EVALUATION OF ALTERNATIVE MEASURES OF CORPORATE TAX RATES

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ΒΕΒΑΙΩΣΗ ΕΚΠΟΝΗΣΗΣ ΔΙΠΛΩΜΑΤΙΚΗΣ ΕΡΓΑΣΙΑΣ

«Δηλώνω υπεύθυνα ότι η συγκεκριμένη πτυχιακή εργασία για τη λήψη του Μεταπτυχιακού Διπλώματος Ειδίκευσης στη Λογιστική και Χρηματοοικονομική έχει συγγραφεί από εμένα προσωπικά και δεν έχει υποβληθεί ούτε έχει εγκριθεί στο πλαίσιο κάποιου άλλου μεταπτυχιακού ή προπτυχιακού τίτλου σπουδών, στην Ελλάδα ή στο εξωτερικό. Η εργασία αυτή έχοντας εκπονηθεί από εμένα, αντιπροσωπεύει τις προσωπικές μου απόψεις επί του θέματος. Οι πηγές στις οποίες ανέτρεξα για την εκπόνηση της συγκεκριμένης διπλωματικής αναφέρονται στο σύνολό τους, δίνοντας πλήρεις αναφορές στους συγγραφείς, συμπεριλαμβανομένων και των πηγών που ενδεχομένως χρησιμοποιήθηκαν από το διαδίκτυο».

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ABSTRACT

Purpose: The purpose of the research is to examine the reliability of the financial statement tax measures in the approximation of the corporate statutory tax burden for the listed companies of Germany, France and Spain.

Methodology/Design/Approach: In order to fulfill the research aim and objectives of the research, a quantitative research was conducted in a sample of 238 German, 114 French and 66 Spanish listed companies of two years: 2010 and 2015. The financial statement based average tax rate measures used are the ones of Gupta and Newberry (1997), Porcano (1986) and Zimmermann (1983). The tax-return based measures were regressed on the financial statement based measures in order to obtain the reliability ratios.

Findings: The results showed that only the Porcano (1986) model has high reliability ratio. The latter holds for both tax return based measures, for all countries and years. For the rest measures, the reliability ratios were either insignificant or very low.

Originality/value: The research follows the one of Plesko (2003) and provides useful insight concerning the mismeasurement of corporate tax burden for the European listed companies, for two different years. As the research of Plesko (2003) was conducted for the U.S listed companies, the findings reveal that more research is needed in order to understand what drives the differences in the reliability ratios of financial statement measures of tax rates.

Keywords: average tax rates, reliability, Germany, France, Spain.

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1 INTRODUCTION

1.1 Overview

Business decisions are closely linked to the Management, the Organization, Programming, Management and Control. It's every kind of decision that a business or a businessman gets for his business, which will directly affect its course business and its profit. Some of the business decisions concern how business will be organized, where the headquarters or branches will be located, its size, human resources, what kind of machinery or technology will be purchased, how will the chain will communicate between superiors and subordinates, the logistics scheme used for its needs, how to plan work that needs to be done and the priority of work that needs to be completed at a specific deadline (European Commission, 2015:11).

A major role in business decisions is the attitude of the state toward businesses and the tax system that exists in a country. Most companies seek to have the minimum tax rate that the state will impose on it, and as the business cannot change the laws or the tax system of a country, it can choose how to move within the tax system or even to choose another country to locate. An entrepreneur or a target company has to create as much as the largest possible profit, which simply comes from deduction of costs/expenses from the revenues. So the businessman is called upon to decide the moves which will follow in order to map the best path for the business, either generating higher revenue, making investments, which will be profitable, or by reducing various costs, which do not need to be done and which do not harm the operation of the business (European Commission, 2015:22).

