

## Tax and macroeconomic framework. The case of Greece

**Panagiotis ASIMAKOPOULOS**

Athens University of Economics and Business, Greece  
asimakop@aueb.gr

**Abstract.** *The aim of this paper is to analyze the impact of taxation in Greece from 1974 to 2018 and highlight key recommendations for policymakers and tax authority to contribute further to strategic planning, revenue capacity, sustainability of public finance and efficient tax administration. The empirical part is vital to analyze and appraise the robustness of tax methodology in a purposeful way, highlight key recommendations for policymakers and tax authority to contribute further to strategic planning, revenue capacity, sustainability of public finance and efficient tax administration in Greece. Overall, the evaluation of the tax changes impact in Greece economy will be examined under the scope of macroeconomic performance and this plays a crucial role in the application of efficient strategies from tax authorities.*

**Keywords:** Greek tax legislation, tax policy, tax reforms.

**JEL Classification:** E62, E63.

## 1. Introduction

In this paper we try to explore the macroeconomic impact of taxation in Greece and highlight key recommendations for policymakers and tax authority to contribute further to strategic planning, revenue capacity, sustainability of public finance and efficient tax administration.

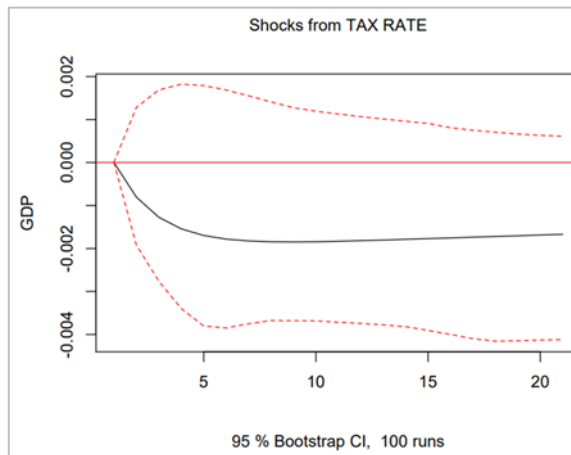
## 2. Literature Review

At first, we focus on a literature review that provides robust evidence on the relationship between tax policy and economic growth. Numerous studies analyze the relationship of taxation and economic growth not only concept of endogenous growth models, but also within the framework of dynamic modeling and the newly developed approach of narrative methods. Indicatively distinguished studies which examined the relationship between tax changes and reforms, tax structure, fiscal policy and their impact on economic growth and other macroeconomic variables included Helms (1985), Barro (1990), Koester and Kormendi (1989), Barro and Martin (1992), Engen and Skinner (1992), Easterly & Rebelo (1993), Pecorino (1994), Alesina and Rodrik (1994), Stokey and Rebelo (1995), Jones et al. (1993), Lehmussaari (1990) and Marsden (1990) and Trella and Whalley (1991, 1992), Barro (1991, 1992) King and Rebelo (1990) Easterly and Rebelo (1993), Devereux and Love (1995), Slemrod (1995), Zee (1996). Also, Alesina and Perotti, (1995), Engen and Skinner (1996), Alesina and Perotti (1995) Padovano and Galli (2001), Gale and Potter (2002), Li and Sarte (2004), Lee and Gordon (2005) and Tosun and Abizadeh, (2005), Moreover, Daveri and Tabellini (2000) Widmalm (2001), Levine and Renelt (1992) J. Agell, T. Lindlh and H. Ohlsson (1996), Jang-Ting Guo and Kevin J. Lansing (1997). Moreover, Mendoza et al. (1997), Gemmell et al., (1999), Myles, (2000), Myles (2009) Steven P. Cassou and Kevin J. Lansing (2003), Daveri and Tabellini (2000), Widmalm (2001) Levine and Renelt (1992), Kerr and MacDonald (1999), Anastasiou and Dritsaki (2005), Myles (2007). Johansson et al. (2008) Arnold et al. (2011). Mendoza et al., (1994) proposed methodology to compute effective tax rates. For relevant studies on effective tax rates and their impact on economic performance see Martinez-Mongay (2000), Carey and Tchilinguirian (2000) and Carey and Rabesona (2002), Trabandt and Uhlig (2011), Papageorgiou et al. (2012). Also see McDaniel (2007), Dellas et al. (2017), Kollintzas, Papageorgiou and Vasilatos (2010). Papageorgiou et al. (2011). Also relevant studies on taxation and economic growth included Pjesky, (2006) Marcellino, (2006) Bania et al. (2007) Reed, (2008). Arnold (2008), K. Angelopoulos, J. Malley, A. Philippopoulos (2008) Gemmell et al. (2011) Ferede and Dahlby, (2012), McBride (2012), Huang and Frenztz (2014), Hungerford (2012) Gravelle (2014). Also, Gemmell et al. (2014). Gale and Samwick (2014) Gale et al. (2015) Li and Lin (2015) Also, Akgun et al. (2017), Galindo (2011) and Blochliger (2015) Jelena et al. (2018) Karras (2019). Zidar (2019) and Alinaghi (2021). As far as dynamic modeling is concerned, it is worth noting that distinguished examples on VAR approaches include Blanchard and Perotti (2002), Barro and Redlick (2011), Perotti (2002). Also, Alesina, et al. (2018) ,Mertens and Olea (2018), Alan et al (2021). Moreover, Mountford and Uhlig (2002, 2009), Hussain and Malik (2016), Jordà and Taylor (2016), Fieldhouse et al. (2017), Stock and Watson (2018), Mertens and Olea

