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The sinful side of taxation: is it possible to satisfy the government hunger for revenues while promoting economic growth?*

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Abstract

In this study we try to evaluate both linear and non-linear relationships between each tax item and real *per capita* growth. Our analysis, conducted for all the OECD countries between 1980 and 2015 and by resorting to panel data techniques in a short and long-term basis, evidences tax items threshold values for all tax components (except for taxes on individual income). In particular, for long-run economic performance, we obtain optimal threshold values for social security contributions between 7.0% and 12.43%. Lastly, our results provide some conclusions, highlighting the raise of some taxes, in GDP terms, without harming economic growth evolution.

Keywords: Economic Growth; Tax systems; Fiscal Policy; Optimal taxation
JEL: E62; H21; O47

*The opinions expressed herein are those of the author and do not necessarily reflect those of his employers. Any remaining errors are the author's sole responsibility.

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1 Introduction

Nowadays, and as always, the tax burden imposed by the governments is a crucial discussion topic. In fact, there is a constant tension between the non-appropriation of individuals' income and wealth, through taxation, and, at the same time, the need to finance public expenditure. That tension probably arises from a micro-macroeconomics duality problem. Indeed, there is a microeconomic perspective that taxation is a subtraction of income obtained by individual efforts, both for households and firms, which is true in a static perspective of reality, but it is neglected from the macroeconomic circuit.

However, in a macroeconomic framework, the income and wealth levied from the economic private sector are redistributed and allocated through public spending. Independently of the productive or unproductive features of government expenditures, the money is not taken out of the economy. It is, in fact, put into circulation boosting several aspects of an economy through both public consumption and investment. Consequently, there is a need to understand the truly effects of taxation on real economic growth. Yet, and as a criticism, when David Ricardo claims that taxation always presents a counter-productive factor for economic development (Ricardo (2005)), we believe he is only taking part in the microeconomic outlook, and not in the macroeconomic overview, which is representative of a dynamic and circular economy, regardless of the development stage.

Therefore, and to give new insights, in this study we try to find both linear and non-linear tax items-economic growth relationships, for the 1980-2015 period. In this empirical assessment, we intend to evaluate possible inefficient characteristics of the power to tax. Despite of some founds about linear connections between taxation and economic growth, we also find concave relationships between those economic phenomena. More specifically, we reach few tax-growth thresholds values elucidating the possible positive effects of the coercion power of the governments, i.e, we found optimal values of taxation that boosts economic growth, both in a short and a long-term perspective, contrarily to the mainstream speeches verified nowadays.

The remaining of this empirical research is organised as follows: section 2 provides a literature review of the related theoretical viewpoints and empirical studies on this topic; section 3 presents the methodology, the data and its sources; section 4 highlights the empirical results; and section 5 summarizes our conclusions.

2 Literature Review

Several literature addresses the linkage between government revenues and, more specifically the tax composition and economic growth, both in short and long-term. In particular, Kneller et al. (1999) through an empirical analysis including 22 OECD countries for 26 years timespan, found that, contrarily to non-distortionary taxation, distortionary taxes hamper economic growth. The same conclusion is reached by Bleaney et al. (2001). In fact, these authors investigate the endogenous growth model proposition, considering that government spending and taxation have both temporary and permanent effects on economic performance. The authors' analysis was conducted for the years between 1970 and 1995 for OECD countries. Regarding taxation effects on growth, it is found that non-distortionary taxes have a positive impact on growth, while distortionary taxes present an opposite effect. The negative distortionary taxation impact on growth is also found in an analysis performed by Gemmell et al. (2007), on the period between 1970 and 2004 for OECD countries conducted; Fölster and Henrekson (2001) evaluate the growth-tax linkage in the 1970-1995 period for a sub-sample of OECD countries, and found a non-significant effect of taxation on growth. The authors' conclusions are also robust under extreme bound analyses. However, considering other geographies as Hong Kong, Singapore and Taiwan, the conclusions evidence a negative significant impact on economic performance by taxation.

Afonso and Furceri (2010) report that indirect tax revenues present negative and significant effects on growth for both EU and OECD countries between 1970 and 2004, while direct taxes show no impact on economic performance, evidencing a lesser degree of distortion when compared to indirect taxes. Yet, the authors do not find a concave relationship between taxes and growth.

Furthermore, a similar result is achieved in Karras and Furceri (2009). The author addresses the tax-growth relation for 19 European countries and during a 39 years period (1965-2003). While it is found that taxes present a negative impact between 0.5% and 1% for a percentage point increase in the overall taxation, consumption taxes seem to be the most detrimental source of taxation for growth. In addition, a similar result is reached by Zimčík (2016), who concludes that non-distortionary taxes, as production taxes, show a detrimental effect on growth. Still, Arnold et al. (2011) examine the tax policy changes needed for a sustainable transition from the short to the long-term economic growth, while a sample of 21 OECD countries for the 1971-2004 period, and founds that growth can be promoted by a progressive increasing towards consumption and property taxation, with a consequent income taxation reduction.

Angelopoulos et al. (2007) develop a competitive decentralized equilibrium model to study the growth-government revenues nexus, among other relationships, evaluating their model for 23 OECD countries, and for 5-year periods between 1970 and 2000. The authors' conclusion is that capital and corporate income tax rates are positively related to growth. On the other hand, some studies report a different result. More specifically, Cashin (1995) concludes for a negative impact on growth by distortionary taxation. For the period between 1970 and 2012, Afonso and Alves (2015), in order to determine debt thresholds, find that capital and profits taxation are detrimental for growth. This result is corroborated by Arnold (2008), which assesses how tax structures influence growth dynamics for 21 OECD countries between 1971 and 2004. The author concludes that, besides the fact that income taxes, in particular, the ones on firms, are detrimental for growth, the priority should be to tax the property and consumption, since those taxation sources are growth enhancing. In line with the two previous studies, Benos (2009), through an analysis with a 14 EU countries' sample between 1990 and 2006, found that distortionary taxation, where capital, income and wealth taxation are included, has a negative impact on economic growth rates. Yet, and in line with these conclusions, Acosta-Ormaechea and Yoo (2012) found that changing the tax composition in favour of income taxes is negatively related with long-term growth rates. This effect is even clear for social security contributions and personal income taxes. Contrarily, the results achieved highlight that it is preferable to shift taxation from income to property taxes rather than to change from income to consumption taxation.

