Tax Evasion, Tax Monitoring Expenses and Economic Growth: An Empirical Analysis in OECD Countries

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Abstract

Based on an endogenous growth model, we extent Roubini and Sala-i-Martin (1993) theoretical framework to analyse empirically the relationship between economic growth, announced tax rate and tax monitoring expenses using data from 32 OECD countries during the 1999-2007 period. Our results indicate that high announced tax rates above the elasticity of private capital and excess expenses on tax auditing as means of reducing tax evasion are not effective deepening rather recession.

Keywords: statutory tax rate, tax monitoring, tax evasion, GDP growth.
JEL Codes: *H21*, *H26*, *H54*.

Introduction

Since the seminal papers of Barro (1990) and Roubini and Sala-i-Martin (1995) it is recognized among researchers that taxation and tax evasion matter for economic growth. On the one hand, taxation distort the accumulation of private capital in the economy, while on the other it generates resources to finance the supply of the productive inputs provided by the government (*i.e.*, public goods and infrastructure). Analyzing these competing effects, Barro (1990) suggested that the growth maximizing statutory tax rate set by the government, must be equal with the elasticity of private capital in the aggregate production function. As noted by Roubini and Sala-i-Martin (1995), Barro's natural efficiency condition can be satisfied

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even in the presence of tax evasion as long as the effective tax rate, the tax rate actually collected by tax revenue services, is indeed equal with the the elasticity of private capital.

However, without disputing Barros' optimal taxation policy, empirical evidence in both developed and developing countries, suggest that in economies with high tax evasion rates there is also a great extent of fiscal corruption with serious consequences on the equity and efficiency of any economic system (*e.g.*, Slemrod and Yitzhaki, 2002). In these cases, simply increasing statutory tax rates to satisfy Barros' efficiency condition is not always appropriate. Instead, governments combat tax evasion by allocating a share of collected tax revenues to monitor tax compliance in order to reduce fiscal corruption in the economy. It is evident therefore, that although tax evasion may leads to an erosion of tax revenues and a lower provision of public goods, the overall effect of tax evasion on capital formation and economic growth depends on the relative productivity of public and private capital goods and obviously on the magnitude of auditing costs allocated by central government.

Based on the relevant literature, we use a standard one-sector endogenous growth model in order to analyze empirically how the statutory tax rate and tax compliance policy affects the rate of economic growth using a panel data set from OECD countries during the 2000-07 period. The novel feature of our model is the inclusion of the tax evasion rate as a positive function of the announced tax rate and as a negative function of tax revenues allocated for tax auditing purposes. This feature introduces a trade-off between these two policy instruments concerning their growth-maximizing values, making the analysis of optimal tax policies an empirically interesting issue. In the next section the key features of our theoretical model are presented, followed by the data and econometric model used. Section 3 presents the most important empirical findings, while the last section concludes the paper.

Theoretical Model

Using Kafkalas *et al.*, (2013), we build on a standard endogenous growth model with public capital accumulation (*e.g.*, Barro, 1990; Kalaitzidakis and Kalyvitis, 2004), modified under the existence of tax evasion in the economy following Roubini and Sala-i-Martin (1995). The government finances its total expenditures for public capital accumulation (G) through tax revenues collected by imposing a tax rate (τ) on total output produced. The government announces a tax rate but individual firms pay taxes that correspond to a lower actual or *effective* tax rate denoted by τ^e. At the same time government allocates a share of its budget for tax auditing purposes in order to improve tax compliance in the economy. The difference between the announced and the effective tax rate is the tax evasion rate, $\tau - \tau^e = h\left(\frac{M}{T}, \tau\right)$, which is assumed to be a negative function of government expenditure allocated to tax monitoring as a percentage of total taxes collected, $\frac{M}{T}$, and a positive function of the announced tax rate. Public expenditures for improving the technology and, thus, the efficiency of the tax collection mechanism may improve the ability of tax authorities to detect tax evaders and control tax evasion. On the other hand, the incentive for tax evasion may increase as the announced tax rate increases because, for a given state of tax monitoring, the marginal benefit of tax evasion increases. However, an increase in the announced tax rate leads to a smaller increase in the tax rate, so that the effective tax rate also increases. Therefore tax evasion function satisfies the following monotonicity conditions:

$$\frac{\partial h(\cdot)}{\partial\left(\frac{M}{T}\right)} < 0 \quad \text{and} \quad 0 < \frac{\partial h(\cdot)}{\partial \tau} < 1 \tag{1}$$

