



**A Panel Data Econometric Study of Corporate Tax Revenue
in European Union:
Structural, Cyclical Business and Institutional Determinants**

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Resumo

Este estudo analisa os determinantes económicos da receita fiscal proveniente da tributação dos rendimentos empresariais nos países da União Europeia durante o período de 1998 a 2009.

Os resultados das regressões FGLS sugerem que factores estruturais, cíclicos, internacionais e institucionais tais como o PIB, o Deficit Governamental, o Volume de Negócios da Indústria, o Desemprego, o Numero de Empresas, o Grau de Abertura ao Exterior, o Investimento Directo do Estrangeiro e a Corrupção afectam o montante das receitas fiscais de uma economia. Assim, os resultados demonstram que a Taxa de Desemprego e a Corrupção têm um efeito adverso na arrecadação de impostos, enquanto os restantes factores analisados contribuem positivamente para tal recolha.

Na presente análise também utilizámos como factores explicativos as variáveis fiscais Taxa Média Efectiva de Imposto e Taxa Marginal Efectiva de Imposto. Os resultados empíricos indicam uma relação parabólica entre a receita fiscal proveniente da tributação dos rendimentos empresariais e a Taxa Marginal Efectiva de Imposto, reforçando a hipótese de existência de uma curva de Laffer.

Adicionalmente, os resultados obtidos sugerem que os últimos dois anos de alargamento da União Europeia parecem não influenciar o rácio receita fiscal/PIB. E, por fim, obtivemos evidência empírica de que factores específicos de determinados países (Grécia, Portugal e Espanha) afectam positivamente a receita fiscal.

Palavras-chave Receita Fiscal do Sector Empresarial, Taxa Média Efectiva de Imposto, Taxa Marginal Efectiva de Imposto, Corrupção, Curva de Laffer

Classificação JEL H25, H26

Abstract

This paper studies the economic determinants of corporate tax revenue to GDP across European Union members over the period 1998-2009.

The FGLS regression results suggest that structural, cyclical, international and institutional factors such as GDP, Government Deficit, Industry Turnover, Unemployment, Number of Enterprises, Trade Openness, FDI and Corruption affect revenue performance of an economy. Thus, the findings show that Unemployment Rate and Corruption have an adverse effect on tax collection, while the other analysed factors contribute to a better performance concerning tax collection.

In the present paper we also consider as explanatory factors the tax variables EATR and EMTR. In fact, empirical results indicate a parabolic relationship between EMTR and corporate tax revenues, reinforcing the hypothesis of the existence of a Laffer curve.

Our findings also suggest that the last two years of European Union enlargement are likely not to have had effect in corporate tax revenue to GDP. In addition, specific factors of some countries (Greece, Portugal and Spain) seem to positively affect corporate revenues.

Keywords Corporate Tax Revenue, Effective Average Tax Rate, Effective Marginal Tax Rate, Corruption, Laffer Curve

JEL Classification H25, H26

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Commonly used acronyms

EATR	Effective Average Tax Rate
EMTR	Effective Marginal Tax Rate
ES	Spain
EU	European Union
FDI	Foreign Direct Investment
FGLS	Feasible Generalized Least Squares
GDP	Gross Domestic Product
GOSMI	Gross Operating Surplus and Mixed Income
GR	Greece
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PT	Portugal
U.K.	United Kingdom
U.S.	United States of America

1. Introduction

The economic crisis that the world faced in recent years has decisively contributed to the current instability in the Europe, triggering a new crisis which may be entitled “*Sovereign Debt Crises*”.

The debt levels of European nations have increased in recent years threatening the integrity of the Euro Zone.

Austerity measures, rescue plans, financing and refinancing of public debt are the current slogans of European leaders. In fact, there are deep financial and budgetary problems in the European Union members that require clear and decisive orders.

We are aware that the recovery process will be uneven, with a higher growth rate in some countries than others and several further reasons can justify such differences.

Given that fiscal policy is currently one of the main macroeconomic policy instruments available in each country, our analysis will focus in the fiscal policy on the revenue side; more precisely, we will study the main economic determinants of corporate tax revenue in European Union over the period 1998-2009.

In this context it is important to highlight that we chose not to analyze the tax revenue as a whole but only the corporate tax revenue, taking into consideration the relevant role of corporate sector – the creation of new businesses and their investments, as well as the added value generated by them, which contribute to economic growth and development of a country.

In this sense, the purpose of this paper is to study the effect of structural, cyclical, international and institutional variables on the corporate revenue performance. We will analyze the impact of GDP, Government Deficit, Unemployment, Industrial Turnover, Trade Openness, High-tech exports, Corruption and other variables on the ratio of corporate tax revenue to GDP.

We must refer that, regarding this topic, there is a considerable number of studies. Some of them focus their analysis on the determinants of the government revenue, and some emphasize the factors to set the tax rates, while others examine the controversy relationship

between tax rates and revenues. While some authors study developed countries, others prefer to understand developing countries. Notwithstanding, literature review shall be discussed in detail on Chapter 2 of this document.

Although some previous studies focus on the OECD members, developing countries or even a small number of European Union members (EU15), in a few years, in the present analysis we will extend the literature taking into account the 27 European Union members for the period 1998-2009.

Besides the more recent time series and the broader sample of European Union members, this paper explores the effective tax burden employing the EATR and the EMTR as exogenous tax variables.

With this analysis we would like to answer questions as simple as: Does a variation in the EATR or EMTR trigger a change in corporate tax revenue? Is there a revenue-maximizing corporate income tax rate? Does Government Deficit or Trade Openness or still Corruption affect corporate tax revenue?

To help answering these and other questions we use econometric specifications applying the panel FGLS cross-section weights method.

This paper is organized as follows: In Chapter 2, we analyze some papers that provide a theoretical and empirical knowledge about the present study; In Chapter 3, we explain the data and methodology adopted; Chapter 4 shows the empirical analysis and results; and, finally, Chapter 5 points out the main conclusions.

2. Literature review

The main determinants of tax revenue, corporate tax rate, as well as the paradox between corporate tax rate and its revenue have attracted the attention of many different researchers.

In this sense, there is a considerable set of studies examining the trends in corporate tax revenues, corporate income tax rates and, on the other hand, the relevant factors that influence these variables triggering the observed trends and fluctuations.

It is important to refer that most of the aforementioned analysis is focused on developed countries, but many other studies have focused their attention in developing countries, stressing institutional factors, which are characteristic of these countries.

This Chapter is divided into four parts:

- In “2.1. The determinants of corporate tax revenues” we briefly describe previous studies that analyze the effect of corporate profitability, foreign investment, statutory tax rate and tax base on revenues;
- “2.2. The determinants of corporate tax rates” outlines the effect of economic integration, initial rate, trade openness, country size and the relationship between corporate tax rate and individual tax rate on corporate income tax rates;
- “2.3. The determinants of tax revenue in developing countries” describes the impact of per capita income, imports, exports, agriculture, foreign debt and corruption on corporate tax revenue in developing countries;
- In “2.4. The corporate income tax rate – tax revenue paradox” we outline the controversy trends between tax rate and tax revenue, which could be explained, according to previous literature, by rising of profits, increasing of corporatization, income shifting and changes in effective tax burden.

2.1. The determinants of corporate tax revenues

The corporate sector and all its surrounding are important determinants of tax revenues. Nevertheless, will be profits or losses an immediate influence of tax revenues? Auerbach and Poterba (1988) consider the sources of the decline in U.S. corporate income tax

revenues over the period 1959-1985. Douglas (1990) does a similar analysis for Canada over the period 1960-1985.

Both papers decompose the tax revenue share into the tax rate and the profit rate, as $\text{Taxes/Assets} = \text{Taxes/Profits} * \text{Profits/Assets}$, and they both conclude that it is declining profitability, rather than declining tax rates, that explains the bulk of the reduction in corporate income tax revenues.

However, the sources of the declining profitability are not systematically addressed, and the tax rate formulation does not allow a separate consideration of the statutory tax rate and the tax base.

Still in the corporate sector, Bartelsman and Beetsma (2003) consider the related question of how tax motivated transfer pricing issues affect corporate income tax revenues. Their empirical approach relates differences in tax rates (between the country and the OECD average) to a ratio of value added to labor compensation, with a data set that considers this relationship for 16 countries over 19 years (1979-1997). Findings indicate a negative relationship between value added and country tax rates, evidence that the authors interpret as indicating profit shifting toward low-tax countries. Therefore, the authors suggest that a one percent increase in the corporate income tax rate will lead to a small decrease in corporate tax revenues.

Another important factor that intuitively determines tax revenues is the country's relationship with foreign countries. Gropp and Kostial (2000) e Bénassy-Quéré et al. (2000) both consider the connection between foreign investment, tax rates, and corporate tax revenues. Both analyses demonstrate that foreign investment is sensitive to tax rate differences. Gropp and Kostial find that this effect is statistically significantly larger for countries that exempt foreign income from taxation. The subsequent papers proceed to perform simulated calculations regarding how European Union tax rate harmonization would affect revenues in European Union countries. Gropp and Kostial suggest that high tax countries would gain revenue from harmonization. Additionally, both studies find that the net foreign direct investment positions of European Union countries are likely to be affected.