Tosun and Abizadeh (2005) evaluate the tax structure and its effects on growth. The analysis conducted for 24 OECD countries between 1980 and 1999 highlights that personal and property taxes are the tax items, which more respond (positively) to a change in *per capita* GDP, while taxes on payroll, and on goods and services decrease their importance. In addition, and by decomposing the tax revenues into several tax components for 155 countries during a 39 years period, Afonso and Jalles (2014) evidence a non-significant effect of each tax component on growth.

De Witte and Moesen (2010) resort to a non-parametric data envelopment analysis to assess a concave relationship between growth and government size, with a sample of 23 OECD countries. The authors computed a 42% value, on average, for an economic optimality for tax burden. Lastly, the study conducted in Xing (2012), by assessing the tax revenues composition and the *per capita* growth found that several empirical articles regarding tax-economic growth topic present a non-robust econometric results under different heterogeneity hypothesis across the articles' countries sample, both for short and long term.

3 Methodology and Data

In our analysis we consider an aggregate production function of the type $Y = F(T)$, i.e., the economic output is a function of the structure of taxation represented generically by the set T.

$$g_{i,t} = \alpha_{i,t} + \beta_{0,i,t} y_{i,t-1} + \sum \beta_{n,i,t} \tau_t + \beta^j_{n,i,t} + \nu_i + \eta_t + \varepsilon_{i,t}, j = 1, 2, t = 1, ..., T, i = 1, ..., N \quad (1)$$

where $g_{i,t}$ is the real *per capita* GDP growth rate, $y_{i,t-1}$ is the one-lag real *per capita* GDP, τ_t represents each tax item, in GDP term, $x^j_{i,t}$ is an independent variable belonging to the first or second sets of control variables j, ν_i and η_t are the country and time-specific effects, respectively, $\varepsilon_{i,t}$ represents an unobserved zero mean white noise-type column vector satisfying the standard assumptions, and lastly, the $\beta_{n,i,t}$ are the coefficients that will be estimated to assess the impact of each variable on growth.

We then add an additional squared term for each tax item to assess possible non-linearity effects of tax items on economic performance, as expressed in the following equation

$$g_{i,t} = \alpha_{i,t} + \beta_{0,i,t} y_{i,t-1} + \sum \beta_{1,i,t} \tau_t + \sum \beta_{2,i,t} \tau_t^2 + \beta_j x^j_{i,t} + \nu_i + \eta_t + \varepsilon_{i,t}, t = 1, ..., T, i = 1, ..., N \quad (2)$$

By deriving the equation 2 we obtain the equation 3:

$$\frac{\partial g_{i,t}}{\partial(\tau_{i,t},\tau_{i,t}^2)} = \frac{\partial(\alpha_{i,t} + \beta_{0,i,t}y_{i,t-1} + \sum\beta_{1,i,t}\tau_t + \sum\beta_{2,i,t}\tau_t^2 + \beta_i x_{i,t}^j + \nu_i + \eta_t + \varepsilon_{i,t})}{\partial(\tau_{i,t},\tau_{i,t}^2)} \tag{3}$$

Each tax item threshold is computed by equalizing equation (3) to zero as shown in equation (4),

$$0 = \beta_1 + 2\beta_{2,i,t}\tau_t \Leftrightarrow \tau_t = \frac{-\beta_{1,i,t}}{2\beta_{2,i,t}} \tag{4}$$

Consequently, if the results evidence a significant negative signal for $\beta_{2,i,t}$, it means that there is a concave relationship between a tax item and economic performance, implying a maximum value of taxation raised in an economy that promote economic growth. On the contrary, a positive significant coefficient leads to an inverse conclusion. A positive $\beta_{2,i,t}$ means a convex relationship translating, in an economic sense, into a tax item value that minimizes economic growth. Hence, in the results section, when we get convex relations we will highlight those coefficient to differentiate between maximum and minimum optimal levels.

The model is estimated for the period between 1980 and 2015 and for the following OECD countries: Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Chile (CHL), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Iceland (ISL), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), South Korea (KOR), Latvia (LVA), Luxembourg (LUX), Mexico (MEX), the Netherlands (NLD), New Zealand (NZL), Norway (NOR), Poland (POL), Portugal (PRT), Slovak Republic (SVK), Slovenia (SVN), Spain (ESP), Sweden (SWE), Switzerland (CHE), Turkey (TUR), United Kingdom (GBR) and United States (USA).

Our database consisted in several data sources. The GDP is based on purchasing-power-parity *per capita* GDP (*realgdppc*), in thousands, and the respective growth rate (*realgdppcgr*), the general government structural balance in percentage of GDP (*capb*), the general government gross debt-to-GDP ratio (*debt*), and the share of total government expenditures in percentage of GDP (*totexp*) are from World Economic Outlook, from the International Monetary Fund; taxes on income, profits and capital gains of individuals (*taxinc*), taxes on income, profits and capital gains of corporates (*taxfirms*), social security contributions (*ssc*), taxes on payroll and workforce (*taxpayroll*), taxes on property (*taxprop*), taxes on goods and services (*taxvat*), gross fixed capital formation growth rate (*gfcfgr*), current account balance in percentage of GDP (*current*), long-term interest rates (*ltir*), average hours actually worked (*avg*), and unemployment rate in percentage of active population (*unem*) are based on *OECD.Stats* database.

From the Government Finance Statistics we used data of public spending, based on classification of the functions of government, i.e., government expenditures on general public services (*pubser*), on defense (*def*), on public order & safety (*pubor*), on economic affairs (*eco*), on environment protection (*env*), on housing & community amenities (*hou*), on health (*hea*), on recreation, culture, & religion (*cul*), on education (*edu*), and on social protection (*socpro*).

In addition, the data on old age dependency ratio as percentage of active population (*ageratioold*), total fertility rate (*fertility*), GDP percentage of household final consumption expenditure (*hconsggdp*), land area in squared km (*landarea*), and total life expectancy at birth in years (*lexpectancy*) are from the World Development Indicators (WDI).