Under the assumption of a balanced government budget, $T = G + M = \tau^e Y$, where $M = \mu\tau^e Y$ and $G = (1-\mu)\,\tau^e Y$, the ratio of tax monitoring expenditures to total tax revenues is equal to the share of government expenditures allocated to tax monitoring. This implies that $\tau - \tau^e = h(\mu, \tau)$. Solving the model, the steady-state growth rate of the economy is a general function of the expression $(1-\tau^e)\left(\frac{G}{Y}\right)^{\frac{1-\alpha}{\alpha}}$.[1] The term $(1-\tau^e)$ captures the negative effect of taxation on growth through its negative effect on the marginal product of private capital, while $\left(\frac{G}{Y}\right)^{\frac{1-\alpha}{\alpha}}$ captures the positive effect of taxation on growth through higher public expenditure for public capital formation. Therefore, the long-run growth rate of the economy can be written as a general function of μ and τ^e as:

$$g_y = f_g\left((1-\tau^e)\left[\frac{G}{Y}\right]^{\frac{1-\alpha}{\alpha}}\right) = f_g\left((1-\tau^e)\left[(1-\mu)\tau^e\right]^{\frac{1-\alpha}{\alpha}}\right) \tag{2}$$

Taxation affects the growth of the economy through two channels. It affects negatively the marginal product of private capital as it absorbs resources from the private sector of the economy, while on the other hand, government expenditures for public capital formation collected from tax receipts increases the productivity of labor. At low values of τ the positive effect of government expenditure dominates, and, hence, the growth rate of the economy rises with the tax rate. At higher tax rates, however, the negative impact of taxation eventually dominates, and the growth rate declines as τ rises. Given that $\tau^e = \tau - h(\mu, \tau)$, it holds:

$$\frac{\partial g_y}{\partial \tau^e}\frac{\partial \tau^e}{\partial \tau} \begin{cases} > 0 & \text{if} \quad \tau^e < 1-\alpha \\ = 0 & \text{if} \quad \tau^e = 1-\alpha \\ < 0 & \text{if} \quad \tau^e > 1-\alpha \end{cases} \tag{3}$$

This result is similar to the typical finding obtained by standard endogenous growth models, which states that that the growth-maximizing announced tax rate has to be such that

[1] For more details on model description along with its solution see Kafkalas *et al.*, (2013).

the effective tax rate is equal to the elasticity of public capital in the aggregate production function (*i.e.*, Barro's natural efficiency condition).

On the other hand, the direct effect of tax monitoring expenses on aggregate output growth is negative, *i.e.*, $\frac{\partial g_y}{\partial \mu} < 0$. However, its indirect effect on growth, through its impact on the effective tax rate, can be easily shown that satisfies the following:

$$\frac{\partial g_y}{\partial \tau^e}\frac{\partial \tau^e}{\partial \mu}\begin{cases} > 0 & \text{if} \quad \tau^e < 1-\alpha \\ = 0 & \text{if} \quad \tau^e = 1-\alpha \\ < 0 & \text{if} \quad \tau^e > 1-\alpha \end{cases}$$

since the monotonicity conditions of the tax evasion function imply that $\frac{\partial \tau^e}{\partial \mu} > 0$, the sign of the above relation depends on relation (**??**).

