010 | 0.181 | 0.167 | 0.114 | 0.173 | 0.250 | 0.223 | 0.200 | 0.153 | 0.153 | 0.153 | 0.254 | 0.198 | 0.169 | 0.149 |
| 2011 | 0.181 | 0.166 | na | 0.180 | 0.252 | 0.228 | 0.212 | 0.157 | 0.155 | 0.157 | 0.251 | 0.199 | 0.166 | 0.149 |
| 2012 | 0.182 | 0.171 | na | 0.184 | 0.247 | 0.229 | 0.212 | 0.158 | 0.153 | na | 0.271 | 0.201 | 0.125 | 0.152 |

| Year | JPN | LUX | NLD | NOR | POL | PRT | SVK | SVN | ESP | SWE | CHE | TUR | UK | US |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1998 | 0.079 | 0.201 | 0.177 | 0.263 | 0.176 | 0.184 | 0.183 | 0.221 | 0.147 | 0.209 | 0.088 | 0.107 | 0.156 | 0.066 |
| 1999 | 0.079 | 0.211 | 0.183 | 0.269 | 0.181 | 0.185 | 0.178 | 0.227 | 0.153 | 0.205 | 0.094 | 0.111 | 0.157 | 0.065 |
| 2000 | 0.077 | 0.219 | 0.181 | 0.269 | 0.165 | 0.176 | 0.178 | 0.215 | 0.152 | 0.209 | 0.099 | 0.132 | 0.152 | 0.063 |
| 2001 | 0.075 | 0.208 | 0.184 | 0.258 | 0.151 | 0.178 | 0.157 | 0.211 | 0.148 | 0.209 | 0.096 | 0.139 | 0.149 | 0.061 |
| 2002 | 0.074 | 0.211 | 0.178 | 0.247 | 0.164 | 0.183 | 0.159 | 0.218 | 0.147 | 0.209 | 0.094 | 0.154 | 0.148 | 0.061 |
| 2003 | 0.074 | 0.227 | 0.180 | 0.235 | 0.166 | 0.182 | 0.169 | 0.220 | 0.148 | 0.210 | 0.095 | 0.163 | 0.148 | 0.061 |
| 2004 | 0.075 | 0.243 | 0.185 | 0.237 | 0.165 | 0.179 | 0.174 | 0.219 | 0.149 | 0.211 | 0.096 | 0.147 | 0.147 | 0.061 |
| 2005 | 0.076 | 0.245 | 0.192 | 0.240 | 0.178 | 0.185 | 0.178 | 0.219 | 0.153 | 0.214 | 0.096 | 0.150 | 0.142 | 0.063 |
| 2006 | 0.075 | 0.241 | 0.190 | 0.248 | 0.187 | 0.187 | 0.160 | 0.219 | 0.152 | 0.214 | 0.097 | 0.151 | 0.140 | 0.062 |
| 2007 | 0.074 | 0.245 | 0.190 | 0.253 | 0.190 | 0.180 | 0.164 | 0.221 | 0.142 | 0.217 | 0.095 | 0.143 | 0.139 | 0.061 |
| 2008 | 0.071 | 0.251 | 0.189 | 0.235 | 0.186 | 0.172 | 0.151 | 0.220 | 0.123 | 0.217 | 0.099 | 0.139 | 0.136 | 0.059 |
| 2009 | 0.070 | 0.248 | 0.178 | 0.226 | 0.169 | 0.154 | 0.139 | 0.214 | 0.107 | 0.214 | 0.096 | 0.137 | 0.128 | 0.056 |
| 2010 | 0.070 | 0.244 | 0.184 | 0.229 | 0.178 | 0.163 | 0.142 | 0.222 | 0.127 | 0.217 | 0.098 | 0.154 | 0.139 | 0.057 |
| 2011 | 0.071 | 0.251 | 0.179 | 0.229 | 0.183 | 0.171 | 0.151 | 0.211 | 0.122 | 0.211 | 0.099 | 0.156 | 0.150 | 0.058 |
| 2012 | na | 0.264 | na | 0.230 | na | 0.170 | 0.138 | 0.217 | 0.126 | 0.206 | 0.094 | 0.156 | 0.148 | 0.058 |

Source: Appendix A.1. Note that 2012 estimations are provisional. Country codes: Austria (AUT), Belgium (BEL), Canada (CAN), Czech Republic (CZK), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Iceland (ISL), Ireland (IRE), Italy (ITA), Japan (JPN), Luxembourg (LUX), Netherlands (NLD), Norway (NOR), Poland (POL), Portugal (PRT), Slovak Republic (SVK), Slovenia (SVN), Spain (ESP), Sweden (SWE), Switzerland (CHE), Turkey (TUR), United Kingdom (UK), United States (US).