Despite all factors mentioned above, the corporate income tax base cannot be forgotten. Thus, Devereux et al. (2004) consider U.K. corporate tax revenues between 1980 and 2004, focusing on the puzzling combination of reductions in corporate statutory tax rates and increases in corporate revenue. They conclude that this puzzle is partially a result of measures that increased the breadth of the corporate income tax base. In addition, the growing size and profitability of the financial sector is likely to have increased the taxable income generated by the corporate sector.

Still in line with the above mentioned rationale, Clausing (2007) studies variation among OECD countries in the size of corporate income tax revenues relative to GDP over the period 1979-2002. The decomposition explains such variation as a function of the statutory tax rate, the breadth of the tax base, corporate profitability, and the share of the corporate sector in GDP. Empirical results indicate a parabolic relationship between tax rates and revenues, implying a revenue-maximizing corporate income tax rate of 33% for the whole sample. This revenue-maximizing rate is found to decrease as economies are smaller and more integrated with the world economy.

Likewise, Stinespring (2009) addressed the hypothesis of the existence of a Laffer curve for the corporate income tax. His studies estimate the impact of corporate income tax rates on corporate tax revenue at the state level over the period 1996-2007. Following standard theoretical constructions, corporate income tax revenues are characterized as a quadratic function of the corporate tax rate, which support the hypothesis under consideration. Results also show the revenue-maximizing corporate tax rate has declined over time. The rates range from 8.52% to 9.32% for the time period 1996-2002 and 6.03% to 7.47% over 2004-2007.

2.2. The determinants of corporate tax rates

Taking into consideration the above, the determinants of corporate tax rates should also be pointed out instead of the determinants of tax revenues. Hence, concerning the present subject, it would be interesting to address the question of how countries set their corporate tax rates.

Economic integration could be a factor of the strength of agglomerative forces, which establish the link between economic integration and tax competition. For this reason, Bretschger and Hettich (2002) examine the determinants of corporate income tax rates for 14 OECD countries between 1967 and 1996 and they find evidence in support of the hypothesis that greater international integration will lower corporate income tax rates. Rodrik (1997) has a similar finding.

In addition, the tax background could also be an indicator of the current fiscal situation. Mutti (2003) considers the determinants of changes in corporate income tax rates across countries. The analysis focuses on 60 countries in the years 1984, 1992, and 1996. He considers how the change in the corporate income tax rate is affected by the initial rate and use in his analysis dummy variables for poor countries, small countries and openness. Mutti finds that small countries and countries with higher initial statutory tax rates are both likely to see greater reductions in their statutory corporate income tax rate than other countries. Furthermore, he admits the possibility that the individual and corporate rates are related.

Other authors emphasize the determinants of a company's effective tax burden. For example, Simon Loretz (2009) examined a large panel of nearly 8,000 bilateral effective tax rates within the OECD and suggests that country size is an important determinant of the effective tax rate. In line with the literature, bilateral tax rates with small host countries exhibit a smaller overall effective tax rate, despite the fact that larger countries are more likely to reduce the tax burden by means of tax treaties at a bilateral level. Further, they intend that Trade Openness is an aspect of economic integration (mobility factor) and expect a negative sign given the reduced scope for taxation, because mobile factors can respond faster to changes in taxation.

Another point of view is defended by Slemrod (2004). The author considers variation in corporate tax rates over 90 countries and 4 years (1980, 1985, 1990, and 1995). Dependent variables examined include the individual income tax rate, an interaction term with capital gains exclusion, government expenditure to GDP ratio, oil, electricity and measures of openness. He goes on to observe that in certain specifications of his model, a greater degree of openness predicts lower tax rates in certain years. Some evidence of a Laffer effect,

although not explicitly acknowledged by Slemrod, as he writes, “*While a policy of openness may contribute to driving down the rate of taxation per unit of investment, bigger, more globalized economies attract a higher base for corporate taxation, and, therefore, can collect more revenue from taxing corporate income*”.

Moreover, findings indicate some support to the notion that the corporate tax is a “backstop”¹ for the individual income tax. The author concludes that there is a strong and statistically significant relationship between these two tax rates in the analysis. Results also indicate that there is little evidence that corporate tax rates are driven by a country’s revenue needs and expenditures are not related to tax rates.

2.3. The determinants of tax revenue in developing countries

In this subsection the institutional factors and the characteristics of developing countries demonstrate their relevance. Lotz and Morss (1967) find that per capita income and trade share are determinants of the tax share, and this finding has been replicated since.

In a similar study, Tanzi (1992) finds that half of the variation in the tax ratio is explained by per capita income, import share, agriculture share and foreign debt share.

From another point of view, various studies explain that collection of tax revenue is one of the important areas where corruption is most likely to arise (Galtung (1995), Li (1997), Toye and Moore (1998), Tanzi (2000), Fjeldstad and Tungodden (2003)).

Some of the factors that contribute to corruption in tax system are as follows:

- A complex and fragmented tax system increases the demand for corruption. Tax auditors and tax payers get advantages through complex rules, unclear laws, regulations and procedures of tax system. Complexity of regulation often allows the authorities to use their flexible powers and mount corruption in the system;
- Complexity in the paying tax procedures leads to corruption;
- Another factor that fosters corruption is high tax rates, since they incentive tax evasion;

¹ See Clausing, Kimberly (2007), “Corporate tax revenues in OECD countries”.

- In order to indulge corrupt behavior, individuals compare its benefits with the risk of detection and punishment, they engage in corrupt activities if they feel that the expected punishment is low; and
- Finally, low wages of tax administration and tax payers also foster corruption.

In fact, the impact of corruption and tax evasion on tax revenue is not new in the field of public finance. In a series of paper Tanzi and Dvoodi (1997) have provided evidence that countries with high level of corruption tend to have lower collection of tax revenues in relation to GDP. Since some of the taxes paid by taxpayers are diverted away from public accounts.

Sanyal et al. (1998) investigate the relationship between corruption, tax evasion and Laffer curve. The study explains that a corrupt tax administration leads to Laffer curve behavior.

Ghura (1998) concludes that the tax ratio rises with income and degree of openness, and falls with the share of agriculture in GDP. He also finds that other factors like corruption, structural reforms and human capital development affect the tax ratio. While a rise in corruption is linked with a decline in tax ratio, structural reforms and an increase in the level of human capital are associated with an increase in tax ratio.

In the same way, Gupta (2007) studies the principal determinants of tax revenue performance across developing countries by using a broad dataset (105 countries over 25 years). The results confirm that structural factors, such as per capita GDP, agriculture share in GDP, trade openness and foreign aid, significantly affect the revenue performance of an economy. However, other factors such as corruption, political stability, share of direct and indirect taxes also affect tax revenue.

Bird, Martinez-Vasquez and Torgler (2004) find factors such as corruption, rule of law, entry regulations play key roles.

Similarly, Ajaz and Ahmed study institutional problems in developing countries, namely the corruption in tax administration and the low quality of governance. The study analyzes the effect of institutional and structural variables (corruption and governance) on tax revenues using panel data set for 25 developing countries during 1990- 2005. Once again,

the results show that corruption has an adverse effect on tax collection, while good governance contributes to better performance in tax collection.

To summarize, most studies find that per capita GDP and degree of openness is positively related to revenue performance, but a higher agriculture share and adverse institutional factors are more likely to lower it.

2.4. The corporate income tax rate – tax revenue paradox

As we will demonstrate in the following chapter, there are different trends in tax rate and tax revenue, while one increases the other shows significant falls.

In fact, these tendencies can be justified by a plenty of reasons related to, for example, a rise of profits, an increase of corporatization, or a growth of capital gains, besides changes in effective tax burden.

Auerbach (2006) points out a relatively stable ratio of U.S. federal tax revenues from non-financial corporations to GDP. He defends that this probably masks a declining ratio of corporate profits of these corporations relative to GDP and an increasing average tax rate on these profits. He claims that the average corporate tax rate rose steadily between 1996 and 2003 in large part because of the importance of tax losses, reflecting the asymmetric treatment of gains and losses under the corporate income tax and caused by a growing dispersion in profit outcomes among firms (i.e. many firms have losses even when the overall rate of profit is not low).

Sørensen (2006) argues that the rate-revenue paradox may be explained by an increasing corporatization, itself caused by subsequent decline of certain sectors in which non-corporate organizational form dominates, by the income shift between personal and corporate income and, finally, base broadening. De Mooij and Nicodème (2007) argue that the simultaneous decline in corporate tax rates and rising tax-to-GDP ratios in Europe may to a large extent be explained by a growing corporatization and income shifting from personal to corporate income tax. According to their findings, since the early 1990s income shifting could have raised the share of corporate tax revenue in GDP by nearly 0.25 percentage points.