Data and Econometric Model

According to relation (**??**), per capita growth rate, $\hat{g}_y$, is affected non-linearly by both the effective tax rate and the share of tax revenues allocated to monitoring tax evasion. Further, we assume that $\hat{g}_y$ is also linearly related to: (a) the share of private investment to GDP, $z = I/GDP$, which has been shown to be a robust explanatory variable of GDP growth, and (b) the real per capita-lagged GDP, y_{t-1}, to capture any convergence process among countries. In order to take into account the unobserved heterogeneity arising from differences in tax burden and auditing mechanism across countries, we adopt a mixed fixed and random coefficients approach following Hsiao *et al.*, (1989) and Hsiao *et al.*, (1993). First, we cluster countries using announced tax rate quartiles as differences on average tax burden and auditing mechanism may exhibit different marginal effects on per capita GDP growth rate. Next, we assume that responses to effective tax rate and monitoring expenses changes are group-specific, whereas responses to private investments and real per capita-lagged GDP changes are fixed across countries in different quartiles. Under these assumptions, the econometric specification of the per capita growth equation has the following form:

$$\hat{g}_{ijt} = \beta_1 y_{it-1} + \beta_2 z_{it} + \beta_3 \mu_{it} + \beta_4 \tau^e_{it} + \beta_5 (\tau^e_{it})^2 + \varepsilon_{ijt} \tag{4}$$

where j denotes the announced tax rate quartiles, and $\varepsilon_{ijt} = \rho_j \mu_{it} + u_j \tau^e_{it} + e_{it}$ with $\rho_j \sim (0, \sigma^2_\rho)$, $u_j \sim (0, \sigma^2_u)$, and $e_{it} \sim (0, \sigma^2_e)$ being independent of each other and among themselves. The $\beta's$ parameters along with the variance of the error components in (**??**) were estimated using the REML method.

However, according to (**??**) effective tax rate is directly related with the two policy variables τ and μ. Thus, we adopt a two-stages estimation procedure estimating first the following linearized version of the tax evasion function:

$$\tau_{it}^e = \alpha_0 + \alpha_1 \tau_{it} + \alpha_2 \mu_{it} + \varepsilon_{it}^e \tag{5}$$

where i and t denote countries and years, respectively, while $\varepsilon^e \sim (0, \sigma_\varepsilon^2)$. Then, the predicted values of $\hat{\tau}^e$ were used in the estimation of the per capita growth equation in (**??**). Finally, using (**??**) and (**??**), the marginal effect of the announced tax rate on per capita GDP growth rate is given by

$$\frac{\partial \hat{g}}{\partial \tau^e} \frac{\partial \tau^e}{\partial \tau} = \alpha_1 \left(\beta_4 + u_j + 2\beta_5 \tau_{it}^e \right) \tag{6}$$

whereas that of monitoring expenses from

$$\frac{\partial \hat{g}}{\partial \mu} + \frac{\partial \hat{g}}{\partial \tau^e} \frac{\partial \tau^e}{\partial \mu} = \beta_3 + \rho_j + \alpha_2 \left(\beta_4 + u_j + 2\beta_5 \tau_{it}^e \right) \tag{7}$$

with the first term being the direct and the second term the indirect effect, respectively.

For the econometric estimation of (**??**) and (**??**), we first need a proxy for the shadow economy in order to calculate tax evasion and effective tax rates. To do so, we adopt the recent study of Schneider *et al.*, (2010) who provide an estimate for the shadow economy as a percentage of GDP for for a broad set of developed and developing countries around the world for the 1999-07 period. Their approach is based on a MIMIC estimation method that allows comparison across countries. Using these estimates and the GDP values for the same period, obtained from *Penn World Tables Ver 7.1*, we calculated the size of the shadow economy in each country assuming that the economic activity in the underground economy is indeed tax evading. Then, using the average tax burden, that includes both income and indirect taxes published by OECD, we calculated tax revenues lost due to shadow economy. This figure was added to actual tax receipts, also published by OECD, to obtain a measure of tax evasion and effective tax rate.

Unfortunately expenses on tax auditing and legal prosecution system against tax evaders are not directly available. To overcome this problem we used again OECD statistics who published central government spendings as a percentage of GDP on different categories. From those we used government expenditures on economic affairs as a proxy of tax monitoring expenses. Since specific data on tax services and monitoring infrastructure are not available from any known source, the proposed variable can be used as a reasonably proxy of the share of tax revenues allocated in monitoring tax compliance. Since OECD statistics provide this variable only for some OECD countries we restrict our analysis to 32 countries. Finally, the share of private investments to GDP was obtained also from *Penn World Tables*. The average values over countries and time periods of the constructed variables per announced tax rate quartile are presented in Tables **??** and **??**, respectively.