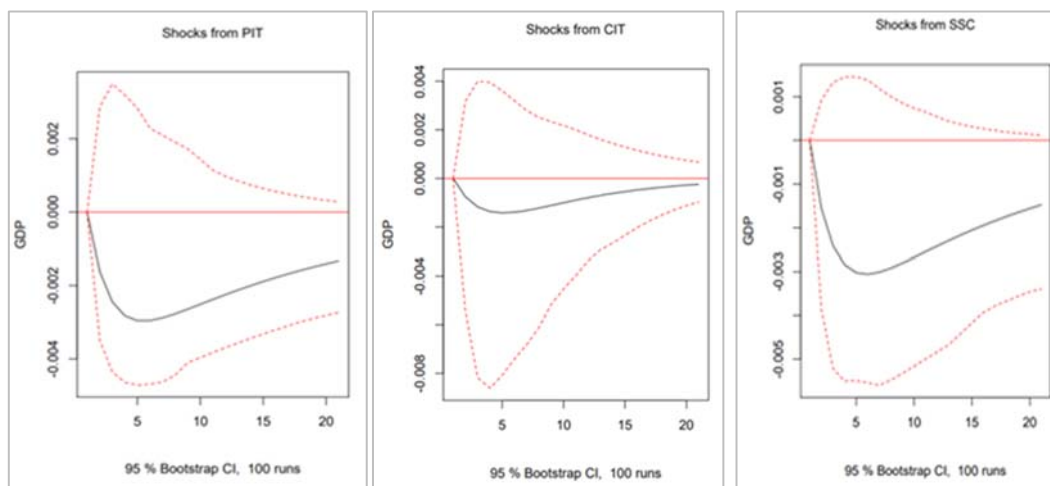
(2017), Ramey and Zubairy (2018). Afonso and Sousa (2012). A newly built up method for measuring the macroeconomic impact of tax changes is the narrative approach. This method is based on the legislative record to identify tax shocks and estimate their macroeconomic effects. This approach has been extensively used to estimate the impact of monetary policy in Romer and Romer (1989, 2004), government spending in Ramey and Shapiro (1998) and Ramey (2011) and for fiscal consolidations Guajardo et al. (2011). Romer and Romer, (2010) Also, Favero and Giavazzi, (2009), Favero and Giavazzi, (2010, 2012), Cloyne (2011). In Devries et al., (2011), Also, Perotti (2012 Favero and Giavazzi (2012), and Perotti (2012) thoughtfully discuss and compare the two approaches. For Narrative tax datasets see for Country-specific: Romer and Romer (2010), Cloyne (2013), Uhl (2013), Lopes (2015), Pereira and Wemans (2015), Gechert et al. (2016), Gil et al. (2018), Loate et al (2021). For Cross-country see Devries et al. (2011), Alesina et al. (2015, 2017), Gunter et al. (2019), David and Leigh (2018). For identification problem in narrative and VAR see Leeper (1997). Alesina, Favero and Giavazzi (2012) Guajardo et al., (2014) Furthermore, Mertens and Ravn (2013), Cloyne (2013). Guajardo et al., (2014) investigate the short-term effects of fiscal consolidation on economic activity in OECD economies by examining the contemporaneous historical narrative records. Moreover, Romer and Romer (2014), Mertens and Ravn (2014) Nughen et al (2016). Gunter et al (2017) Kato et al. (2018), Dabla-Norris and Lima (2018). Cloyne et al. (2018). Nguyen et al., (2020) Wan der Wielen (2020).