Lastly, population in millions (*pop*) and the total factor productivity at constant national prices (*rtfpna*) are based in Feenstra et al. (2015), while liquid liabilities-to-GDP ratio (*llgdp*) is based on International Financial Statistics (IFS) data from the International Monetary Fund. The table 1 presents the summary statistics for each variable used in our econometric specifications[1].

To estimate the coefficients, we apply panel data techniques by using OLS, OLS-Fixed Effects (FE), Generalized Method of Moments (GMM) and Robust Least Squares (RLS). With the exception of RLS, we estimate the coefficient resorting to white diagonal covariance matrix assumption, in order to assume a residual heterokedasticity. In addition to the use of each tax component as mentioned above, we used two set of control variables: in the first econometric specification we include as the set of control variables $realgdppc_{-1}$, *gfcfgr*, *current*, *ltir*, *avg*, *unem*, *capb*, *debt* and *totexp* variables; in the second specification, we include the variables $realgdppc_{-1}$, *pubser*, *def*, *pubor*, *eco*, *env, hou, hea*, *cul*, *edu*, *socpro*, *llgdp*, *lpop*, *rtfpna*, *ageratioold*, *fertility*, *hconsggdp*, *landarea*, and *lexpectancy* variables. Furthermore, we estimate both equations (1) and (2) for an annual growth rate as well as for a 5-years average economic growth. Yet, it is important to mention that we will only assess possible tax thresholds for each tax item when we obtain both statistical coefficients for both linear and square term items regressors, with significant level of at least 10%.

Table 1: Summary statistics of the variables set for economic growth regressions, 1980-2015.

	realgdppc	*taxinc*	*taxfirms*	*ssc*	*taxpayroll*	*taxprop*	*taxvat*
Mean	24.448	8.820	2.806	8.345	0.369	1.745	10.588
Std dev	14.313	4.635	1.500	4.981	0.728	1.003	3.046
Max	101.054	26.780	12.594	19.173	5.661	7.334	18.730
Min	2.184	0.873	0.261	0.000	0.000	0.074	2.979
Obs.	1195	1106	1106	1137	1137	1137	1137
	gfcfgr	*current*	*ltir*	*avg*	*unem*	*capb*	*debt*
Mean	3.314	-0.578	6.211	1797.237	7.349	-2.588	55.728
Std dev	8.917	5.565	3.429	249.343	3.835	3.295	35.901
Max	45.119	16.467	22.498	2911.000	27.467	6.003	242.113
Min	-47.761	-23.201	-0.069	1361.700	1.854	-18.676	3.664
Obs.	1164	727	854	986	741	860	943
	totexp	*pubser*	*def*	*pubor*	*eco*	*env*	*hou*
Mean	42.621	6.703	1.681	1.698	4.760	0.689	0.756
Std dev	9.657	2.274	1.333	0.440	1.763	0.346	0.440
Max	68.436	16.701	8.851	3.761	25.280	1.758	5.411

[1]For reasons of parsimony, the results of realgdppc and *landarea* variables are expressed in thousands of USD and squared *km*, respectively.

Min	14.244	2.980	0.000	0.815	1.307	-0.284	-0.083
Obs.	977	585	586	585	585	583	585
	hea	*cul*	*edu*	*socpro*	*llgdp*	*pop*	*rtfpna*
Mean	5.901	1.176	5.394	15.562	72.910	33.531	0.941
Std dev	1.686	0.570	1.080	4.708	48.689	52.235	0.123
Max	9.123	3.630	8.116	26.180	399.114	319.449	1.539
Min	0.379	0.248	3.021	5.440	6.865	0.228	0.472
Obs.	585	585	585	585	1139	1173	1173
	ageratioold	*fertility*	*hconsggdp*	*landarea*	*lexpectancy*		
Mean	20.094	1.793	56.382	1014985.867	76.316		
Std dev	5.519	0.499	7.069	2412039.914	3.934		
Max	42.653	4.836	79.551	9161920.000	83.844		
Min	6.641	1.076	29.918	2590.000	58.692		
Obs.	1260	1260	1174	1220	1260		

4 Results

4.1 Short-run effects of taxation on economic growth

For both econometric specifications, as addressed in the previous section, equations (1) to (8) are based on the first set of control variables, while the equations (9) to (16) are based on second set.

When the first set of control variables is used, the results presented in table 2 show that there is always a β-convergence process, through the negative and significant signal evidenced for the real *per capita* GDP. In addition, the growth of investment ($gfcfgr$) and the long-term interest rates evidence an expected signal for the economic growth dynamics, when their coefficients are statistically significant. On other hand, the government expenditures seem to be detrimental to growth, which is consistent to Afonso and Jalles (2016) findings. However, at the same time, the structural budget balance and the government debt-to-GDP ratio appear to present an expected negative relationship to economic growth (see for e.g. the conclusions presented in Afonso and Alves (2015)).

Looking in detail for the tax components effects on economic performance, and for the equations without the square term (equations (1), (3), (5) and (7)), we can conclude that only taxation of individual income, in proportion of GDP, presents a positive effect on growth. The other tax items evidence a consistent relationship. In fact, the econometric regressions highlight some positive, and other negative, tax effects on GDP, depending on the econometric technique under analysis.

Additionally, and when we study the possible non-linear relationships between tax-to-GDP items and their impact on growth (equations (2), (4), (6) and (8)), we verify some tax thresholds. Namely, we reach to the conclusion that there is an average value of 5.82%, which represents the maximum proportion of taxation that should be levied on firms' income. The same conclusion is found for taxes on payroll and workforce, when we reach to an average maximum of 1.86% proportion of GDP from this tax item. In addition, we reach to an average value of 11.37% of social security contributions maximum in percentage of GDP (equations (2), (6) and (8)). On the other hand, we also compute a minimum value of 17.15%, meaning that raising social security revenues until that value will lower the economic growth rates.

Table 2: Linear and non-linear short-run impact results of taxation structure on economic growth dynamics for equation (1).