Success in making the right decisions depends on the business and economic conjuncture. In a period of economic growth, it is easier to make decisions. A not very right decision can lead to positive results, despite the errors that it contains. An incorrect decision may have a lot less impact, so it can be more easily overcome. In a period of economic recession, decision-making is of much greater importance and criticality. A problematic market reveals weaknesses. The knowledge and the ability of the decision-maker are revealed in the difficult times. Trying to simplify the decision-making process, many managers rely on specific practices - strategies, such

as: the use restrictions that limit the scope of the problem, the simplification of the process of evaluating potential outcomes and defining a certain level of ambition (European Commission, 2015:35).

According to the opinion of business representatives in Europe, the economic crisis continues and affects the fundamentals of their businesses. The majority of these representatives believe that the primary problem are the number and amount of taxes, which have to be reduced or even eliminated by some of them, and many of them consider it necessary to reduce the insurance contributions and to provide incentives for investment. Overall, they seem to proposed a lower corporate tax burden (European Commission, 2015:39).

Given the turbulence in Europe, many businesses are unable to stand on their feet, to cope with their daily obligations and recover, especially due to the imposition of taxes, that may even lead to their disappearance from the labor market landscape. The ever-increasing recession is in danger of leading the majority of companies in an irreversible unfavorable situation. Most of those businesses think that the most important measure for their recovery will be the reduction in VAT rates that may restore consumption levels, and also considers an optional and simple system to be positive where a tax on turnover depends on its type activity could replace income tax and VAT (European Commission, 2015:53).

In addition to the tax burden, the cost of compliance with the tax provisions also affect the performance of the business. This cost represents the time and money that businesses spend to be informed of their tax obligations, keeping records etc. In addition, we should mention that the fact is that micro companies are taxed more than they larger companies do. The simplification and codification of tax legislation as well the adoption of a stable and fair tax system by avoiding surprises, is one of the central demands of the organizations and especially small and medium-sized enterprises (European Commission, 2015:59).

Padlocks and unemployment hit some of the European businesses that they give a struggle for their survival, especially in the midst of an economic downturn. It is estimated that only by the tax measures imposed on the businesses, there is space

for increases the percentage of businesses that they consider to relocate or that they will have a serious operating problem in the coming years. Especially for the European countries that faced the most important problems during the crisis (e.g Greece, Italy, Spain, Portugal), 53.3% of the companies were found in the verge of closing. More than 1 in 4 businesses, that is, a percentage 25.8% considered it very likely to proceed to closure during the recent financial crisis (European Commission, 2015:65).

Business anxiety in whether to avoid the padlock, or whether the company will manage to survive, it is doubtful if businesses will eventually recover due to their treatment of the tax system. Cumulatively from direct and indirect taxes and in conjunction with regular annual taxes and the application of extraordinary contributions, it arises a financial burden ranging from 48% up to 53% for Southern European countries, while the European Union companies pay taxes at a rate which does not exceed 33% (European Commission, 2015:67).

Given the significance of corporate taxation and specifically the tax burden during economic recessions, it is important to find the appropriate measures in order to approximate as efficiently as possible the corporate tax burden. Previous studies such as the ones of US Congress, Joint Committee on Taxation (1984:1-35), Porcano (1986:17-31), Shevlin (1990:2-7), Stickney and McGee (1982:125-152) and Zimmerman (1983:119-149) introduced financial statement based measures. However, according to Plesko (2003: 201-226), those are not highly correlated with the statutory taxes, which questions the reliability of the measures. Plesko (2003:201-226) himself concluded that those measures are not reliable for the approximation of the statutory tax burden. In the light of the above, the present dissertation examines whether the latter applies for the case of the European listed firms.

1.2 Research aims and objectives

The research aim of the dissertation is to evaluate the financial statement based tax measures, as opposed to the tax return based measures of average tax rates. This analysis will be held at country level. Specifically, throughout the research, the

approach of Plesko (2003) will be followed, but between two different time periods (2010 and 2015) and among the listed companies of three different European countries: Germany, France and Spain. To support the research aim, the research objectives of the dissertation are as follows:

1. To examine the reliability ratios of the financial statement based tax rates.

2. To investigate differences in the reliability ratios of the financial statement based tax rates between 2010 and 2015.