Average tax burden for all 32 OECD countries in the sample was 32.25% during the 2000-07 period exhibiting an increasing trend after 2005, when financial crisis emerged. The highest tax rates are observed in Scandinavian countries, New Zealand, Israel and Japan, 41.28% on average. On the other hand, in Slovak Rep., USA, Czech Rep. and Korea direct and indirect taxes were below 25% during the same time period. Tax monitoring expenses, as proxied in this study, were found to be 4.25% following a decreasing trend after 2003. Surprisingly, the relation between the two policy variables is weak and there is no a clear pattern that emerges from our dataset. Contrary, calculated tax evasion rates are higher in countries with high announced tax rate confirming both Roubini and Sala-i-Martin (1995) and our model theoretical intuition on the monotonicity properties of the tax evasion function. In countries belonging to the first two quartiles of the announced tax rate, evasion was 1-2% lower than in those countries belonging to the last two quartiles.

In all Scandinavian countries with the highest average tax burden tax evasion exceeds 5.5% with Denmark, the country with the highest tax rate, the relevant figure being 8.42%. However, in all eastern European countries tax evasion rates are higher besides the low tax rates occasionally, probably due to poor legislative framework against tax evaders. Finally, average per capita GDP growth rate was 5.76% during the 2000-07 period. The highest value is observed in the first and third quartile of the announced tax rate, while countries with the higher average tax burden exhibit the lowest growth rates, 4.99% on the average. Due to the transition period experienced by many eastern European countries at the beginning of 00's, per capita GDP growth rates have been extremely high (Estonia 12.31%, Russia 11.45%, Slovak Rep. 7.65% Czech Rep. 6.96%).

Empirical Results

Parameter estimates of both (**??**) and (**??**) are presented in Table **??**. The overall fit of both econometric equations is satisfactory as the adjusted-R^2 is sufficiently large for a panel data setting. Starting from (**??**) and noting that $(\tau - \tau^e)$, both parameters are statistically significant having the correct magnitude and sign as the announced tax rate increases tax evasion (0.1302), while monitoring expenses decrease willingness to evade taxes from individual firms (-0.1497). For per capita growth equation, the adjusted-R^2 is 0.796 while all parameter estimates are also statistical significant with the anticipated sign. One-period lagged GDP affects negative current GDP growth, while the share of private investments on GDP has a positive effect. Both results are in accordance with the relevant literature on endogenous growth models. The direct effect of tax monitoring expenses was found to be negative as tax auditing mechanism absorbs public expenditures from productive investments reducing thus, the growth rate in aggregate output (-0.3948). Finally, effective tax rate seems to have a non-monotonic effect on GDP growth as both the own and squared terms were found statistically significant with opposite sign (0.3403 and -0.5128, respectively). Table ?? also reports the BLUPs of the random effects for each tax rate quartile. The majority of the random coefficient estimates were found to be statistically significant at least at the 10% level whereas their magnitudes were found to vary significantly across quartiles.

Table 1: Parameter Estimates of Effective Tax Rate and GDP Growth Functions

Variable		Parameter	Estimate	t-statistic
Effective Tax Rate Function:				
Constant		α_0	-0.0160	-2.64
Announced Tax Rate (τ)		α_1	0.8698	62.11
Share of Tax Monitoring Expenses (μ)		α_2	0.1497	2.18
Adjusted R-squared		$\bar{R}^2$	0.9415	
Per Capita GDP Growth Equation:				
One-period Lagged GDP (y_{t-1})		β_1	-0.0091	-2.05
Share of Private Investments (z)		β_2	0.1215	3.09
Share of Tax Monitoring Expenses (μ)		β_3	-0.3948	-2.39
Effective Tax Rate (τ^e)		β_4	0.3403	4.65
Effective Tax Rate Squared $(\tau^e)^2$		β_5	-0.5128	-3.33
Adjusted R-squared		$\bar{R}^2$	0.7959	
Best Linear Unbiased Predictions of Random Effects:				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
ρ_j	0.1686	-0.0122	-0.0666	-0.0897
u_j	0.0154	-0.0094	-0.0097	-0.0097

Asymptotic standard errors were obtained using block resampling techniques (Politis and Romano, 1994).