	OLS		OLS-FE		GMM		RLS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$realgdppc_{-1}$	-0.000**	-0.000***	-0.000***	-0.000***	-0.000	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
taxinc	0.097	0.037	-0.017	0.221	-0.008	-0.176	0.159***	0.134*
	(0.063)	(0.122)	(0.146)	(0.250)	(0.077)	(0.165)	(0.043)	(0.081)
$taxinc^2$		0.004		-0.012		0.007		0.003
		(0.004)		(0.009)		(0.004)		(0.003)
taxfirms	0.063	0.557***	-0.337**	0.318	-0.010	0.173	0.085	0.631***
	(0.080)	(0.200)	(0.163)	(0.312)	(0.087)	(0.315)	(0.06)	(0.170)
$taxfirms^2$		-0.050***		-0.058***		-0.016		-0.052***
		(0.017)		(0.020)		(0.029)		(0.015)
ssc	0.173***	0.655***	-0.903***	-2.950**	0.095	0.525***	0.241***	0.647***
	(0.059)	(0.108)	(0.205)	(1.258)	(0.064)	(0.124)	(0.036)	(0.082)
ssc^2		-0.03***		0.086*		-0.027***		-0.024***
		(0.006)		(0.052)		(0.006)		(0.005)
taxpayroll	0.042	1.006***	-0.711**	0.496	-0.052	0.587	0.111	0.974***
	(0.118)	(0.276)	(0.356)	(0.540)	(0.127)	(0.382)	(0.103)	(0.270)
$taxpayroll^2$		-0.283***		-0.266***		-0.157		-0.252***
		(0.076)		(0.096)		(0.105)		(0.081)
taxprop	0.103	0.111	-0.685*	-2.196	0.058	0.449	0.156*	-0.335
	(0.115)	(0.473)	(0.374)	(1.576)	(0.122)	(0.601)	(0.092)	(0.388)
$taxprop^2$		-0.062		0.321		-0.114		0.065
		(0.099)		(0.288)		(0.120)		(0.087)
taxvat	0.097	0.272	-0.783***	-1.862	0.067	-0.124	0.109**	-0.033
	(0.082)	(0.250)	(0.294)	(1.132)	(0.096)	(0.357)	(0.050)	(0.184)
$taxvat^2$		-0.009		0.048		0.008		0.008
		(0.013)		(0.043)		(0.018)		(0.009)
gfcfgr	0.302***	0.295***	0.181***	0.182***	0.347***	0.327***	0.282***	0.275***
	(0.028)	(0.029)	(0.031)	(0.029)	(0.050)	(0.050)	(0.011)	(0.010)
current	-0.019	-0.039	-0.098**	-0.071	-0.059	-0.089	0.029	0.006
	(0.037)	(0.042)	(0.043)	(0.048)	(0.049)	(0.055)	(0.018)	(0.018)
ltir	0.007	0.047	-0.269***	-0.258**	-0.017	0.027	-0.012	0.039
	(0.059)	(0.065)	(0.104)	(0.111)	(0.097)	(0.113)	(0.041)	(0.043)
avg	0.000	-0.001	-0.006***	-0.009***	0.000	-0.002	0.001	-0.001
	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)
unem	0.013	0.002	-0.084*	-0.084*	0.016	0.006	0.011	0.023
	(0.036)	(0.039)	(0.045)	(0.045)	(0.043)	(0.048)	(0.025)	(0.025)
capb	-0.068	-0.051	0.082	0.042	0.060	0.118	-0.099**	-0.091**
	(0.065)	(0.074)	(0.075)	(0.071)	(0.092)	(0.115)	(0.040)	(0.040)
debt	-0.007*	-0.006	0.023***	0.033***	-0.003	-0.005	-0.008***	-0.008***
	(0.004)	(0.004)	(0.009)	(0.011)	(0.005)	(0.006)	(0.003)	(0.003)
totexp	-0.103*	-0.120*	-0.091	-0.085	-0.033	-0.027	-0.135***	-0.163***
	(0.057)	(0.061)	(0.069)	(0.069)	(0.068)	(0.083)	(0.030)	(0.030)
Tax thresholds								
taxinc	-	-	-	-	-	-	-	-
taxfirms	-	5.57%	-	-	-	-	-	6.07%
ssc	-	10.92%	-	**17.15%**	-	-	-	13.48%
taxpayroll	-	1.78%	-	-	-	-	-	1.93%
taxprop	-	-	-	-	-	-	-	-
taxvat	-	-	-	-	-	-	-	-
R^2	0.630	0.651	0.834	0.844	0.624	0.641	0.462	0.476
DW-statistic	1.432	1.492	1.518	1.554	1.472	1.507	n.a.	n.a.
Obs.	525	525	525	525	491	491	525	525

Notes: *, ** and *** represent statistical significance at levels of 10%, 5% and 1% respectively. The robust standard errors are in brackets. The White diagonal covariance matrix is used in order to assume residual heterokedasticity, with the exception for RLS technique. The DW-statistic is the Durbin-Watson statistic. The non-bold and bold values express, respectively, maximum and minimum optimal tax items levels.

Now looking for the equations (9) to (16), which show the results of equation (1) and (2) by using the second set of control variables as mentioned before, we can conclude that government spending, by the functions of government, are generally negative to growth as also evidenced in the previous results. The same negative effect on growth is also found for life expectancy. In contrast to these results, an increment of monetary supply and on total factor productivity appears to improve real economic growth. Yet, an increase of household consumptions presents a negative impact on growth, although the statistical coefficients obtained evidence a marginal impact (less than 0.15% on economic growth by an unit increase in household consumption).

When we evaluate possible tax-to-growth thresholds with the second set of control variables, we verify fewer values. The results show average growth-maximizing values of 13.76% for social security contributions, while evidencing maximum values of 2.50% and 4.58% for taxes on payroll and on property, respectively. Comparing to the previous results, we conclude that there are no structural differences between the regression results using the first or the second set of control variables. In these regressions, a tax on goods and services threshold is found to be 14.52%, on average. The results are presented in table 3.

Table 3: Linear and non-linear short-run impact results of taxation structure on economic growth dynamics for equation (2).