According to the above, Swiston et al. (2007) consider the role of personal and corporate income tax, capital gains and income distribution as factors explaining the vast majority of variations of tax revenue. They find that the 2004-2006 increase of the tax to GDP ratio in the U.S. is mainly due to the growth of corporate profits and capital gains. These two determinants of tax revenue each contribute to a 40 percent increase in the tax to GDP ratio.

Swiston et al.'s analysis of time series adjusted for tax policy changes suggests that corporate income tax is the most volatile revenue component. They conclude that because of capital income volatility over the analyzed business cycle, the observed surge in tax revenue buoyancy is a temporary phenomenon.

Piotrowska and Vanborren (2008) analyze, in Europe, the absence of reflection of the decline in the corporate tax rates in the tax to GDP ratio. The authors explore to what extent the observed trend can be explained by changes in the effective tax burden on corporate income, in the share of total income accruing to the corporate sector and in total business income relative to GDP. The main results suggest that corporatization is the driving factor for the trend observed in corporate tax revenues, similar to Sorensen's results.

Finally, Creedy e Gemmell (2007) consider to what extent the observed volatility in the buoyancy of the corporate tax revenues in the U.K. in 1992-2004 could be determined by the fiscal drag properties of the tax system. Creedy and Gemmell show that deductions play an important role in determining the rate of growth of corporate tax revenues relative to profits.

This analysis differs from previous literature because it seeks to analyze the effect of some institutional factors in developed countries, regardless the fact that they are more characteristic and expressive in developing countries (e.g., Corruption). Additionally, although there are many studies related to some countries of European Union, this document differs either in the selected time series, or in the broader sample of countries belonging to the European Union.

Moreover, the EATR and the EMTR appear in this study as exogenous variables (a proxy of effective tax levels) using a model approach based on the Devereux/Griffith methodology.

Finally, in the present study corporate tax revenue will not be solely explained by changes in corporate income tax rate, but also by different economic and structural factors, some of them are mentioned above.

3. Data and methodology

Our analysis will focus on the 27 current European Union members over the 12 years between 1998 and 2009.

It should be noted that this analysis was performed for European Union countries for various reasons. First, data on main variables are more available for these countries. Then, this analysis shall be relevant in the current conjuncture of financial, economic and even political crisis that the European Union faces, where fiscal policy assumes an increasingly key role. And, finally, this study provides a diversified analysis in respect of whether quantitative variables like GDP, Industrial Turnover, Unemployment or qualitative variables such as the level of Corruption.

Chapter 3 is divided as follows:

- In subsection “3.1. Data Description”, we outline the countries used in this study, we define the variables and present data statistics and data sources;
- The subsection “3.2. Econometric Model” provides, firstly, our general econometric model and, then, describes possible determinants of corporate income tax revenues, as well as their rationale and direction of influence;
- “3.3. Estimation Technique” describes the estimation method and some econometric assumptions used.

3.1. Data Description

The countries included in the analysis are the European Union members. These 27 countries are Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Ireland, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom

Variable definitions and data statistics are summarized in Table 1 and Table 2.

Table 1: Variable Definitions

Explanatory Variable	Definitions	Prediction
CIT	Corporate Income Tax (as % of GDP) – Taxes on the income or profits of corporations including holding gains as percentage of GDP	N.A.
EATR	<p>Effective Average Tax Rate (%) – is a measure of the effect of tax on a non-marginal investment. A non-marginal investment is one that not only covers all of its economic costs but also provides an economic or above-normal profit to the investor. So the EATR is a measure of the proportion of pre-tax economic profit that the investor gets to keep after paying corporate tax.</p> <p>EATR may be a better indicator of the tax incentives facing a multinational corporation in deciding on a country for locating a large, discrete investment project, especially where the corporation has a strong expectation that it will earn economic profit due to a patent or similar source of market power.</p> <p>EATR was derived from the raw tax data and corresponds to overall mean of: Asset – industrial buildings, intangibles, machinery, financial assets, inventory; and, Source of Finance – retained earnings, new equity and debt.</p>	(+)
EMTR	<p>Effective Marginal Tax Rate (%) – is a measure of the effect of tax on the return to a marginal investment. A marginal investment is one that just breaks even or covers all of its economic costs, including a return to the labour and capital that may be provided by the owner of the investment. A marginal investment returns a normal profit to the investor.</p> <p>The effect of tax on the return to a marginal investment depends not only on the statutory corporate tax rate but also on depreciation allowances and any available corporate tax concessions.</p> <p>EMTR was derived from the raw tax data and corresponds to overall mean of: Asset – industrial buildings, intangibles, machinery, financial assets, inventory; and, Source of Finance – retained earnings, new equity and debt.</p>	(+)
GDP_PPS	GDP per capita in Purchasing Power Standards (Index: EU-27 = 100)	(+)
INDUSTRY TURNOVER	Industry turnover index – Annual data for intermediate and capital goods (2005 = 100)	(+)
GOSMI	Gross Operating Surplus and Mixed Income (as % of GDP) – Operating surplus is the surplus (or deficit) on production activities before account has been taken of the interest, rents or charges paid or received for the use of assets. Mixed income is the remuneration for the work carried out by the owner (or by members of his family) of an unincorporated enterprise. This is referred to as 'mixed income' since it cannot be distinguished from the entrepreneurial profit of the owner.	(+)

Explanatory Variable	Definitions	Prediction
TOTAL NUM ENTERPRISES	<p>Total Number of Enterprises (units) – The number of enterprises active during at least part of the reference period in the following sectors: Manufacturing, Mining and Quarrying, Electricity, Gas Water Supply, Construction, Wholesale, Retail Trade, Repair of motor vehicles, motorcycles and personal and household goods, Hotels and Restaurants, Transport, Storage, Communication, Real estate, Renting and business activities.</p>	(+)
UNEMPLOYM. RATE	<p>Unemployment rate (as % of labour force) – Unemployment rate represents unemployed persons as a percentage of the labour force. The labour force is the total number of people employed and unemployed. Unemployed persons comprise persons aged 15 to 74 who were:</p> <ul style="list-style-type: none"> a. without work during the reference week, b. currently available for work, i.e. were available for paid employment or self-employment before the end of the two weeks following the reference week, c. actively seeking work, i.e. had taken specific steps in the four weeks period ending with the reference week to seek paid employment or self-employment or who found a job to start later, i.e. within a period of, at most, three months. 	(-)
FDI	<p>Inward Foreign Direct Investment from the rest of the world (as % of GDP) – This indicator is the ratio between the inward Foreign Direct Investment and GDP. It covers investment from the rest of the World. Data for the EU Member States includes investment from all foreign countries (including Intra- EU investment). FDI is the category of international investment made by a resident entity (direct investor) to acquire a lasting interest of at least 10% of the equity capital of an entity operating in an economy other than that of the investor (direct investment enterprise). Inward FDI (or FDI in the reporting economy) is investment by foreigners in enterprises resident in the reporting economy. Data are expressed as percentage to GDP to remove the effect of differences in the size of the economies of the reporting countries. FDI flows denote the new investment made during the period. They are recorded in the Balance of Payments financial account. FDI stocks (or positions) denote the value of the investment at the end of the period. They are recorded in the International Investment Position. Outward FDI stocks are recorded as assets of the reporting economy, inward FDI stocks as liabilities.</p>	(+)

Explanatory Variable	Definitions	Prediction
TRADE OPENNESS	Trade Openness (as % of GDP) – This variable corresponds to imports of goods and services plus exports of goods and services both as percentage of GDP, which represent the value of all goods and other market services received/provided from/to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments.	(+)
HTECH EXPORT	High-tech exports (as % of total exports) – Exports of high technology products as a share of total exports.	(+)
CPI	Corruption Perceptions Index – The CPI score indicates the perceived level of public-sector corruption in a country/territory. The CPI is based on 13 independent surveys. However, not all surveys include all countries.	(+)
GOV DEFICIT	Cash surplus/deficit (as % of GDP) – Cash surplus or deficit is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets. This cash surplus or deficit is closest to the earlier overall budget balance (still missing is lending minus repayments, which are now a financing item under net acquisition of financial assets).	(+)

Table 2: Data Statistics

Explanatory Variable	Time Period	n	Mean	Standard Deviation
CIT	1995-2009	405	3.040	1.303
EATR	1998-2009	324	25.088	7.291
EMTR	1998-2009	324	18.884	8.239
GDP_PPS	1995-2010	404	94.626	44.176
INDUSTRY TURNOVER	1999-2010	273	96.924	23.440
GOSMI	1999-2010	296	42.119	6.600
TOTAL NUM ENTERPRISES	1997-2008	301	694,587	905,302
UNEMPLOYMENT RATE	1995-2010	362	8.215	3.705
FDI	1995-2010	348	12.349	49.993
TRADE OPENNESS	1995-2010	402	105.323	49.993
HTECH EXPORT	1995-2009	319	12.995	12.218
CPI	1995-2009	363	6.445	1.990
GOV DEFICIT	1995-2009	337	-1.925	3.338

Data on Corporate Income Tax Revenue, GDP per capita, Industry Turnover Index, GOSMI, Total Number of Enterprises, Unemployment Rate, FDI and high tech exports come from Eurostat databases.