### 3. Tax Structure and Macroeconomic Framework, An Empirical Analysis

Regarding the data modeling, all the data are derived from OECD and The Conference Board Total Economy Database™, IMF and AMECO. At first, we focus on overall response of GDP growth from tax changes. So, we simply defined as a proxy for tax rate, total tax revenue as a percentage of GDP (TAX RATE) and employed it on annual real GDP growth. The same process we follow other tax aggregates such as Personal Income Tax (PIT), Corporate Income Tax (CIT), Property Tax (PT), Tax on Goods and Services (TOGS) and Social Security Contributions (SSC). The decomposition of tax revenue helps us to conclude regarding the impact of each different category of taxes in GDP growth. Another extension except for the decomposition of tax revenue is to analyze the macroeconomic impact of tax reforms in GDP aggregates and other macroeconomic determinants. Instead of looking at aggregate GDP, we now investigate the effects of the tax rate on unemployment (UNM), inflation (INF) as annual growth rates and other national accounts such as gross fixed capital formation (GFCF), general government consumption expenditure (GGCE) and household consumption (HSCONS) as percentage of GDP. As we have already mentioned we start with the simplest dynamic relationship that can capture the responses of GDP growth to changes in the total tax rate (revenue % GDP). Figure 1 shows the responses of GDP growth to an increase in the tax rate by 1% and more specifically falls at initial level by about a one percentage point, and then continues declining to a long-run decrease of approximately 0.2%. Thus, a positive shock to tax revenue by 1% has a negative effect on output by 0,2% on the long run. We also provide with VAR estimation results and diagnostics.

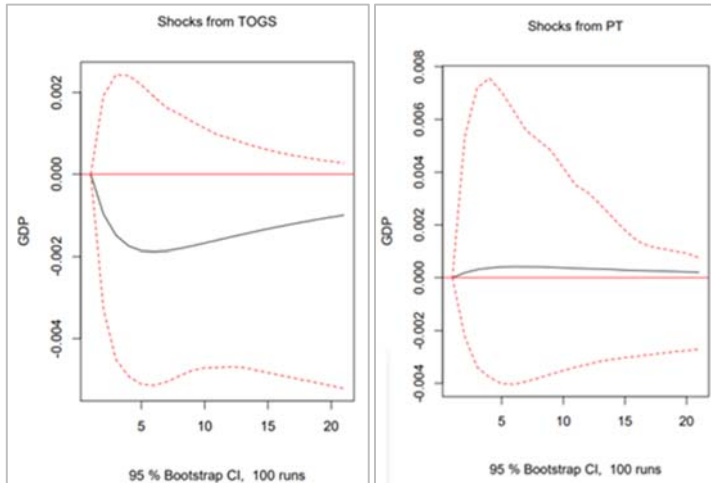
**Figure 1.** Impulse Response Functions GDP growth and TAX RATE

The first extension is the decomposition of tax revenues and their impact on GDP growth. It is obvious that positive effect on tax rates has negative effect on output. Concerning personal income taxes, we observe a long run decrease of 0,2% after a sharp decrease at first place while it seems that corporate income tax has smoother and clearer trend not affecting GDP growth to the extent that personal income tax does and become neutral to the long run.

**Figure 2.** Impulse Response Functions GDP growth and Income Tax and SSC

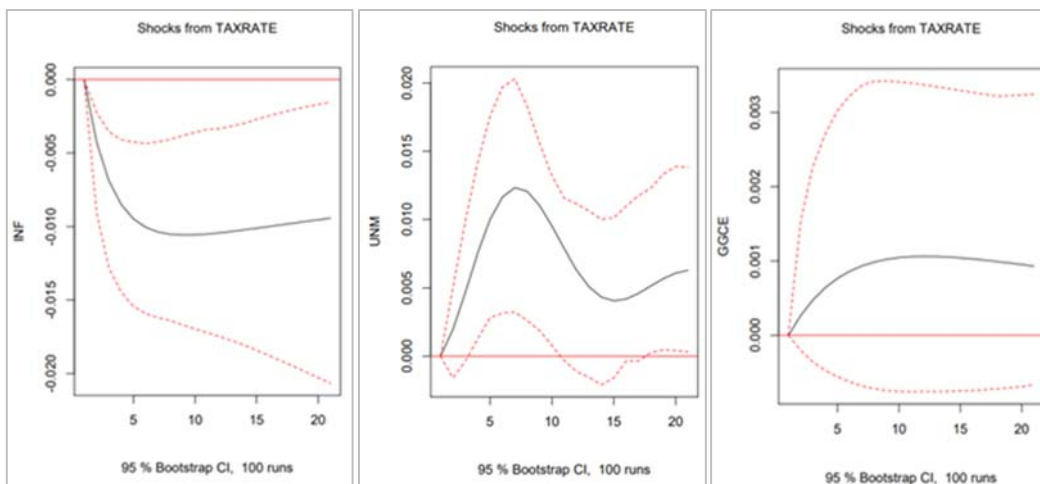
As it is clearly shown from Figure 2, Social Security Contributions has negative effect on GDP growth, with an initial decrease at 0,3% and a long run decrease of 0,2%. Furthermore, concerning other taxes positive effects on Tax on Goods and Services (TOGS) negatively affect long run decrease below of 0, 2% while positive effect on property taxes has neutral effect on GDP growth.