	OLS		OLS-FE		GMM		RLS	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
$lngdppc_{-1}$	-0.000***	-0.000***	-0.001***	-0.001***	-0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$taxinc$	0.307***	0.279**	0.177	0.075	-0.002	0.153	0.189***	0.110
	(0.08)	(0.136)	(0.129)	(0.298)	(0.114)	(0.186)	(0.064)	(0.117)
$taxinc^2$		0.003		0.002		-0.003		0.005
		(0.005)		(0.010)		(0.007)		(0.005)
$taxfirms$	0.172**	0.304	0.237	0.373	-0.081	-0.693	0.069	0.338
	(0.087)	(0.265)	(0.153)	(0.375)	(0.138)	(0.501)	(0.091)	(0.267)
$taxfirms^2$		-0.022		-0.014		0.052		-0.031
		(0.021)		(0.026)		(0.043)		(0.024)
ssc	0.374***	0.989***	-0.452*	-0.365	0.192	0.592**	0.283***	0.750***
	(0.078)	(0.199)	(0.241)	(0.839)	(0.120)	(0.273)	(0.060)	(0.184)
ssc^2		-0.035***		-0.004		-0.022		-0.028***
		(0.010)		(0.031)		(0.014)		(0.009)
$taxpayroll$	0.492***	1.490***	-0.394	0.601	0.136	0.176	0.294*	0.904**
	(0.176)	(0.451)	(0.359)	(0.801)	(0.205)	(0.583)	(0.153)	(0.440)
$taxpayroll^2$		-0.298**		-0.245*		0.036		-0.180
		(0.138)		(0.138)		(0.184)		(0.134)
$taxprop$	0.838***	1.748***	-0.008	-0.921	1.212***	1.858	0.523***	0.734
	(0.229)	(0.503)	(0.185)	(0.908)	(0.385)	(1.331)	(0.176)	(0.456)
$taxprop^2$		-0.191**		0.112		-0.156		-0.057
		(0.074)		(0.113)		(0.317)		(0.081)
$taxvat$	0.394***	1.006***	0.127	1.341*	0.390**	0.436	0.286***	0.844***
	(0.138)	(0.383)	(0.185)	(0.686)	(0.197)	(0.677)	(0.090)	(0.321)
$taxvat^2$		-0.027		-0.048*		0.000		-0.028**

		(0.018)		(0.028)		(0.032)		(0.014)
pubser	-0.514***	-0.589***	-0.325**	-0.369***	-0.417***	-0.490***	-0.464***	-0.489***
	(0.085)	(0.082)	(0.127)	(0.138)	(0.157)	(0.147)	(0.068)	(0.071)
def	-0.271	-0.395*	0.018	0.055	-0.156	-0.189	-0.207	-0.349**
	(0.188)	(0.211)	(0.369)	(0.388)	(0.254)	(0.274)	(0.143)	(0.157)
pubor	-1.083**	-1.600***	0.658	0.693	-1.277*	-1.379*	-0.638	-1.069**
	(0.496)	(0.542)	(0.828)	(0.868)	(0.741)	(0.792)	(0.422)	(0.456)
eco	-0.186	-0.175	0.015	0.014	-0.601	-0.717	-0.145**	-0.109
	(0.137)	(0.129)	(0.058)	(0.054)	(0.465)	(0.515)	(0.067)	(0.068)
env	-1.728***	-1.242*	-1.233	-1.171	-1.905**	-0.997	-1.842***	-1.303**
	(0.646)	(0.692)	(0.909)	(0.942)	(0.967)	(1.168)	(0.470)	(0.506)
hou	-0.444	-0.574	0.281	0.300	-0.350	-0.085	-0.354	-0.457
	(0.433)	(0.453)	(0.318)	(0.331)	(0.795)	(0.962)	(0.274)	(0.280)
hea	-0.224*	-0.177	0.390*	0.401*	0.108	0.142	-0.226**	-0.176
	(0.125)	(0.129)	(0.230)	(0.230)	(0.197)	(0.239)	(0.105)	(0.110)
cul	-1.255***	-0.983**	0.016	0.400	-1.084**	-1.132*	-0.754**	-0.491
	(0.435)	(0.457)	(0.693)	(0.756)	(0.537)	(0.637)	(0.341)	(0.370)
edu	-0.281	-0.439**	-1.072**	-1.126**	0.035	-0.162	-0.227	-0.315*
	(0.190)	(0.207)	(0.441)	(0.435)	(0.281)	(0.399)	(0.177)	(0.191)
socpro	-0.343***	-0.311***	-0.597***	-0.595***	-0.136	-0.086	-0.240***	-0.204***
	(0.071)	(0.076)	(0.144)	(0.152)	(0.090)	(0.119)	(0.051)	(0.058)
llgdp	0.011**	0.009	0.037***	0.037***	0.004	0.008	0.008**	0.006
	(0.005)	(0.005)	(0.012)	(0.012)	(0.007)	(0.009)	(0.004)	(0.005)
log(*pop*)	-0.264	-0.267	17.701***	16.495***	-0.452	-0.624	-0.254	-0.234
	(0.217)	(0.223)	(4.657)	(5.217)	(0.368)	(0.468)	(0.155)	(0.165)
rtfpna	7.767***	7.326***	10.797***	9.666***	-3.100	-1.415	8.489***	7.472***
	(2.318)	(2.305)	(2.859)	(3.086)	(3.415)	(3.452)	(1.708)	(1.818)
ageratioold	-0.079	-0.079	0.166*	0.105	-0.184**	-0.215**	-0.018	-0.014
	(0.062)	(0.064)	(0.098)	(0.103)	(0.080)	(0.089)	(0.038)	(0.039)
fertility	-0.802	-0.743	-7.314***	-6.709***	-3.567***	-3.417***	-0.011	0.391
	(0.846)	(0.876)	(1.419)	(1.482)	(1.139)	(1.252)	(0.618)	(0.650)
hconsggdp	-0.060	-0.051	-0.147*	-0.116	-0.090	-0.080	-0.085**	-0.070*
	(0.043)	(0.044)	(0.085)	(0.088)	(0.070)	(0.085)	(0.035)	(0.036)
landarea	0.000	0.000**	0.000	0.000	0.000	0.000*	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lexpectancy	-0.258**	-0.288**	-0.837***	-0.744**	-0.072	-0.032	-0.302***	-0.338***
	(0.109)	(0.117)	(0.316)	(0.328)	(0.144)	(0.163)	(0.066)	(0.073)
Tax thresholds								
taxinc	-	-	-	-	-	-	-	-
taxfirms	-	-	-	-	-	-	-	-
ssc	-	14.13%	-	-	-	-	-	13.39%
taxpayroll	-	2.50%	-	-	-	-	-	-
taxprop	-	4.58%	-	-	-	-	-	-
taxvat	-	-	-	13.97%	-	-	-	15.07%
R-squared	0.392	0.411	0.798	0.801	0.285	0.271	0.305	0.313
Durbin-Watson stat	1.273	1.263	1.195	1.212	1.386	1.403	n.a.	n.a.
Obs.	536	536	536	536	500	500	536	536

Notes: *, ** and *** represent statistical significance at levels of 10%, 5% and 1% respectively. The robust standard errors are in brackets. The White diagonal covariance matrix is used in order to assume residual heterokedasticity, with the exception for RLS technique. The DW-statistic is the Durbin-Watson statistic. The non-bold and bold values express, respectively, maximum and minimum optimal tax items levels.