Data on Trade Openness and General Government Deficit are from World Bank's, World Development Indicators database.

Corruption Perceptions Index is taken from various surveys and indices published by the organization Transparency International.

And, finally, EATR and EMTR are taken from a report of ZEW – Centre for European Economic Research, a project of the European Union Commission.

3.2. Econometric Model

In light of the above, we propose the following econometric model describing the corporate tax revenue to GDP ratio as a function of a number of variables. The model shall be given by:

$$\text{Corporate Tax Revenue/GDP}_{it} = f(\alpha_{it}; \text{Tax Variables}_{it}; \text{Structural Factors}_{it}; \text{Cyclical Business Factors}_{it}; \text{International Factors}_{it}; \text{Institutional Factors}_{it}; u_{it})$$

The factors used in the above equation are defined below. In the equation, i refers to a country and t refers to a year.

Now, it is important to explain the list of independent variables and the rationale of their influences in ratio corporate tax revenues/GDP.

Structural factors

GDP per capita is a good indicator for the overall development of the economy and it is simultaneously used as a proxy for the size of the corporate sector. In fact, it is admissible that richer economies have a larger fraction of the economy in the corporate sector and, consequently, it is expected a positive relationship between these two variables and, therefore, between GDP and corporate tax revenue.

In the same way it may be considered that Government Deficit drives a country's revenue needs, so it is expected a positive sign.

Cyclical business factors

GOSMI correspond to the operating surplus of the corporate sector. This variable should be treated with caution, because it is not similar to corporate profits.

Notwithstanding, to address this issue we will also use the Industrial Turnover Index as another proxy for the corporate financial results, since it describes the development in the turnover of enterprises.

Despite these variables do not correspond to an economist's definition of corporate profits, they are the few available data for this analysis.

Unemployment Rate is used as a proxy to cyclical variables that should influence the profitability of corporate firms. In this sense, it is expected a negative relationship between this variable and corporate revenues.

Total Number of enterprises can represent the size of corporate sector. This variable is expressed in logarithm form.

International factors

Trade Openness can be a measure of factor mobility. The sign for Trade Openness is negative relative to tax rate, because it is expected a reduced scope for taxation as mobile factors can respond faster to changes in taxation, but positive in which concerns to tax revenue. Some studies consider this factor as an aspect of economic integration². In the same way, other studies propose that more open economies should experience higher revenues at low tax rates and lower revenues at high tax rates³.

Regarding FDI, several studies understand that foreign investment is sensitive to tax rate differences. Thus, the investments in higher-tax countries are shifting toward low-tax countries, which, consequently, increase their revenues. Additionally, it could be considered a proxy to the ability of multinational firms to respond to international tax incentives.

Besides being considered a structural variable and a proxy to the development of the economy, the High-Tech Exports could contribute to increase the taxable income. Hence, it is expected a positive relationship with the endogenous variable.

Institutional factors

CPI compares every year the levels of corruption among public officials and politicians. The index is based on the perception of business people and country analysts. When

² See Loretz, Simon (2007), “Determinants of Bilateral Effective Tax Rates: Empirical Evidence from OECD Countries”.

³ See Clausing, Kimberly (2007), “Corporate tax revenues in OECD countries”.

corruption becomes prevalent, higher tax rates lead to smaller net revenues, so it is expected a positive relationship between CPI and revenue collections⁴.

3.3. Estimation Technique

Standard estimation by OLS implies that all observations are homogeneous regarding the variance of disturbances or “errors” (homocedasticity), so they have equal weight in estimation.

Since this study analyzes a panel data, 27 countries over 12 years, we use cross-section weights through panel FGLS method of estimation assuming the presence of cross-section heteroskedasticity.⁵

In this context, cross-section heteroskedasticity allows for a different error variance for each cross section. So the GLS for this specification is straightforward. First, it performs preliminary estimation to obtain cross-section specific residual vectors, and then it uses these residuals to form estimates of the cross-specific variances. The estimates of the variances are then used in a weighted least squares procedure to form the FGLS estimates.

In this subsection, it is important to refer that despite the FGLS approach considers the country’s weight in the variance structure, we use variables like GDP to also demonstrate the specific size of the countries, now with a specific coefficient in the equation. In the same way, we used some similar variables, such as Industry Turnover and GOSMI.

Finally, in all analysis, when we have an expected sign for the variable, we used one-sided tests for the individual variables significance test, with exception of FDI and Government Deficit, which can reach positive or negative values, so, in these cases, we performed two-sided tests.

⁴ In the CPI index higher values corresponding to better governance outcomes.

⁵ We also experimented other approaches to the data (e.g. fixed and random effects, Generalized method of Moments), but in all cases the variable coefficients lose its statistical significance.

4. Empirical analysis and main results

We divided this Chapter in four subsections, namely:

- “4.1. Description of main variables”. This subsection presents an overview of the corporate tax rates (Statutory Tax Rate, EATR and EMTR) and shows the evolution of the ratio corporate income tax revenue/GDP in European Union;
- “4.2. Effective Average Tax Rates as tax variables”. In this subsection, we outline the empirical results of the main specification, taking into consideration only one tax variable (EATR). The main findings suggest that all determinants are positive and significantly related to the dependent variable, with exception of Unemployment Rate, which presents a negative relation, as expected.
- “4.3. Effective Marginal Tax Rates as tax variables”. Assuming as a tax variable the EMTR and some changes in the regressions described in subsection 4.2., our results are similar to those found in equations abovementioned, with exception of CPI, which loses its economic meaning. In addition, the findings reinforce the hypothesis of the existence of a Laffer curve.
- Finally, in subsection “4.4. Dummy Variables: Specific years and countries”, we present a complementary study of the analysed regressions, considering the influence of the last two years of European Union enlargement and the specific factors of some European Union members (Greece, Portugal and Spain).

4.1. Description of main variables

In this section it is useful to examine the trends in the main variables for this dataset. In this sense, Figure 1 illustrates the downward trend of the Statutory Tax Rate, the EATR and the EMTR.

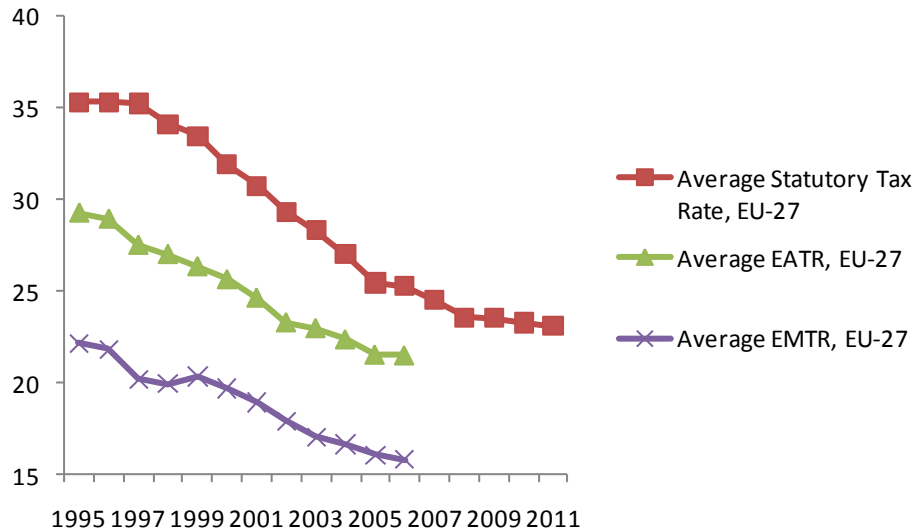


Figure 1: Average Statutory Tax Rate, EATR and EMTR, EU27

As mentioned, Figure 1 presents an overview of the corporate tax rates in the European Union.⁶ Taking into consideration this graph and focusing it only on Statutory Tax Rate, we can verify that tax rates have been falling over the time, from an average of 35% in 1995 to an average of only 23.5% in 2009 and 23% in 2011. In 2009 and considering the EU15, the average Statutory Tax Rate is 27.2%. Nonetheless, this overall average hides considerable dispersion in the Statutory Tax Rate levels across the individual Member States.

In fact, in 2009, the average Statutory Tax Rate is 23.53%, but it is lowest in Cyprus and Bulgaria (10%) and the highest in Malta (35%).

Regarding the EATR, the fall is from an average of 29.27% in 1998 to an average of 21.49% in 2009. In the EU15 the EATR in 2009 is 25.09%. The lowest EATR is in Bulgaria (8.8%) while the highest is in France (34.6%).

Additionally, if we look at the EMTR, the rates decreased from an average of 22% to an average of 15.8%, but once again there is a significant dispersion. The EMTR is lowest in Belgium (-5.1%) and highest in France (34.9%). In the EU15 the EMTR in 2009 is 18.99%.