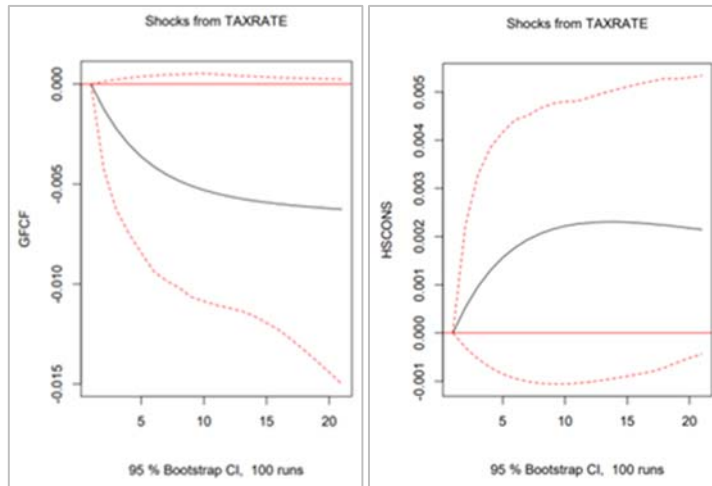
**Figure 3.** Impulse Response Functions GDP growth and Property Tax (PT) and Tax on Goods and Services (TOGS)



In this part we are going to analyze the macroeconomic impact of tax reforms in GDP aggregates. Instead of looking at aggregate GDP, we now investigate the effects of the tax rate on unemployment (UNM) which is negatively affect at first place and increase at 0,5% in the long run. As far inflation (INF) is concerned a negative response to positive tax shock is observed at 0, 1% on the long run. Gross fixed capital formation (GFCF) sharply decreased at 0,5% in the long run while general government consumption expenditure (GGCE) and household consumption (HSCONS) response positively to an increase from a tax shock at 0,1% and 0,2% respectively.

**Figure 4.** Impulse Response Functions GDP components and extensions and TAXRATE





### Fiscal Policy and Economic Growth (OLS Regression)

*Effects of fiscal policy on the economic growth in Greece 1974-2018*

Variable	Model 1	p-value	Model 2	p-value	Model 3	p-value	Model 4	p-value
constant	-0,060524	(0,3143)	0,102124	(0,0002)	0,068923	(0,0101)	0,042611	(0,0001)
Government Spending (% GDP)	-0,12913	(0,2261)	-0,198764	(0,0010)				
Tax Revenue (% GDP)	0,764877	(0,0042)			-0,190181	(0,0362)		
Debt (% GDP)	-0,093961	(0,0061)					-0,030466	(0,0020)
R-squared	0,371327		0,22496		0,098051		0,200878	
Adjusted R-squared	0,325327		0,206936		0,077075		0,182294	
Durbin-Watson	1,138521		0,808801		0,712215		0,789056	
F-statistic	8,07226		12,48101		4,674531		10,80904	
Prob (F- statistic)	0,000243		0,000996		0,03622		0,002018	
Obs	45		45		45		45	

*Taxation and Government Spending Greece 1974-2018*

*Taxation and Debt Greece 1974-2018*

Variable	Model 1	p-value	Variable	Model 1	p-value
constant	0,100138	(0,0091)	constant	1,515277	(0,0000)
Tax Revenue (% GDP)	1,191384	(0,0000)	Tax Revenue (% GDP)	8,527071	(0,0000)
R-squared	0,675763		R-squared	0,910817	
Adjusted R-squared	0,668223		Adjusted R-squared	0,908743	
Durbin-Watson	0,452527		Durbin-Watson	0,549237	
F-statistic	89,61907		F-statistic	439,1564	
Prob(F- statistic)	0		Prob(F- statistic)	0	
Obs	45		Obs	45	