4.2 Long-run effects of taxation on economic growth

In what respects to the long-term relationship between taxation structure and economic growth, we also compute our main equations using both sets of variables. As explained variable, we use the 5-years average economic growth rates to evaluate the taxation items impact in gross income performance. The long-term results are shown in tables 4 and 5, for first and second sets of control variables, respectively.

Regarding to the first set of control variables with linear relationships of taxes with growth (equations (1), (3), (5) and (7)), we verify the same positive impact of investment growth on economic performance, as in the short-run analysis. The same conclusions are reached for the impacts of government spending. However, and in accordance to the short-run results, the government debt growth and fiscal consolidation, through the structural budget balance, evidence, in general, a negative relation with *per capita* growth. Yet, the results show a positive linkage between some tax items and growth, namely, social security contributions and taxes on payroll. For the remaining tax sources, the results obtained cannot be summarized in an unique impact of growth, since different signals are obtained, depending on the econometric specifications.

In the analysis of possible non-linear impacts of taxation on economic performance (equations (2), (4), (6) and (8)), we retrieve similar conclusions of the control variables effect on *per capita* growth. In what concerns the taxation thresholds existence, we obtain maximum average values of 10.80% and 10.58% for social security contributions and for taxes on goods and services, respectively. We also reach two optimal average values of maximum taxation for taxes on payroll and workforce (1.95%), while property taxes appear to not present a non-linear connection with economic growth.

Table 4: Linear and non-linear long-run impact results of taxation structure on economic growth dynamics for equation (1).

	OLS		OLS-FE		GMM		RLS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$lngdppc_{-1}$	-0.000***	-0.000***	-0.000***	-0.000***	-0.000**	0.000**	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$taxinc$	0.035	-0.007	-0.203***	-0.302*	0.058	-0.029	0.073***	-0.020
	(0.043)	(0.072)	(0.078)	(0.178)	(0.062)	(0.109)	(0.027)	(0.052)
$taxinc^2$		0.002		0.003		0.005*		0.004**
		(0.002)		(0.006)		(0.003)		(0.002)
$taxfirms$	-0.009	0.113	0.043	0.394***	0.002	0.458**	0.028	0.180*
	(0.041)	(0.119)	(0.073)	(0.148)	(0.054)	(0.186)	(0.037)	(0.107)
$taxfirms^2$		-0.017*		-0.029***		-0.049***		-0.015
		(0.010)		(0.009)		(0.018)		(0.010)
ssc	0.078*	0.385***	-0.170	0.103	0.107	0.497***	0.142***	0.373***
	(0.041)	(0.064)	(0.120)	(0.498)	(0.054)	(0.087)	(0.022)	(0.052)
ssc^2		-0.020***		-0.014		-0.024***		-0.015***
		(0.003)		(0.021)		(0.004)		(0.003)
$taxpayroll$	0.023	0.506***	0.219	0.470	0.091	0.683**	0.115*	0.381**
	(0.070)	(0.184)	(0.151)	(0.322)	(0.094)	(0.265)	(0.063)	(0.171)
$taxpayroll^2$		-0.141***		-0.082		-0.162**		-0.066
		(0.048)		(0.058)		(0.070)		(0.051)
$taxprop$	0.060	0.469	-0.726***	-1.766**	-0.026	-0.057	0.196***	0.445*
	(0.076)	(0.290)	(0.272)	(0.846)	(0.088)	(0.378)	(0.057)	(0.245)
$taxprop^2$		-0.138**		0.232		-0.042		-0.076
		(0.065)		(0.142)		(0.080)		(0.055)
$taxvat$	-0.006	0.499***	-0.406***	-0.852***	0.018	0.378**	0.060*	0.256**
	(0.056)	(0.152)	(0.119)	(0.324)	(0.071)	(0.181)	(0.031)	(0.117)
$taxvat^2$		-0.026***		0.022		-0.018**		-0.011*
		(0.007)		(0.014)		(0.008)		(0.006)
$gfcfgr$	0.044***	0.040***	0.031***	0.029***	0.094***	0.079***	0.023***	0.021***
	(0.012)	(0.011)	(0.009)	(0.009)	(0.028)	(0.026)	(0.007)	(0.007)

current	0.024	0.010	-0.027	-0.027	-0.020	-0.033	0.020*	0.000
	(0.015)	(0.017)	(0.020)	(0.021)	(0.022)	(0.025)	(0.011)	(0.012)
ltir	-0.006	0.003	-0.091*	-0.098*	0.074	0.149*	0.058**	0.080***
	(0.045)	(0.049)	(0.052)	(0.054)	(0.073)	(0.082)	(0.025)	(0.027)
avg	0.001**	0.000	-0.001	0.000	0.000	-0.001	0.001***	0.000
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
unem	0.002	-0.026	-0.110***	-0.104***	0.005	-0.010	-0.008	-0.026
	(0.029)	(0.028)	(0.036)	(0.037)	(0.035)	(0.037)	(0.015)	(0.016)
capb	-0.084**	-0.059	0.073	0.066	-0.075	-0.065	-0.066***	-0.041
	(0.037)	(0.039)	(0.048)	(0.047)	(0.070)	(0.080)	(0.025)	(0.026)
debt	-0.018***	-0.016***	0.016***	0.020***	-0.012***	-0.011**	-0.015***	-0.015***
	(0.003)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.002)	(0.002)
totexp	-0.036	-0.037	0.024	0.020	-0.069	-0.091	-0.077***	-0.071***
	(0.041)	(0.042)	(0.048)	(0.046)	(0.056)	(0.061)	(0.018)	(0.019)
Tax threshold								
taxinc	-	-	-	-	-	-	-	-
taxfirms	-	-	-	6.79%	-	4.67%	-	-
ssc	-	9.63%	-	-	-	10.35%	-	12.43%
taxpayroll	-	1.79%	-	-	-	2.11%	-	-
taxprop	-	-	-	-	-	-	-	-
taxvat	-	9.60%	-	-	-	10.50%	-	11.64%
R-squared	0.390	0.440	0.781	0.788	0.288	0.343	0.338	0.359
Durbin-Watson stat	0.433	0.472	0.804	0.848	0.749	0.770	n.a.	n.a.
Obs.	525	525	525	525	491	491	525	525