## A.3. Effects of the National Accounts Revision

Here, we follow Üngör (2013, Section 3.4) to calculate the corresponding tax rates during 1987-2006 using the previous version of the system of national accounts. The Turkish Statistical Institute (TurkStat) published the new national accounts figures according to the European System of Accounts 1995 (ESA 95), including a full scale revision of the quarterly GDP series for the period 1998 to 2006 in current and constant prices in 2008. Turkey'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. Another important initiative was to adopt chain-linking method in constant price estimation, giving more accurate aggregate volume growth rate. Moreover base year is updated from 1987 to 1998.

This revision brought significant changes to national accounts series both in real and nominal terms (World Bank, 2008; Günay, 2011). This motivates us (i) to repeat our calculations using 1987 based series for the 1987-2006 period; (ii) to compare the calculated series, using both national accounts, for the overlapping period of 1998-2006. Table A.4 reports our calculations using the previous version of the accounts.

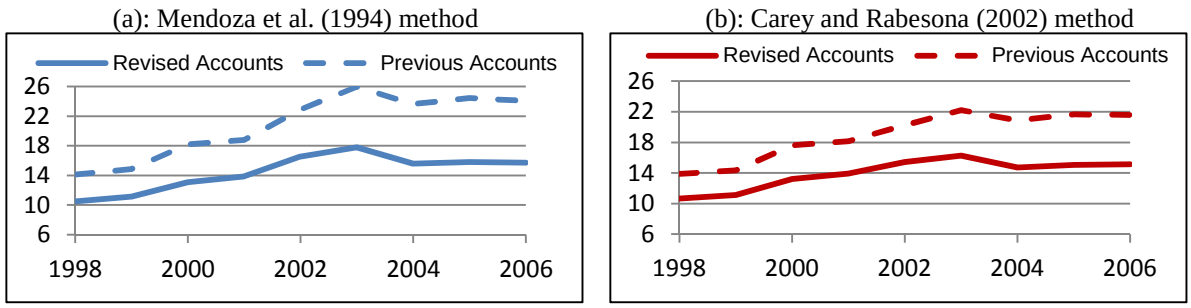
**Table A.4. AETR on consumption using the previous national accounts (%)**

| Year | MRT (1994) | CR (2002) | Year | MRT (1994) | CR (2002) | Year | MRT (1994) | CR (2002) |
|---|---|---|---|---|---|---|---|---|
| 1987 | 6.8 | 8.5 | 1994 | 10.6 | 11.4 | 2001 | 18.8 | 18.1 |
| 1988 | 6.8 | 8.5 | 1995 | 11.0 | 11.6 | 2002 | 22.9 | 20.3 |
| 1989 | 6.1 | 7.7 | 1996 | 14.0 | 13.8 | 2003 | 26.0 | 22.2 |
| 1990 | 6.3 | 7.8 | 1997 | 14.8 | 14.3 | 2004 | 23.6 | 20.9 |
| 1991 | 7.1 | 8.4 | 1998 | 14.1 | 13.9 | 2005 | 24.5 | 21.6 |
| 1992 | 8.0 | 9.3 | 1999 | 14.9 | 14.4 | 2006 | 24.1 | 21.6 |
| 1993 | 8.8 | 10.0 | 2000 | 18.2 | 17.6 | | | |

Source: OECD, TURKSTAT. Note: MRT (1994) refers to Mendoza et al. (1994). CR (2002) refers to Carey and Rabesona (2002).

We compare our calculated series with those reported by Ünlükaplan and Arısoy (2010, 2011) and observe that our calculations are exactly equal to those of Ünlükaplan and Arısoy in each year between 1987 and 2006. Then, we study the effect of the revision on the AETR on consumption in Turkey. A comparison of Table A.3 and Table A.4, for the period of 1998-2006, suggests that there are level differences (although trends remain similar) for the AETR on consumption due to the revision (see Figure A.1). For example, the AETR on consumption is 26.0% in 2003, using the previous version of the national accounts. The corresponding figure is 17.8%, using the revised national accounts.

**Figure A.1 AETR on consumption (%), Turkey: 1998-2006**




Source: OECD Revenue Statistics; TURKSTAT.

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