Using these parameter estimates we calculate the indirect marginal effect of tax auditing expenses (IME_μ) and the direct marginal effect of announced tax rate (ME_τ) on per capita GDP growth for the OECD countries in the sample. The average values over years are presented for each country in Table ??, while Table ?? shows the time pattern of the average marginal effects over countries per announced tax rate quartile. The results confirm theoretical findings presented in the previous section implying that the effect of statuary tax rate on GDP growth is indeed non-linear. Taxation affects the growth of the economy through two contradicting channels. One the one hand, it affects negative the marginal product of private capital decreasing private investments, while on the other government expenditures for public capital formation create an externality to the private sector of the economy. In the presence of tax evasion, the statutory tax rate and the share of public expenditures allocated to monitor tax evasion has to be such that the effective tax rate is equal to the elasticity of private capital. In some OECD countries in the sample this seems not to be the case being either below or above its optimal value.

In all Scandinavian countries, Japan, Israel and New Zealand, where statutory tax rate is the highest among all countries in the sample, (41.28% on average) its impact on per capita GDP growth is very low. In some cases it even turns to a negative value (Norway, Iceland, Sweden and Denmark). On average the marginal effect for countries belonging to the last quartile is negative, 0.0240, underlying the need to revise their tax policies. Contrary, in US, Korea, Netherlands, Germany and in some eastern European countries (Czech and Slovak Rep, Poland and Estonia), with low statutory tax rates (24.6% on average) its impact on economic growth is the highest among all OECD countries (0.1261 on average). Slovak Rep. and USA have the highest marginal effect, 0.1475 and 0.1456, respectively. Assuming that there are no significant differences in the productivity of public capital among OECD countries, this result is not surprising given the significant differences in the statutory tax rate among countries, confirming Barro's (1990) theoretical result also established in this paper using Roubini and Sala-i-Martin (1993) theoretical framework on tax evasion.

For the remaining countries belonging to the second and third tax rate quartiles, the average marginal effects are 0.0690 and 0.0463, respectively. It is worth noting though that in all European countries suffering most by the economic crisis (Greece, Portugal, Spain and Ireland), the marginal effects of the announced tax rate on per capita GDP growth rates are high due to their low statutory tax rates. Only for Italy and Belgium who have very high statutory tax rates and significant tax evasion problems the marginal effect is rather low, 0.0266 and 0.0222, respectively. The same applies for Russia who has the highest tax evasion problems among all OECD countries in the sample. Concerning the time trend of these point estimates, the results presented in Table **??** imply that the marginal effect of announced tax rate is following an increasing trend in all countries until 2006 regardless the tax rate quartile. This is more evident in countries belonging to the first two tax rate quartiles. It seems that governments didn't adjusted optimally their tax policies towards equating statutory tax rate with the marginal productivity of public capital. However, after 2006 when financial crisis emerged, public policies were designed more carefully aimed to increase tax revenues and to sustain public deficits combined with increased GDP growth rates. There are of course exceptions mainly in eastern European countries and Russia where tax compliance has not been improved even after 2006.

Similarly, the indirect effect of tax auditing expenses, by improving tax compliance, on per capita GDP growth rates also follows the same negative trend per announced tax rate quartile. On average, an increase in tax auditing expenses will improve aggregate output growth rates only by 0.0094. In countries with low announced tax rates the effect of monitoring expenses is high following though a decreasing trend through tax rate quartiles. In the Scandinavian countries with extremely high announced tax rates the indirect marginal effect also turns to negative values. Some countries have chosen to simply increase tax rates above the marginal productivity of public capital as means to attain high effective tax rates neglecting though that this creates an incentive for firms to further evade taxes. The higher the statutory tax rate the lower the share of public expenditures allocated to monitor tax compliance. A notable exception is the Scandinavian countries without though to affect significantly marginal effect estimates as still statutory tax rates are set to extremely high levels. Surprisingly, in Russia where average tax burden is among the highest, 0.336, the share of tax revenues allocated to monitor tax compliance is the lowest among all OECD countries in the sample, 0.173.