Notes: *, ** and *** represent statistical significance at levels of 10%, 5% and 1% respectively. The robust standard errors are in brackets. The White diagonal covariance matrix is used in order to assume residual heterokedasticity, with the exception for RLS technique. The DW-statistic is the Durbin-Watson statistic. The non-bold and bold values express, respectively, maximum and minimum optimal tax items levels.

For the regressions in the long run using the second set of control variables, we obtain the following optimal maximum tax items thresholds values: 7.61% for social security contributions, 3.08% for taxes on payroll, 3.87% for property taxation and 10.88% for consumption taxation, both values on average.

Additionally, similar results for the long-run are reached for the control variables impact on real *per capita* GDP growth, when compared to those obtained in the short-run regressions. In particular, the public spending by function evidence a negative impact for economic growth and, consequently, stronger negative affect of expenditures on environment activities. The monetary supply seems to loose statistical significance when it explains the long-term growth, while total factor productivity significance remains, although its impact on real growth is not so high in the long-term. Lastly, household consumption, fertility rate, old-age dependency ratio and life expectancy present the same conclusions as in the short-term analysis.

Table 5: Linear and non-linear long-run impact results of taxation structure on economic growth dynamics for equation (2).

	OLS		OLS-FE		GMM		RLS	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
$lngdppc_{-1}$	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
taxinc	-0.042	-0.030	0.108	0.075	-0.033	-0.087	-0.001	-0.008
	(0.031)	(0.058)	(0.068)	(0.160)	(0.048)	(0.085)	(0.028)	(0.049)

$taxinc^2$		0.000		-0.001		0.003		-0.001
		(0.002)		(0.006)		(0.003)		(0.002)
$taxfirms$	-0.022	0.102	0.169**	0.312*	-0.020	0.065	-0.012	-0.095
	(0.049)	(0.128)	(0.072)	(0.173)	(0.070)	(0.200)	(0.040)	(0.111)
$taxfirms^2$		-0.020**		-0.012		-0.014		-0.009
		(0.010)		(0.012)		(0.017)		(0.010)
ssc	-0.023	0.225***	-0.059	0.471	-0.014	0.324***	0.048*	0.308***
	(0.031)	(0.078)	(0.115)	(0.492)	(0.053)	(0.106)	(0.027)	(0.076)
ssc^2		-0.016***		-0.023		-0.020***		-0.020***
		(0.004)		(0.019)		(0.005)		(0.004)
$taxpayroll$	0.063	0.138	0.428**	1.047**	0.099	0.484**	0.103	0.028
	(0.056)	(0.165)	(0.193)	(0.405)	(0.065)	(0.234)	(0.067)	(0.183)
$taxpayroll^2$		-0.024		-0.170**		-0.107		0.018
		(0.048)		(0.076)		(0.073)		(0.056)
$taxprop$	0.275***	0.774***	-0.149	-1.142	0.438**	1.195**	0.251***	0.988***
	(0.094)	(0.245)	(0.155)	(0.697)	(0.184)	(0.505)	(0.078)	(0.190)
$taxprop^2$		-0.102***		0.130		-0.194		-0.125***
		(0.039)		(0.082)		(0.118)		(0.034)
$taxvat$	-0.129**	0.470***	0.089	0.702**	-0.064	0.642**	-0.011	0.466***
	(0.056)	(0.161)	(0.093)	(0.339)	(0.071)	(0.292)	(0.040)	(0.133)
$taxvat^2$		-0.027***		-0.024*		-0.032**		-0.023***
		(0.007)		(0.014)		(0.013)		(0.006)
$pubser$	-0.129***	-0.164***	-0.063	-0.111	-0.167**	-0.206***	-0.142***	-0.183***
	(0.040)	(0.039)	(0.069)	(0.071)	(0.076)	(0.074)	(0.030)	(0.030)
def	-0.106	-0.127	0.160	0.197	-0.101	-0.199*	0.027	-0.046
	(0.080)	(0.084)	(0.184)	(0.198)	(0.115)	(0.113)	(0.063)	(0.065)
$pubor$	0.059	-0.403*	-0.089	-0.087	-0.015	-0.487	-0.392**	-0.574***
	(0.214)	(0.207)	(0.407)	(0.408)	(0.288)	(0.311)	(0.186)	(0.189)
eco	0.004	0.012	0.076	0.075	0.117	0.156	-0.059**	0.046
	(0.059)	(0.054)	(0.057)	(0.051)	(0.270)	(0.269)	(0.030)	(0.028)
env	-1.740***	-1.428***	-2.512***	-2.423***	-2.193***	-1.801***	-1.026***	-0.642***
	(0.278)	(0.286)	(0.448)	(0.458)	(0.504)	(0.525)	(0.207)	(0.210)
hou	0.039	-0.101	0.007	0.039	0.136	-0.227	0.121	0.124
	(0.148)	(0.164)	(0.157)	(0.166)	(0.472)	(0.487)	(0.121)	(0.117)
hea	0.148**	0.165**	0.152	0.168	0.081	0.110	-0.005	0.135***
	(0.062)	(0.069)	(0.149)	(0.166)	(0.102)	(0.118)	(0.046)	(0.046)
cul	-0.304	-0.087	0.685*	0.946***	-0.409	-0.234	-0.011	-0.350**
	(0.238)	(0.248)	(0.358)	(0.356)	(0.269)	(0.296)	(0.150)	(0.154)
edu	-0.185**	-0.216**	0.103	0.046	-0.266**	-0.273	-0.121	-0.254***
	(0.083)	(0.088)	(0.199)	(0.204)	(0.119)	(0.169)	(0.078)	(0.079)
$socpro$	-0.008	0.018	-0.277***	-0.280***	-0.024	-0.012	-0.026	0.048**
	(0.028)	(0.030)	(0.081)	(0.083)	(0.038)	(0.042)	(0.022)	(0.024)
$llgdp$	0.001	-0.000	0.007	0.006	0.002	0.002	0.001	-0.003
	(0.002)	(0.002)	(0.006)	(0.006)	(0.003)	(0.003)	(0.002)	(0.002)
$\log(pop)$	-0.223**	-0.187*	11.093***	9.345***	-0.184	-0.103	-0.162**	-0.282***
	(0.099)	(0.108)	(2.465)	(2.689)	(0.174)	(0.216)	(0.068)	(0.069)
$rtfpna$	-0.001	-0.364	4.635***	3.597**	-0.796	-1.320	1.041	0.808
	(1.047)	(1.076)	(1.558)	(1.617)	(1.322)	(1.370)	(0.753)	(0.756)
$ageratioold$	-0.079***	-0.077***	0.109**	0.066	-0.078***	-0.073***	-0.076***	-0.113***
	(0.019)	(0.020)	(0.052)	(0.055)	(0.024)	(0.028)	(0.017)	(0.016)
$fertility$	-0.191	-0.338	-2.388***	-2.184***	-0.264	-0.056	-0.607**	-0.538**
	(0.334)	(0.357)	(0.716)	(0.758)	(0.445)	(0.471)	(0.273)	(0.270)
$hconsggdp$	-0.103***	-0.104***	-0.078*	-0.057	-0.105***	-0.094**	-0.053***	-0.084***
	(0.022)	(0.022)	(0.044)	(0.045)	(0.037)	(0.038)	(0.016)	(0.015)
$landarea$	-0.000**	0.000	-0.000	-0.000	-0.000**	0.000	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$lexpectancy$	-0.244***	-0.280***	-0.251	-0.205	-0.220***	-0.269***	-0.215***	-0.226***
	(0.033)	(0.036)	(0.189)	(0.193)	(0.041)	(0.050)	(0.029)	(0.030)
Tax thresholds								
taxinc	-	-	-	-	-	-	-	-
taxfirms	-	-	-	-	-	-	-	-
ssc	-	7.03%	-	-	-	8.10%	-	7.70%
taxpayroll	-	-	-	3.08%	-	-	-	-
taxprop	-	3.79%	-	-	-	-	-	3.95%