⁶ See in Annex the evolution of corporate tax rates and statutory tax rates for each European Union Member.

The decline in EATR and EMTR over the time must be mostly driven by cuts on Statutory Tax Rates, since those rates highly depend on the Statutory Tax Rates.⁷

Even though the goal of this paper is not to analyse the wide dispersion of tax levels, there are several reasons for that. For example, size and the economic development of the countries can justify these differences.

Figure 2 turns to the subject of our analysis, corporate tax revenue relative to GDP.

For the average of European Union members, corporate income tax relative to GDP presents substantial fluctuations over the period in analysis. It is worth to stress the decrease between 2000 and 2003 first and 2007 to 2009 later, as well as the considerable increase in 2004 to 2007. But it is more important to point out that over these periods the tax rates always decreased. Hence, it seems that tax rates are not the only determinants of corporate tax revenue.

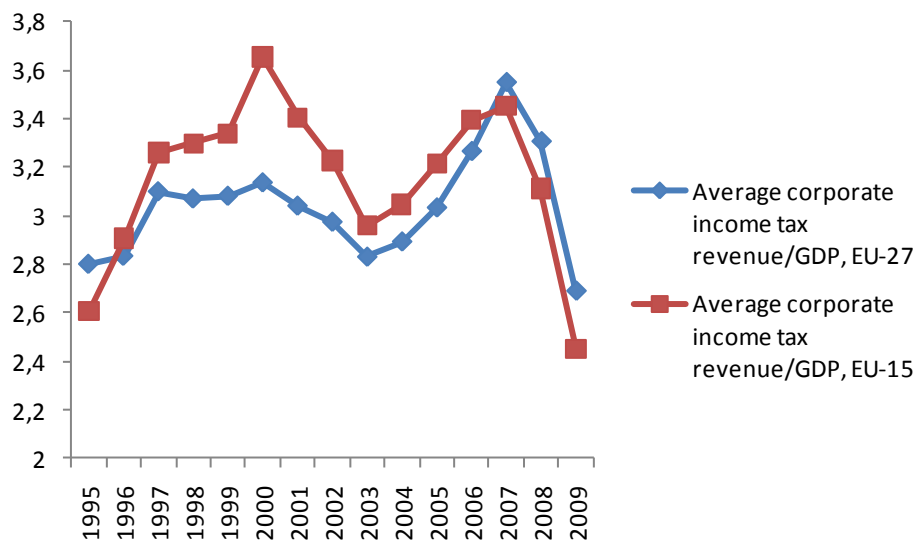


Figure 2: Average Corporate Income Tax Revenue/GDP

In this context, Figures 1 and 2 can be reconciled by a diversity of reasons, including a number of features of the tax system, such as implementation of fiscal reforms and, on the

⁷ See Elschner, Christina and Vanborren, Wernere (2009), “Corporate effective tax rates in an enlarged European Union”.

other hand, a number of features of corporate structure, such as a rising corporate profits or an increase of enterprises.

In this section we will also empirically estimate the relationship between corporate tax revenues and the variables described in Section 3. In the whole document, we distinguish our analysis and examine the hypothesis and equations taking into account two tax variables – EATR and EMTR.

The results of the regressions are summarized in Tables 3 and 4.

4.2. Effective Average Tax Rates as tax variables

Since corporate tax revenue depends not only on tax rates as fiscal variables, we used some structural, cyclical business, international and institutional determinants to understand what influence tax revenues.

In this sense, several alternative specifications were considered to estimate the determinants of revenues across countries in European Union.

And, in fact, our empirical findings are in line with the previous literature for all variables analyzed.

Table 3: Determinants of Corporate Tax Revenue in European Union – EATR

	Eq. (1)	Eq. (2)	Eq. (3)	Eq. (4)	Eq. (5)	Eq. (6)	Eq. (7)	Eq. (8)	Eq. (9)
Constant	2.458 *** (0.132)	0.996 *** (0.222)	-1.120 *** (0.385)	-1.053 ** (0.450)	0.189 (0.488)	0.806 * (0.485)	-1.988 *** (0.590)	-1.795 *** (0.464)	-3.289 *** (0.698)
EATR	0.021 *** (0.005)	0.010 * (0.006)	0.024 *** (0.006)	0.036 *** (0.006)	0.027 *** (0.006)	0.040 *** (0.007)	0.035 *** (0.006)	0.040 *** (0.006)	0.023 *** (0.008)
GDP_PPS		0.011 *** (0.001)	0.013 *** (0.001)	0.010 *** (0.001)	0.007 *** (0.001)				
Industry Turnover		0.006 *** (0.002)	0.007 *** (0.002)	0.004 ** (0.001)	0.003 ** (0.002)	0.004 ** (0.002)	0.004 *** (0.001)	0.007 *** (0.001)	0.006 *** (0.002)
GOSMI			0.036 *** (0.006)	0.060 *** (0.007)	0.043 *** (0.007)	0.028 *** (0.007)	0.067 *** (0.008)	0.063 *** (0.007)	0.066 *** (0.008)
Unemployment Rate				-0.084 *** (0.011)	-0.084 *** (0.011)	-0.097 *** (0.011)	-0.069 *** (0.010)	-0.058 *** (0.010)	-0.063 *** (0.011)
FDI					0.005 *** (0.001)	0.006 *** (0.001)	0.006 *** (0.001)	0.006 *** (0.001)	0.007 *** (0.001)
Trade Openness						0.004 *** (0.001)	0.001 (0.001)	0.002 * (0.001)	0.002 ** (0.001)
CPI							0.206 *** (0.029)	0.129 *** (0.026)	0.172 *** (0.027)
Government Deficit								0.065 *** (0.972)	0.077 *** (0.013)
Total Number Enterprises									0.123 *** (0.042)
Observations	324	273	273	273	261	258	251	227	195
Periods	12	11	11	11	11	11	11	11	10
R-Squared	0.054	0.409	0.477	0.456	0.540	0.469	0.547	0.648	0.719

Note: Standard Errors in brackets. *** Significant at 1%, ** Significant at 5% and * Significant at 10%

Concerning the table abovementioned, Equation (9) includes all variables in analysis (tax, structural, cyclical business, international and institutional determinants).

Firstly, it is considered the relationship between the corporate revenues as a share of GDP and the EATR. The tax term coefficient has the positive expected sign and a high degree of statistical significance.

Secondly, the data on GDP and Industry Turnover Index (two important variables to control the size of the countries and the corporate financial results) demonstrate the consistency with both the intuition and the previous literature (e.g., Auerbach and Poterba (1988), Devereux et al. (2004) and Clausing (2007)). Thus, the results indicate that GDP and Industry Turnover Index are positive and significantly (at the 1% level of significance) related to the ratio of corporate tax revenue to GDP.⁸

Then, we could verify that as expected GOSMI has a positive influence on revenues while the Unemployment Rate has a negative influence. Both factors have a high degree of statistical significance. So, if GOSMI is 1 percentage point higher, *ceteris paribus*, the ratio of corporate tax revenue to GDP is 0.066 percentage points higher. And, if Unemployment Rate is 1 percentage point higher, the corporate tax revenue to GDP is 0.063 percentage points lower.

Additionally, FDI and Trade Openness capture the influence of international factors. Results indicate that a higher stock of FDI relative to GDP increases the ratio of corporate tax revenue to GDP. And, findings also indicate a positive relationship between the Trade Openness and the corporate tax revenue. This result is in line with the previous literature (Slemrod (2004) and Simon Loretz (2007)). In the present equation both variables are statistically significant.⁹

⁸ The inclusion of these variables decreases the number of observations (from 12 to 11 years).

⁹ GDP variable was found to be statistically insignificant and was dropped from the estimated equations (6), (7), (8) and (9).

In addition, we considered the following variables: the CPI – an institutional factor – and the Government Deficit – a structural factor.¹⁰ As expected, both additional variables have a positive influence on revenues with a high degree of statistical significance. Thus, according to our results, an increase in the CPI score of one point may increase the ratio of corporate tax revenue to GDP by up to 0.172 percentage points, *ceteris paribus*.

So, once again, findings are in line with theoretical literature, since a lower level of corruption leads to a higher revenues collection and the Government Deficit drives a country's revenue needs (e.g., Sanyal et al. (1998), Gupta (2007) and Slemrod (2004)).

Finally, we included a new cyclical business factor – Total Number of Enterprises (this variable is expressed in logarithm form). One disadvantage associated with employing this variable is that the overall number of observations is cut due to an incomplete reporting.

However, the results indicate that this variable is positive and also statistically significant at a level of 1%. Again, these results are in line with the previous findings (Devereux et al. (2004), Clausing (2007), Piotrowska and Vanborren (2008)). Note that the Trade Openness is the only variable in the specification that has a lower level of significance (5%).¹¹

4.3. Effective Marginal Tax Rates as tax variables

Alternatively to the EATR, we also used the EMTR and made some relevant changes in the basic equations. With these changes we emphasize the nature of the relationship between tax rates and revenue collections, which is likely to be explained by a combination of factors.