Specifically, for Norway, Iceland, Sweden and Denmark, the indirect marginal effect of tax auditing turns to negative value. On average for countries belonging to the last tax rate quartile the indirect marginal effect is negative, 0.0041. On the other hand, in countries with more rational tax policies monitoring expenses seems to indeed lessen tax evasion affecting positively per capita aggregate output growth rates. US together with Slovak and Czech Rep. exhibit the highest point estimates among all OECD countries in the sample. For countries belonging to the the other two tax rate quartiles the average values are 0.0119 and 0.0080 for the second and third quartile, respectively. Concerning the temporal pattern of these estimates, Table **??** shows that it is rather stable. That seems rational as it is not easy the reallocation of public expenditures against tax evasion that also requires changes in the legislative framework in each country that cannot be made in the short-run. Given these average values and the parameter estimate of μ in (**??**), the total effect of tax monitoring expenses on per capita GDP growth turns to a negative values. It seems that, on the one hand, the direct effect dominates the total marginal effect (*i.e.*, the net gains from the improvement of tax compliance does not offset the losses in public capital accumulation), while on the other the statutory tax rate was not set to extremely low value even in countries with a tax rate below its optimal value. Still though it follows a clear decreasing pattern across tax rate quartiles with the random coefficient for the first quartile to turn into a positive estimate.

Concluding Remarks

Using a standard endogenous growth model with public capital accumulation developed by Kafkalas *et al.*, (2013) enriched with tax evasion following Roubini and Sala-i-Martin (1995) theoretical framework, we provide empirical evidence on the relationship between aggregate output growth, announced tax rate and tax monitoring expenses. Using a panel data set from 32 OECD countries during the 1999-07 period, we confirm Roubini and Sala-i-Martin (1995) intuition on the relationship between tax evasion, statutory tax rate and tax auditing expenses. Our results also indicate that Barro's (1990) natural efficiency condition of optimal taxation is violated in many OECD countries in the sample. Given that technological conditions are similar across countries in the sample, some governments have imposed statutory tax rates beyond their optimal values creating problems in the aggregate output growth. For some countries the effect of taxation turns to a negative value underlying the need to urgently revise their respective tax policies. At the same time some other countries have chosen to simply retain high announced tax rates as means of increasing tax revenues allocating a small share to monitor tax compliance. These findings are rather important in nowadays where economic recession is significantly affecting most of the OECD countries urging for increased tax revenues and sustainable public deficits.

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Table 2: Average Country Values per Announced Tax Rate Quartile