Our empirical finding, as it is highlighted in the above table shows positive and strong relationship between taxation, government spending and debt while a fact is that taxation is less harmful to growth combined with government spending and debt. Moreover, taxation, government spending and debt have negatively relationship with growth. Our

analysis reveals that tax revenue and government spending are more harmful to growth than debt<sup>(1)</sup> and this can be explained that poor tax collection and increased government spending lead to high level of debt and thus policies should focus on preventive rationalization measures. In this context policy makers should adopt a strategy that limit government spending increase debt sustainability and maintain revenue capacity to a level not harmful to growth.

#### 4. Conclusions

To sum up we conduct a further analysis by applying regression between tax revenues by type of tax and GDP growth. At first, we conclude, aligned with previous empirical studies, that total tax revenues, personal income taxes, tax on goods and services and social security contributions have negative impact on GDP growth. Also, looking on their p-values, there is a statistically significance and negative relationship which also is complied with relevant literature. More specifically, results show that 1% increase in total tax revenue decrease GDP growth for 0,19%, a 1% increase in personal income taxes have negative impact of 1,09%, a 1% raise on social security contribution revenues have negative impact of 0,56% and tax on goods and services by 0,67%. On the other hand, our analysis reveals that despite the fact that corporate and property taxes have positive and negative impact on GDP growth respectively, they have no statistically meaningful impact on growth in terms of statistical significance. The latter may be attributed to further investigation by examining specific tax bases characteristics, structure of the economy, and poor revenue evolution per GDP. Thus, using VAR models and impulse response functions we focus on the effect of tax rate on real GDP growth not only at overall level but also per type of tax. In addition, we examine the effects on tax revenue on unemployment, inflation and other national accounts such as gross fixed capital formation, general government consumption expenditure and household consumption. More specifically, GDP growth falls to an 1% increase in the tax rate by about a one percentage point at first place, and then continues declining to a long-run decrease of approximately 0.2%. Thus, a positive shock to tax revenue has a negative effect on output. The first extension that we made is the decomposition of tax revenues and their impact on GDP growth. It is obvious from our analysis that positive effect on tax rates has negative effect on output. Concerning personal income taxes, we observe a long run decrease of 0,2% after a sharp decrease at first place while it seems that corporate income tax has smoother and clearer trend not affecting growth to the extent that personal income tax does. Also, social security contributions have negative effect on growth, with an initial decrease at 0, 3% and a long run decrease of 0, 2%. Concerning other taxes, tax on goods and services negatively affect long run growth with decrease below of 0,2% while property taxes has neutral effect on GDP growth. Another contribution is the fact that we analyze the macroeconomic impact of tax reforms on GDP aggregates and other macroeconomic determinants. Instead of looking at aggregate GDP, we investigate the effects of the tax rate on unemployment which is negatively affect at 0, 5% in the long run. As far inflation is concerned a negative response to positive tax shock is observed at 0, 1% on the long run. Gross fixed capital formation sharply decreased and followed 0,5% in the long run while general government consumption expenditure and household consumption response

positively to an increase from a tax shock at 0,1% and 0,2% respectively. Having in mind, the crucial role of government spending and debt sustainability we apply a general model that enables us to estimate the impacts of the fiscal policy on economic growth. Thus, the equations consist of annual growth rate of GDP, government spending, total tax revenue and gross debt. Our empirical findings show positive and strong relationship between taxation government spending and debt while a fact is that taxation is less harmful to growth compared with other two variables, government spending and debt respectively. In this context policy makers should adopt a strategy that promote rationalization of government spending and debt sustainability and maintain revenue capacity to a level not harmful to long growth. Thus, the empirical part is vital to analyze and appraise the robustness of tax methodology in a purposeful way, highlight key recommendations for policymakers and tax authority to contribute further to strategic planning, revenue capacity, sustainability of public finance and efficient tax administration in Greece. Overall, the evaluation of the tax changes impact in Greece economy will be examined under the scope of macroeconomic performance and this plays a crucial role in the application of efficient strategies from tax authorities.

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#### Note

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<sup>(1)</sup> Coefficient at 0,19 compared to 0,03.

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