In addition, in this subsection we attempt to obtain some empirical evidence related to the hypothesis of the existence of a Laffer curve.

¹⁰ We also tested other institutional variables, like Government Effectiveness, Regulatory Quality and Rule of Law, but we do not find a significant effect. As a result we do not include these factors in the regressions.

¹¹ Sweden is excluded from the present analysis once no data on Government Deficit is available to this country and also Malta due to lack of data.

Table 4: Determinants of Corporate Tax Revenue in European Union – EMTR

	Eq. (1a)	Eq. (2a)	Eq. (3a)	Eq. (4a)	Eq. (5a)	Eq. (6a)	Eq. (7a)	Eq. (8a)	Eq. (9a)	Eq. (10a)
Constant	1.801 *** (0.203)	1.156 *** (0.186)	0.718 *** (0.242)	1.428 *** (0.324)	2.015 *** (0.338)	1.643 *** (0.340)	0.486 (0.422)	1.407 *** (0.365)	1.204 *** (0.293)	0.081 (0.638)
EMTR	0.106 *** (0.020)	0.073 *** (0.018)	0.049 *** (0.018)	0.046 *** (0.018)	0.057 *** (0.021)	0.074 *** (0.021)	0.068 *** (0.019)	0.074 *** (0.021)	0.097 *** (0.020)	0.128 *** (0.021)
EMTR ²	-0.002 *** (0.000)	-0.002 *** (0.000)	-0.001 * (0.000)	-0.001 * (0.000)	-0.001 * (0.001)	-0.001 * (0.001)	-0.001 ** (0.000)	-0.001 ** (0.001)	-0.001 *** (0.000)	-0.003 *** (0.000)
GDP_PPS	0.012 *** (0.001)	0.012 *** (0.001)	0.011 *** (0.001)	0.009 *** (0.001)	0.003 ** (0.001)	0.004 *** (0.001)	0.004 *** (0.001)	0.005 ** (0.002)	0.009 *** (0.002)	0.010 *** (0.002)
Industry Turnover			0.007 *** (0.002)	0.005 *** (0.002)	0.004 *** (0.002)	0.004 ** (0.002)		0.004 *** (0.002)	0.008 *** (0.001)	0.009 *** (0.002)
GOSMI							0.035 *** (0.007)			
Unemployment Rate				-0.037 *** (0.011)	-0.055 *** (0.011)	-0.062 *** (0.008)	-0.082 *** (0.010)	-0.049 *** (0.010)	-0.029 *** (0.007)	-0.033 *** (0.010)
FDI					0.007 *** (0.001)	0.006 *** (0.001)	0.005 *** (0.001)	0.005 *** (0.001)	0.004 ** (0.002)	0.004 ** (0.002)
Trade Openness						0.005 *** (0.001)	0.003 *** (0.001)	0.004 *** (0.001)	0.004 *** (0.001)	0.003 * (0.001)
CPI								-0.053 (0.038)	-0.173 *** (0.037)	-0.182 *** (0.039)
Government Deficit									0.098 *** (0.012)	0.139 *** (0.015)
Total Number Enterprises										0.082 * (0.049)
Observations	324	324	273	273	261	258	276	251	228	195
Periods	12	12	11	11	11	11	11	11	11	10
R-Squared	0.111	0.327	0.394	0.449	0.488	0.491	0.521	0.495	0.605	0.620

Note: Standard Errors in brackets. *** Significant at 1%, ** Significant at 5% and * Significant at 10%

In Equation (10a) is used both the EMTR and its' square. This allows the relationship between revenues and tax rates to be non-linear, supporting the hypothesis of the existence of a Laffer curve. In fact both tax term coefficients have the expected sign and a high degree of statistical significance.

According to other studies, the impact of corporate income tax rates on corporate revenues is modelled as a quadratic function. At low tax rates, an increase in the tax rate is likely to increase revenues and, on the other hand, at higher tax rates, the elasticity of taxable income with respect to the tax rate may exceed one, causing revenues to fall as tax rates increase. Thus, the capacity to collect taxes increases with the level of tax rates until a certain state from which begins to decrease due to the influence of distortion factors, such as corruption (Stinespring (2009)).

Figure 3 maps the resulting revenue curve. Over the entire sample, the revenue-maximizing corporate tax rate is approximately 25%.

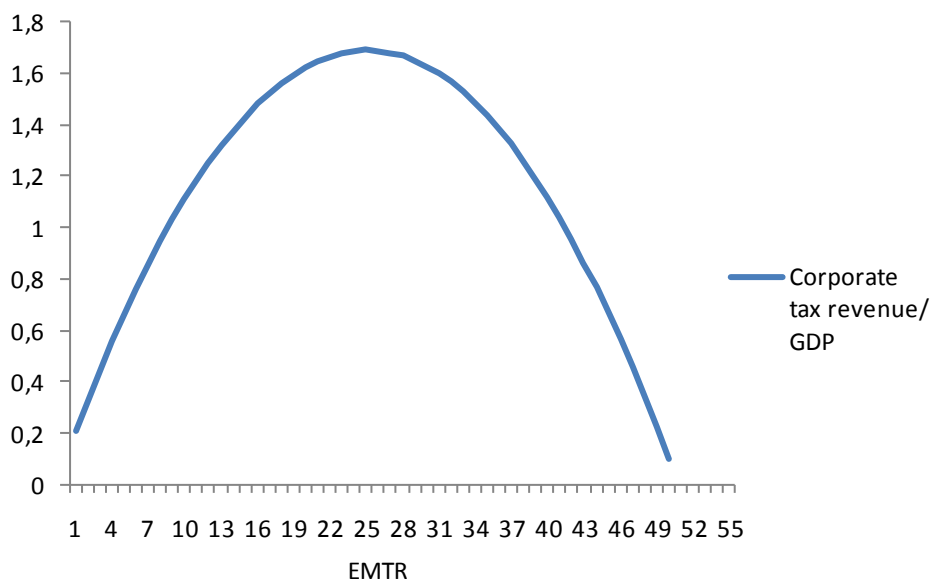


Figure 3: Corporate Revenue Curve – Equation (10a)

It shall be noted that the revenue-maximizing corporate tax rate will not necessarily correspond to the optimal corporate tax rate, but the relationship between tax rates and revenues still has a significant policy interest.¹²

¹² See Figure 4 in the Appendix 1 with the sketch of the revenue curves for all equations in this subsection.

Our results also suggest that Industry Turnover Index and Unemployment Rate are significantly related to the ratio of corporate tax revenue to GDP. In fact, these variables are statistically significant and present the expected signs. So, these determinants are in line with the previous literature (e.g., Auerbach and Poterba (1988), Devereux et al. (2004) and Clausing (2007)). For example, if Unemployment Rate increases 1 percentage point, *ceteris paribus*, corporate tax revenue to GDP is 0.033 percentage points smaller.

Regarding the international factors, we find that FDI and Trade Openness are statistically significant (at the 5% and 10% level of significance) and have a positive effect on the ratio of corporate tax revenue to GDP.

Once again the Trade Openness and FDI coefficients have a positive sign, which are in line with previous studies (e.g. Ghura (1998), Slemrod (2004), Gupta (2007) and Simon Loretz (2007)).

Additionally, our results show that the Government Deficit variable has a positive sign consistent with the foreseen (e.g. Slemrod (2004)). So, if Government Deficit is 1 percentage point higher, *ceteris paribus*, revenue performance to GDP is 0.139 percentage points higher.¹³

When we included the Total Number of Enterprises variable, we find a positive relationship between this variable and revenue performance to GDP. Notwithstanding, the Total Number of Enterprises variable is statistically significant at the 10% level. With the increase in the number of variables, the number of observations in this regression only amounts to 195.¹⁴

It is important to highlight that when we include the institutional factor CPI, this variable loses its economic meaning, despite it is statistically significant at the 1% level.

¹³ Note that an increase in the value of the Government Deficit variable represents an increase in the surplus and thereby a reduction on the deficit.

¹⁴ Sweden is excluded from the present analysis once no data on Government Deficit is available to this country also Malta due to lack of data.

Finally, note that in Equation (7a) we simply replace the Industry Turnover Index by the GOSMI variable. The results are similar to those found in previous equations.

4.4. Dummy Variables: Specific years and countries

We also experimented to introduce dummy variables indicating if the last two years of European Union enlargement, i.e. 2004 and 2007, are relevant for our analysis and, on the other hand, if specific factors of some European Union members influence the ratio of corporate revenues to GDP, more precisely Greece, Portugal and Spain.

In these regressions we also replaced the Trade Openness variable by High-tech Export variable, but note that in these cases the number of observations decreased even more.

Tables 5 and 6 summarize the results of the regressions that include dummy variables.