	g_y	y_{t-1}	z	μ	τ	$\tau - \tau^e$	ME_τ	IME_μ
First Quartile								
Slovak Republic	0.0765	13,051	0.2295	0.0561	0.2174	0.0333	0.1475	0.0254
United States	0.0411	38,329	0.2403	0.0373	0.2231	0.0177	0.1456	0.0251
Czech Republic	0.0696	17,328	0.2549	0.0787	0.2304	0.0355	0.1343	0.0231
Korea	0.0608	19,828	0.3730	0.0622	0.2477	0.0520	0.1231	0.0212
Germany	0.0403	29,498	0.2132	0.0355	0.2570	0.0353	0.1195	0.0206
Poland	0.0671	11,432	0.1946	0.0379	0.2585	0.0551	0.1180	0.0203
Estonia	0.1231	12,363	0.2913	0.0396	0.2635	0.0626	0.1139	0.0196
Netherlands	0.0434	33,392	0.2134	0.0510	0.2704	0.0314	0.1070	0.0184
Average	0.0652	21,902	0.2513	0.0498	0.2460	0.0404	0.1261	0.0217
Second Quartile								
Greece	0.0662	21,910	0.2784	0.0485	0.2717	0.0585	0.0849	0.0146
Portugal	0.0353	18,623	0.2977	0.0423	0.2802	0.0522	0.0791	0.0136
Spain	0.0483	25,415	0.3017	0.0478	0.2818	0.0516	0.0771	0.0133
Ireland	0.0563	35,488	0.2871	0.0406	0.2926	0.0398	0.0697	0.0120
Luxembourg	0.0711	63,385	0.2622	0.0432	0.2973	0.0263	0.0657	0.0113
Slovenia	0.0696	19,925	0.3122	0.0440	0.2988	0.0618	0.0644	0.0111
Austria	0.0463	32,688	0.2492	0.0535	0.3077	0.0273	0.0562	0.0097
France	0.0403	28,580	0.2227	0.0342	0.3122	0.0406	0.0553	0.0095
Average	0.0542	30,752	0.2764	0.0443	0.2928	0.0448	0.0690	0.0119
Third Quartile								
Hungary	0.0623	14,025	0.2232	0.0621	0.3161	0.0618	0.0599	0.0103
South Africa	0.0646	5,868	0.2088	0.0240	0.3228	0.0690	0.0598	0.0103
United Kingdom	0.0526	30,241	0.1853	0.0273	0.3268	0.0362	0.0563	0.0097
Canada	0.0545	32,048	0.2378	0.0343	0.3354	0.0454	0.0487	0.0084
Russia	0.1145	9,482	0.1614	0.0173	0.3366	0.1019	0.0500	0.0086
Australia	0.0596	33,236	0.2914	0.0244	0.3390	0.0414	0.0471	0.0081
Italy	0.0362	27,456	0.2641	0.0396	0.3629	0.0770	0.0266	0.0046
Belgium	0.0437	30,736	0.2586	0.0492	0.3670	0.0657	0.0222	0.0038
Average	0.0610	22,886	0.2288	0.0348	0.3383	0.0623	0.0463	0.0080
Fourth Quartile								
Japan	0.0374	28,716	0.2838	0.0372	0.3696	0.0363	0.0100	0.0017
Israel	0.0376	21,645	0.2293	0.0288	0.3714	0.0668	0.0098	0.0017
New Zealand	0.0545	23,827	0.2218	0.0390	0.3728	0.0407	0.0073	0.0013
Finland	0.0518	29,066	0.2581	0.0468	0.3779	0.0565	0.0023	0.0004
Norway	0.0711	41,798	0.2544	0.0418	0.4006	0.0630	-0.0146	-0.0025
Iceland	0.0487	36,295	0.3197	0.0632	0.4049	0.0543	-0.0208	-0.0036
Sweden	0.0526	30,292	0.1814	0.0406	0.4442	0.0698	-0.0483	-0.0083
Denmark	0.0453	31,246	0.2573	0.0312	0.5611	0.0842	-0.1377	-0.0237
Average	0.0499	30,361	0.2507	0.0411	0.4128	0.0590	-0.0240	-0.0041