taxvat	-	8.72%	-	25.07%	-	10.03%	-	10.13%
R-squared	0.636	0.662	0.796	0.803	0.631	0.649	0.475	0.509
Durbin-Watson stat	0.537	0.570	0.808	0.839	0.545	0.598	n.a.	n.a.
Obs.	536	536	536	536	500	500	536	536

Notes: *, ** and *** represent statistical significance at levels of 10%, 5% and 1% respectively. The robust standard errors are in brackets. The White diagonal covariance matrix is used in order to assume residual heterokedasticity, with the exception for RLS technique. The DW-statistic is the Durbin-Watson statistic. The non-bold and bold values express, respectively, maximum and minimum optimal tax items levels.

5 Concluding Remarks

In this analysis, we have evaluated the relationship between the tax structure in proportion of GDP and real per capita economic growth. This study was conducted in both short-term and a long-term basis, and tried to assess possible non-linear relationships between taxation and growth. The analyses conducted for all OECD countries between 1980 and 2015 resorts to two set of control variables, in order to understand the tax structure impacts on GDP growth.

The results reached in this study evidence the tax-to-GDP thresholds idea, which translates into optimal maximum values for some tax items, in proportion of GDP. In particular, and only in a short-term basis, we found optimal maximum values for taxes on firms, while the social security contributions, taxes on payroll and workforce, taxes on property and taxes on consumption present threshold values for both short and long-term. Furthermore, we conclude that there are no optimal threshold values for taxation of individual incomes.

Lastly, and by comparing our results with the mean values of each tax item presented in the summary statistics, we verify that the historic mean value for consumption taxes is coincident with the threshold value registered for that tax source in the end. In addition, we verify that there is a fiscal space to raise some tax revenues, in GDP proportion, by confronting the obtained threshold results with average historic values. This will lead to a raise in government revenues without jeopardizing the economic performance. This is valid for taxes on firms, for social security contributions (this last is only valid except for the second econometric specification in a long-run analysis), taxes on payroll and workforce, and property taxes.

Furthermore, an additional hypothetical exercise can be made: if we sum the thresholds finding values with the average mean of the other tax components that do not display threshold values, we conclude that the proportion of taxation levied on GDP should be between 40.20% and 46.99%, in a short-term perspective, and between 37.07% and 39.63%, in a long-run framework, depending on the results obtained for the first and second set of control variables used in our analysis. Taking into account this exercise and the mean values for total revenues (32.95%, based on OECD data), we can conclude that, on average, there was fiscal space to increase tax-to-GDP ratio and, consequently, to increase both short and long-run real per capita economic growth. The table 6 summarizes our main findings regarding average tax threshold values.

Table 6: Summary of tax items threshold values for *per capita* real GDP growth rate.

	(1)		(2)		
	Short-run	Long-run	Short-run	Long-run	**Mean**
taxinc	-	-	-	-	8.82%
taxfirms	*5.82%*	*5.73%*	-	-	2.81%
ssc	**17.15%** / *11.37%*	*10.80%*	*13.76%*	*7.61%*	8.35%
taxpayroll	*1.86%*	*1.95%*	2.50%	3.08%	0.37%
taxprop	-	-	4.58%	*3.87%*	1.75%
taxvat	-	*10.58%*	*14.52%*	*10.88%*	10.59%

Notes: The non-bold and bold values, presented in the short-run and long-run columns express maximum and minimum optimum levels, respectively. The values expressed in *italics* represent average values.

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