3. To examine differences in the reliability ratios of the financial statement based tax rates among the listed companies of Germany, France and Spain for the same time period.

In order to fulfill the research aim and objectives, a secondary quantitative research will be conducted to a sample of German, French and Spanish listed companies for the years 2010 and 2015.

1.3 Significance of research

The reliability of the financial statement based tax rates is crucial for companies. Specifically, given that corporate tax rates affect a number of decisions in the corporate environment, then the significance of the research is evident. Furthermore, since there has been little research concerning listed companies of various countries as well as between different time period, the research sheds light on whether financial statement based tax rate measures may be reliable under specific circumstances and during specific time periods.

1.4 Research structure

The first chapter of the research is the present introductory one. The second chapter is the literature review. The third chapter involves the methodology of research, that is followed in order to fulfill the research aim and objectives. In the fourth chapter, the results of the empirical analysis are presented and discussed. The fifth and last chapter of the research involves the conclusion, where the most important findings of the research are discussed.

2 LITERATURE REVIEW

2.1 Financial and tax information

Since financial reporting goals differ from those of tax system, the revenues that are counted in each system will vary. Financial accounting recognizes that income and tax liabilities that are communicated to the tax authorities of the USA in a given year may vary from the amount to be paid, while GAAP (Generally Accepted Accounting Principles) are used as tax base. GAAP have defined several ways of calculating these differences. In accordance with the SFAS 109, businesses report a total tax liability based on the financial results of the running report and define the due and deferred installments due to differences in the recognition of income and expenses between tax and financial accounting methods (Hanlon & Shevlin, 2002). There are two reasons why these differences occur.

First, the timing differences are due to differences in the recognition of revenue and expenses between the two reference systems that should at some point reverse. In many cases, timing differences arise from the requirements of reporting according to each system, while in other cases differences arise because GAAP allow discretion to administrators in determining the appropriate amounts to be collected, while the tax system does not allow such a thing (Hanlon & Shevlin, 2002). An obvious example of such difference is the depreciation.

The second source of differences in income measure occurs when a certain income or expense that is resulting from a system is not recognized in the context of another system. Interest on municipal bonds and a part of dividends received, for example, are generally excluded from taxable income, though they are considered income in accordance with GAAP (Maydew, 2001). Such ' permanent ' differences are not reverted and are reflected in an enterprise agreement with the effective tax rate with the legal taxation. While the temporary and permanent differences can persist over time, there is still a predictable relationship between economic and fiscal information, as the main business activities are the same (Maydew, 2001).

Since the reports' objectives of each system differ, a weak relationship is expected between financial and tax reporting. Firstly, the two sets of regulations can lead to big differences that are not reverted in a predictable pattern or expected to be reversed, but this is not actually happening (Omer et al., 2000). For example, while earnings at foreign subsidiaries are consolidated in the parent based on the GAAP, these gains are not recognized as taxable income until the liquidity flow in the domestic parent company. While it is considered as temporary difference, given that that the profits will eventually be repatriated, tax planning will result in the displacement of such transfers as much as possible or forever (Omer et al., 2000).

Secondly, while critic/evaluation is considered an important element of financial reporting, the way in which it is applied does not require consistency between businesses, even in an industry (Collins & Shackelford, 1997). The differences within the discretion could cause confusion in any analysis based on detection of interbranch relations and financial results.

There are three additional factors that complicate the relationship between the values listed on financial statements and those declared for tax purposes. Firstly, the consolidated entities may vary. GAAP require companies to file financial statements that include all functions in which the parent company has at least 50% (Angrist & Krueger, 1999). For tax purposes, consolidation is not allowed, unless there is at least 80% of ownership, but even then it is not required. Therefore, the consolidated financial statements may include any number of separate taxpaying entities (Angrist & Krueger, 1999).