The results show that the dummy variable that represent the last two years of European Union enlargement is not statistically significant in both regressions that use the EATR as a tax variable or equations that use the EMTR with the same purpose.¹⁵

Furthermore, the country-specific dummy variables are found to be statistically significant (at the 1% level of significance) suggesting that specific factors of these countries (Greece, Portugal and Spain) are also important determinants of variations in the ratio of corporate revenues to GDP.¹⁶

¹⁵ The results are similar if we analyze the individual years (not reject the null hypothesis).

¹⁶ We also tested these equations specifying other countries, such as France, Germany and United Kingdom, but we obtain ambiguous results and quite different levels of significance.

Table 5: Determinants of Corporate Tax Revenue in European Union – EATR
(Dummy Variables: Specific years and countries – Complementary Study)

	Eq. (1d)	Eq. (2d)	Eq. (3d)	Eq. (4d)
Constant	-3.299 *** (0.703)	-4.691 *** (0.634)	-2.187 *** (0.695)	-4.025 *** (0.678)
EATR	0.023 *** (0.008)	0.037 *** (0.008)	0.012 (0.008)	0.026 *** (0.008)
Industry Turnover	0.006 *** (0.002)	0.007 *** (0.002)	0.005 *** (0.002)	0.006 ** (0.002)
GOSMI	0.066 *** (0.008)	0.090 *** (0.009)	0.049 *** (0.008)	0.079 *** (0.010)
Unemployment Rate	-0.063 *** (0.011)	-0.068 *** (0.009)	-0.060 *** (0.011)	-0.064 *** (0.010)
FDI	0.007 *** (0.001)	0.008 *** (0.001)	0.007 *** (0.001)	0.009 *** (0.001)
Trade Openess	0.002 ** (0.001)		0.003 ** (0.001)	
High Tech Exports		0.013 ** (0.005)		0.013 ** (0.005)
CPI	0.171 *** (0.027)	0.171 *** (0.038)	0.136 *** (0.028)	0.161 *** (0.039)
Government Deficit	0.077 *** (0.013)	0.057 *** (0.014)	0.091 *** (0.014)	0.063 *** (0.014)
Total Number Enterprises	0.122 *** (0.042)	0.121 (0.037)	0.132 *** (0.044)	0.131 *** (0.039)
Year=2004 or Year=2007	-0.014 (0.070)	-0.040 (0.074)		
COUNTRY="GR" OR COUNTRY="PT" OR COUNTRY="ES"			0.564 *** (0.107)	0.341 *** (0.121)
Observations	195	150	195	150
Periods	10	8	10	8
R-Squared	0.719	0.824	0.708	0.807

Note: Standard Errors in brackets. *** Significant at 1%, ** Significant at 5% and * Significant at 10%

Table 6: Determinants of Corporate Tax Revenue in European Union – EMTR
(Dummy Variables: Specific years and countries – Complementary Study)

	Eq. (5d)	Eq. (6d)
Constant	0.143 (0.637)	0.282 (0.616)
EMTR	0.126 *** (0.022)	0.129 *** (0.021)
EMTR^2	-0.003 *** (0.000)	-0.003 *** (0.000)
GDP_PPS	0.010 *** (0.002)	0.011 *** (0.002)
Industry Turnover	0.008 *** (0.002)	0.008 *** (0.002)
Unemployment Rate	-0.034 *** (0.010)	-0.035 *** (0.009)
FDI	0.004 *** (0.002)	0.004 ** (0.002)
Trade Openness	0.002 * (0.001)	0.003 ** (0.001)
CPI	-0.180 *** (0.039)	-0.199 *** (0.037)
Government Deficit	0.138 *** (0.015)	0.138 *** (0.013)
Total Number Enterprises	0.085 * (0.049)	0.072 (0.048)
YEAR=2004 OR YEAR=2007	0.079 (0.073)	
COUNTRY="GR" OR COUNTRY="PT" OR COUNTRY="ES"		0.665 *** (0.096)
Observations	195	195
Periods	10	10
R-Squared	0.656	0.705

Note: Standard Errors in brackets. *** Significant at 1%, ** Significant at 5% and * Significant at 10%

5. Conclusions

Our principal objective was to investigate corporate revenue performance of European Union over the past 12 years, using panel data set for 27 European Union members during the period 1998-2009. All estimates are based on panel FGLS cross-section weights method.

The main contribution of this study is that it extends the previous literature by considering all European Union members, more recent years, the use of effective tax burden through the EATR and the EMTR tax variables and, in addition, it analyzes the influence of institutional factors, such as corruption, in these developed countries.

The results show that structural factors like GDP or Government Deficit are statistically significant and positive determinants of corporate tax revenue, using either the EATR or the EMTR as tax variable.

We also looked the impact of cyclical determinants on the ratio of corporate tax revenue to GDP. Our findings suggest that the business performance is statistically and positively related to endogenous variable. We use Industry Turnover Index and GOSMI variables as a proxy of business performance. Additionally, the relationship between Unemployment Rate and corporate tax revenue is negative, as predicted. Moreover, we found that an increase in the number of enterprises may increase corporate tax revenue.

We continued the analysis adding international factors like FDI and Openness Trade. Our findings demonstrate that more open economies should experience higher revenues at low tax rates and lower revenues at high tax rates. Moreover, FDI is positively related to corporate revenue.

Then, we included institutional variables. Among the institutional determinants, for example, voice and accountability, political stability, government effectiveness, regulatory quality, rule of law and corruption, we found that corruption has a significantly negative effect on corporate tax revenue. However, in some regressions CPI loses its economic meaning, presenting a negative sign, which means that a better level of governance may lead to a smaller revenue collection.

Furthermore, our findings show a parabolic relationship between the EMTR and corporate tax revenues as a share of GDP. It is important to point out that this finding does not imply that it is the optimal tax rate. Nonetheless, it reinforces the hypothesis of the existence of a Laffer curve. So at high EMTR the elasticity of taxable income with respect to the EMTR may exceed one, implying that an increase in EMTR will reduce corporate tax revenues.

Regarding dummy variables, it is interesting to highlight that our results indicate that the last two years of European Union enlargement are likely not to have any effect in corporate tax revenue to GDP. In addition, specific factors of some countries like Greece, Portugal and Spain seem to be important determinants of variations in corporate revenues.

In this sense, we can conclude that all analyzed variables play an important role in the ratio corporate tax revenue to GDP, but different determinants imply different effects.

Although the general of results are in line with the previous literature and predictions, several data limitations put constraints on the present analysis like the lack of data or variables that only represent few economic sectors, not covering all sectors (e.g., Total Number of Enterprises).

In addition, it is generally acknowledged that the list of factors that could potentially explain the corporate income tax revenue is extensive, and our analysis only examines some of them. So many others determinants should be further studied.

Finally, our results may have implications for governments. Governments should consider the impacts of fiscal harmonization, define sustained international policies that promote Trade Openness, delineate policies to fight the unemployment, create a good economic atmosphere to rise the number of enterprises, increase tax evasion penalties and punishment for corrupt tax administration.

Appendix 1 – Sketch of the revenue curves

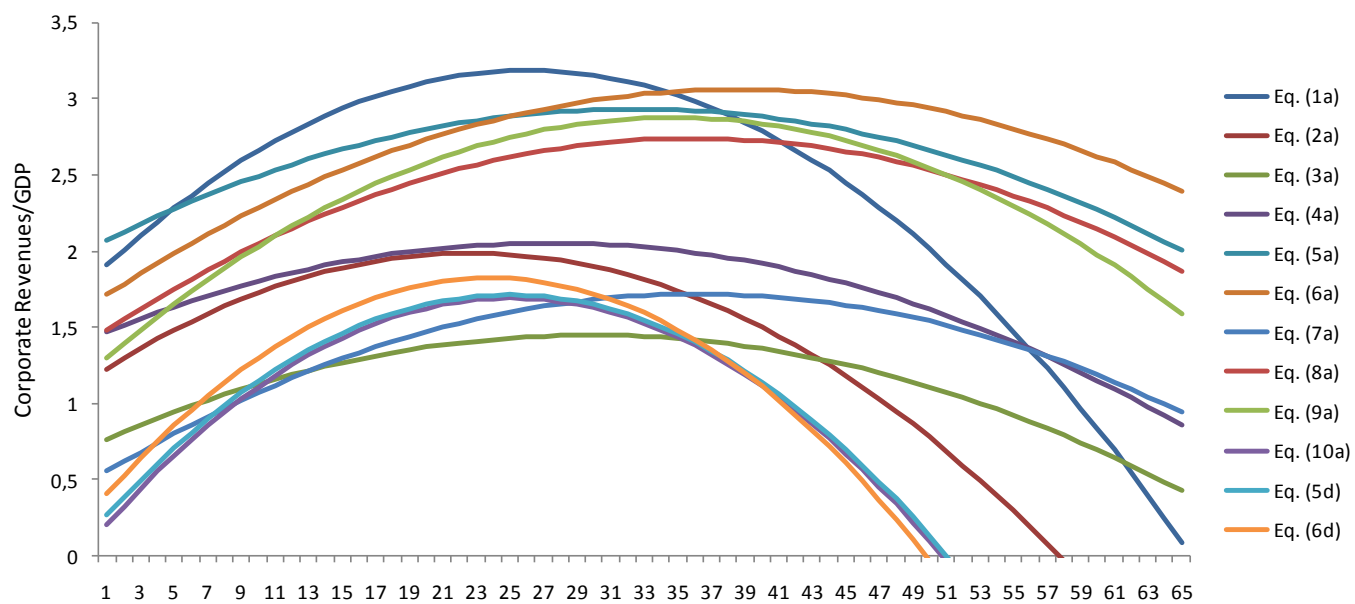


Figure 4: Revenue Curves

The revenue-maximizing corporate tax rate varies between 22.67% and 38.56%

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Netgraphy

http://ec.europa.eu/	European Commission
http://epp.eurostat.ec.europa.eu/	Eurostat
http://www.worldbank.org/	World Bank
http://www.oecd.org/	OECD
http://www.transparency.org/	Transparency International