Table 3: Average Period Values per Announced Tax Rate Quartile

	2000	2001	2002	2003	2004	2005	2006	2007	Average
First Quartile									
g_y	0.0610	0.0492	0.0490	0.0529	0.0663	0.0739	0.0834	0.0861	0.0652
y_{t-1}	18,280	19,329	20,158	20,962	21,871	23,189	24,757	26,674	21,902
z	0.2557	0.2475	0.2457	0.2363	0.2450	0.2488	0.2626	0.2687	0.2513
μ	0.0506	0.0527	0.0519	0.0567	0.0470	0.0453	0.0468	0.0474	0.0498
τ	0.2516	0.2437	0.2422	0.2429	0.2398	0.2455	0.2483	0.2539	0.2460
$\tau - \tau^e$	0.0419	0.0405	0.0405	0.0406	0.0396	0.0399	0.0397	0.0403	0.0404
ME_τ	0.1216	0.1275	0.1287	0.1276	0.1313	0.1271	0.1247	0.1203	0.1261
IME_μ	0.0209	0.0219	0.0222	0.0220	0.0226	0.0219	0.0215	0.0207	0.0217
Second Quartile									
g_y	0.0584	0.0447	0.0435	0.0437	0.0504	0.0570	0.0687	0.0671	0.0542
y_{t-1}	25,526	27,172	28,263	29,544	30,933	32,527	34,670	37,378	30,752
z	0.2836	0.2758	0.2655	0.2657	0.2729	0.2748	0.2828	0.2901	0.2764
μ	0.0440	0.0428	0.0444	0.0441	0.0488	0.0432	0.0431	0.0436	0.0443
τ	0.2987	0.2938	0.2919	0.2874	0.2882	0.2928	0.2950	0.2944	0.2928
$\tau - \tau^e$	0.0464	0.0449	0.0449	0.0440	0.0440	0.0446	0.0448	0.0444	0.0448
ME_τ	0.0645	0.0684	0.0697	0.0732	0.0720	0.0692	0.0675	0.0678	0.0690
IME_μ	0.0111	0.0118	0.0120	0.0126	0.0124	0.0119	0.0116	0.0117	0.0119
Third Quartile									
g_y	0.0696	0.0422	0.0440	0.0550	0.0697	0.0705	0.0705	0.0664	0.0610
y_{t-1}	19,019	20,172	21,005	21,841	22,958	24,420	25,992	27,685	22,886
z	0.2220	0.2170	0.2191	0.2176	0.2298	0.2333	0.2423	0.2496	0.2288
μ	0.0322	0.0342	0.0360	0.0346	0.0325	0.0365	0.0360	0.0361	0.0348
τ	0.3466	0.3422	0.3374	0.3361	0.3359	0.3347	0.3360	0.3377	0.3383
$\tau - \tau^e$	0.0653	0.0641	0.0629	0.0624	0.0616	0.0610	0.0606	0.0604	0.0623
ME_τ	0.0402	0.0434	0.0469	0.0480	0.0485	0.0489	0.0479	0.0467	0.0463
IME_μ	0.0069	0.0075	0.0081	0.0083	0.0084	0.0084	0.0083	0.0080	0.0080
Fourth Quartile									
g_y	0.0688	0.0281	0.0147	0.0267	0.0570	0.0743	0.0687	0.0607	0.0499
y_{t-1}	25,817	27,743	28,532	28,931	29,682	31,479	34,066	36,634	30,361
z	0.2515	0.2387	0.2305	0.2267	0.2446	0.2616	0.2774	0.2749	0.2507
μ	0.0423	0.0423	0.0429	0.0417	0.0409	0.0401	0.0399	0.0385	0.0411
τ	0.4166	0.4058	0.4064	0.4049	0.4093	0.4222	0.4217	0.4157	0.4128
$\tau - \tau^e$	0.0609	0.0591	0.0591	0.0586	0.0584	0.0597	0.0586	0.0572	0.0590
ME_τ	-0.0271	-0.0187	-0.0193	-0.0179	-0.0212	-0.0311	-0.0307	-0.0259	-0.0240
IME_μ	-0.0047	-0.0032	-0.0033	-0.0031	-0.0037	-0.0054	-0.0053	-0.0044	-0.0041
All Countries									
g_y	0.0645	0.0411	0.0378	0.0445	0.0608	0.0689	0.0728	0.0701	0.0576
y_{t-1}	22,160	23,604	24,489	25,320	26,361	27,904	29,871	32,093	26,475
z	0.2532	0.2448	0.2402	0.2366	0.2481	0.2546	0.2663	0.2708	0.2518
μ	0.0423	0.0430	0.0438	0.0443	0.0423	0.0413	0.0414	0.0414	0.0425
τ	0.3284	0.3214	0.3195	0.3179	0.3183	0.3238	0.3252	0.3254	0.3225
$\tau - \tau^e$	0.0536	0.0522	0.0519	0.0514	0.0509	0.0513	0.0510	0.0506	0.0516
ME_τ	0.0498	0.0552	0.0565	0.0577	0.0577	0.0535	0.0524	0.0522	0.0544
IME_μ	0.0086	0.0095	0.0097	0.0099	0.0099	0.0092	0.0090	0.0090	0.0094