The second factor that complicates the above relationship is schedule. Financial and tax information seem to follow similar schedules: the financial statements must be submitted within 90 days of the end of fiscal year (about 30 March for a company in a calendar year) and corporate tax returns up to the 15th day of the third month after the close of the financial year (15 March for the same company) (Angrist & Krueger, 1999). The date of submitting SEC and the disclosure of information to shareholders is relatively stable, while companies must have made all the expected tax obligation until that date, in order to avoid interest and/or penalties for any uncompleted payments (Callihan, 1994).

Payment is usually made within a six-month extension. The actual tax declaration will be submitted much later, until September 15th for a calendar year of a company. Since the financial statements shall be drawn up and communicated several months prior to the submission of tax returns, many tax information listed on financial statements (e.g. current tax expenses) are estimates of the tax liability that will be declared later in the year and are subject to change during the months preceding the submission of the tax return (Callihan, 1994).

Finally, the amount of income and the tax liability reported in the initial tax statement cannot represent the final tax liability of the company. This is especially true for larger companies, which are subject to ongoing supervision by the Internal Revenue Service (IRS). When submitting, tax declarations can be regarded as initial submission to the Government, knowing that many aspects of the declaration will be examined thoroughly and will be challenged (Callihan, 1994). In addition, during its submission, the tax return - even if accepted - may be affected retroactively if any transfers occur in the future.

2.2 Effective tax rates

Effective tax rates are generally defined as measures of middle and not marginal tax burden. The general terminology of an effective tax rate does not clearly distinguish the average tax rate (ATR), that is defined as a measure of taxation for a certain measure of income, from MTR, that is measured as the change in the tax for a given change of income (Porcano, 1986). While the measures ATR and MTR are designed to capture the differences in charges between businesses, the argument that there is or should there be a real measure is misleading, as most analyses of tax burden (especially the marginal tax burden) are specific to the particular set of cases examined (Porcano, 1986).

Even with the information of tax returns, the determination of ATR is not simple, as the final measure of income for a company is achieved the calculation of some intermediate income definitions. Based on the difference between income and tax reductions, companies estimate the net income (NI) which may be positive or negative. However, the incomes subject to tax (IST), the basis of the tax liability of a business, may differ from the NI for two reasons (Shackelford & Shevlin, 2001).

Firstly, the IST cannot be negative. Companies with negative NI will have zero IST during the running year. Secondly, for companies with positive NI two additional discounts are provided: Net Operating Losses (NOLs) and special tax credits. The reduction of NOL enables companies carrying losses from previous years to remove them from the income of the current year (Shackelford & Shevlin, 2001). Special discounts are made by the discounts of dividends. IST will be the maximum NI after these deductions or zero. Furthermore, the determination of the tax liability is Alternative Minimum Tax (AMT), that can produce different levels of taxation, due of businesses with the same percentage NI ή IST, as it is calculated under the normal tax (Shackelford & Shevlin, 2001).

Tax revenues of ATR may differ from the maximum legal rate applicable for the IST for two reasons. Firstly, the tax rates are graduated and income below a threshold ($ 75.000 for the year under review here) is taxed with reduced marginal rate (Shackelford & Shevlin, 2001). Previous activities of a business can create tax breaks that reduce the amount of tax that the company must pay in a given year.

For a better understanding of tax concepts included in the measures of financial statements, the analyses of this thesis uses two measures of the state ATRs of enterprises. The first, TACNI (Tax After Credit / Net Income), is defined as tax after credits divided by the measure of tax efficiency of NI (Zimmerman, 1983): taxable income pre NOL and special discounts. The second measure, TACIST (Tax After Credit / Income Subject to Tax) is defined as tax after credits divided by the IST.