Annex

Corporate tax rates and statutory tax rates (%)

Country	Year	Nominal		Local profit tax rates (nominal)	Effective statutory profit tax rates
		Corporate Income Tax Rates	Surcharge		
Austria	1998-2004	34	-	-	34
	2005-2009	25	-	-	25
Belgium	1998-2002	39	3	-	40.17
	2003-2009	33	3	-	33.99 ¹⁷
Bulgaria	1998	30	-	10	37
	1999	27	-	10	34.3
	2000	25	-	10	32.5
	2001	20	-	10	28
	2002	15	-	10	23.5
	2003	23.5	-	-	23.5
	2004	19.5	-	-	19.5
	2005-2006	15	-	-	15
Cyprus	1998-2000	25	-	4 ¹⁸	29
	2001-2002	25	-	3 ⁵	28
	2003-2004	15	-	-	15
	2005-2009	10	-	-	10
Czech Republic	1998-1999	35	-	-	35
	2000-2003	31	-	-	31
	2004	28	-	-	28
	2005	26	-	-	26
	2006-2007	24	-	-	24
	2008	21	-	-	21
Denmark	2009	20	-	-	20
	1998	34	-	-	34
	1999-2000	32	-	-	32
	2001-2004	30	-	-	30
	2005-2006	28	-	-	28
Estonia	2007-2009	25	-	-	25
	1998-1999	26	-	-	26
	2000-2004	26 ¹⁹	-	-	26
	2005	24 ⁶	-	-	24
	2006	23 ⁶	-	-	23
	2007	22 ⁶	-	-	22
2008-2009	21 ⁶	-	-	21	

¹⁷ There is a notional interest deduction applicable since assessment year 2007 (income of 2006). The deduction is calculated as a percentage of the equity (incl. retained earnings), determined according to Belgian accounting law. The notional interest rate is based on the return on a 10-year state bond. The rates were for financial years 2006, 2007, 2008 and 2009 respectively 3.442%, 3.781%, 4.307% and 4.473%.

¹⁸ So-called defence contribution.

¹⁹ Split-rate system: The corporate tax rate for retained profits is 0 %.

Country	Year	Nominal		Local profit	Effective
		Corporate Income Tax Rates	Surcharge	tax rates (nominal)	statutory profit tax rates
Finland	1998-1999	28	-	-	28
	2000-2004	29	-	-	29
	2005-2009	26	-	-	26
France	1998	33.33	25	-	41.67
	1999	33.33	20	-	40
	2000	33.33	13.3	-	37.76
	2001	33.33	9.3	-	36.43
	2002-2004	33.33	6.3	-	35.43
	2005	33.33	4.8	-	34.93
	2006-2009	33.33	3.3	-	34.43
Germany	1998	45 ²⁰	5.5	17.22	56.52
	1999-2000	40 ⁷	5.5	17.56	52.35
	2001-2002	25 ²¹	5.5	17.63	39.35
	2003	26.5 ⁸	5.5	17.63	40.66
	2004-2007	25 ⁸	5.5	17.63	39.35
	2008-2009	15	5.5	15.12	30.95
Greece	1998-2004	35	-	-	35
	2005	32	-	-	32
	2006	29	-	-	29
	2007-2009	25	-	-	25
Hungary	1998	18	-	1.4	19.148
	1999	18	-	1.7	19.394
	2000-2003	18	-	2	19.64
	2004	16	-	2.2 ²³	17.76
	2005	16	-	2.25 ¹⁰	17.71
	2006	16	-	2.3 ¹⁰	17.567
	2007-2009	16	4 ²²	2.3 ¹⁰	21.44
Ireland	1998-2002	10 ¹⁰	-	-	10
	2003-2009	12.5	-	-	12.5
Italy	1008-2000	37	-	4.25	41.25
	2001-2002	36	-	4.25	40.25
	2003	34	-	4.25	38.25
	2004-2007	33	-	4.25	37.25
	2008-2009	27.5	-	3.9	31.12
Latvia	1998-2001	25	-	-	25
	2002	22	-	-	22
	2003	19	-	-	19
	2004-2009	15	-	-	15

²⁰ Split-rate system: For distributed profits, the corporation tax is reduced to 30%. Local tax is deductible from the base of corporation tax and its own tax base.

²¹ Local tax is deductible from the base of corporation tax and its own tax base.

²² An additional solidarity tax is levied on a taxable base similar to that of the corporate income tax.

²³ 125% of local tax is deductible from corporate tax in 2004. In 2005, 150% are deductible. In 2006 and 2007, 200% are deductible.

Country	Year	Nominal		Local profit	Effective
		Corporate Income Tax Rates	Surcharge	tax rates (nominal)	statutory profit tax rates
Lithuania	1998-1999	29 ⁶	-	-	29
	2000-2001	24 ⁶	-	-	24
	2002-2005	15	-	-	15
	2006	15	-	4 ²⁴	19
	2007	15	-	3	18
	2008	15	-	-	15
	2009	20	-	-	20
Luxembourg	1998-2001	30	4	10 ²⁵	37.45
	2002-2005	22	4	7.5 ¹²	30.38
	2006-2008	22	4	6.75 ¹²	29.63
	2009	21	4	6.75 ¹²	28.59
Malta	1998-2009	35	-	-	35
Netherlands	1998-2001	35	-	-	35
	2002-2004	34.5	-	-	34.5
	2005	31.5	-	-	31.5
	2006	29.6	-	-	29.6
	2007-2009	25.5	-	-	25.5
Poland	1998	36	-	-	36
	1999	34	-	-	34
	2000	30	-	-	30
	2001-2002	28	-	-	28
	2003	27	-	-	27
	2004-2009	19	-	-	19
Portugal	1998-1999	34	10 ²⁶	-	37.4
	2000-2001	32	10 ¹³	-	35.2
	2002-2003	30	10 ¹³	-	33
	2004-2006	25	10 ¹³	-	27.5
	2007-2009	25	1.5 ²⁷	-	26.5
Romania	1998-1999	38	-	-	38
	2000-2004	25	-	-	25
	2005-2009	16	-	-	16
Slovakia	1998-1999	40	-	-	40
	2000-2001	29	-	-	29
	2002-2003	25	-	-	25
	2004-2009	19	-	-	19
Slovenia	1998-2006	25	-	-	25
	2007	23	-	-	23
	2008	22	-	-	22
	2009	21	-	-	21

²⁴ An additional social tax is levied on the corporate income tax base.

²⁵ Local tax is deductible from the tax base of corporate income tax and its own base.

²⁶ The municipality surcharge of 10% applies to the tax due which is equivalent to multiplying the corporate tax rate with 1.1.

²⁷ The municipality surcharge of 1.5% applies to the taxable profit and is, therefore, added to the corporate tax rate.

Country	Year	Nominal		Local profit	Effective
		Corporate Income Tax Rates	Surcharge	tax rates (nominal)	statutory profit tax rates
Spain	1998-2006	35	0.49	7.5 ²⁸	40.3
	2007	32.5	0.49	7.5 ¹⁵	38.01
	2008-2009	30	0.53	7.5 ¹⁵	35.74
Sweden	1998-2008	28	-	-	28 ²⁹
	2009	26.3	-	-	26.3 ¹⁶
United Kingdom	1998	31	-	-	31
	1999-2007	30	-	-	30
	2008-2009	28	-	-	28

²⁸ The local business tax (impuesta sobre actividades) is deductible from the corporate income tax base

²⁹ The effective tax rate is reduced to around 26.37% in 1998-2000 if contributions to the profit periodisation reserve (periodiseringsfond) of up to 20% are taken into account. In 2001-2009 the maximum reserve is up to 25%. As from financial year 2005 a standardized income is imposed on former years appropriation with 72% of the interest rate on Governmental debt notes. The effective tax rate is thus 25.64% in 2001-2004, 27.34% in 2005-2007 and 25.68 in 2009.