While the accounting literature contains several measures ATR on the basis of the financial information, the most commonly used have been identified and tested by Omer et al. (1991), as well as by Gupta & Newberry (1997). All measures are based on the current tax expenses as a basis for measuring fees taxes. However, as pointed out by Omer et al., the revenues that are used in accounting are divided into three categories. The first category ATR uses pretax book income or a variation of income before taxes as a measure of income. The second category is mentioned by Zimmerman (1983) and uses the operating cash flow. The last category, which is

referenced by Stickney & McGee (1982) and Shevlin (1990), attempts in the representation of taxable income.

Omer et al. (1991) have identified the sensitivity of estimates of Effective Tax Rates (ETR) in the measure used and indicate that estimates of ETR of the companies do not apply to the chosen measure. Taking into account the different focus of the definition of income in each category, it must be expected a priori that the measures of this latter category will be more correlated with the tax return measures. This is consistent with the assumptions of Shevlin (1987) & Graham (1996b) who use the structure of Shevlin (1990) as a basis simulation to estimate the current value MTR. Other measurements ATR must less correlate with the measure of tax declaration, since the measure that is used is intended to capture a different concept of income.

2.2.1 Application of error measurement

The previous section described the likely measurement of error of tax rates that are based on financial statements. Therefore, it is essential to analyze in detail the economic consequences of this error in empirical research. This issue is being investigated and in other areas such as economy of labor, where studies are identified on the accuracy of response data of the survey, as well as in the area of environmental economy, where the different monitoring systems orient different measures for different levels (Graham, 1996a).

Angrist & Krueger (1999), Bound and Kruegar (1991) & Duncan and Hill (1985) focused on the impact of error measurement at survey's data on the labor market and at general statistical analyses of Fuller (1987), Greene (1998) and Griliches (1986). The empirical effects of error measurement may be significant. Topel (1991) concludes that inconsistencies in responses of the years of work of Panel Study of Income Dynamics (PSID) are so serious, so it is impossible to extract the logical configuration considerations.

Klepper et al. (1993) argue that the error measurement can not only lead to false conclusions about the size and significance of the non-measured variable, but to illustrate the wider measurement error of results in any independent variable in the importance of other explanatory variables. The researchers conclude that the statistical conclusions will be more affected by the error measurement in the

regressions that focus on variables with relatively little explanatory power and are associated with the incorrect measured variables.

2.3 Effective Tax Rates and enterprise characteristics

Effective Tax Rates (ETR) are used for several years by policy makers and interest groups in discussions of tax reform, especially those associated with the tax rules for businesses. ETR (usually measured as a ratio of taxes paid on income) are often discussed, because they summarize in an appropriate way the cumulative result of various tax incentives in a statistical process (Lyon & Silverstein, 1995).

The evidence that corporate ETR vary between businesses and during time is used to indicate that the tax system is unfair, while it is used as an excuse for introducing reforms. A series of reports published by the Citizens for Tax Justice, (1988) provide a specific example of the role of ETR in recent discussions on tax policy. Based on the calculations of ETR, CTJ argued that the larger companies of the United States (U.S.) don't pay the appropriate share of taxes that corresponds to them. The reports of CTJ are widely believed that they influenced many of the sweeping changes of the Tax Reform Act of 1986 (TRA86), that led to the largest corporate tax increase in the history of USA-120 billion over a period of five years (Spooner, 1986; Birnbaum & Murray, 1987).

The increase in corporate taxes was achieved primarily by reducing or abolishing some tax preferences with the clear aim of balancing competition between enterprises. Given the focus of the discussions on tax policy, several studies have attempted to examine whether ETR are systematically correlated with the size of the company. The results were mixed. While some studies have actually noticed a negative correlation between enterprise size and ETR (Siegfried, 1972; Porcano, 1986), others have noticed a positive relationship (Zimmerman, 1983), while other researchers did not detect a correlation (Stickney & McGee, 1982; Shevlin and Porter, 1992).

However, a fundamental limitation of most of these studies is that they tend to consider the relationship between the size of the firm and ETR in a univariate

framework, which probably raises the problem of related variables leftovers. This problem comes from the variations of ETR arising from the differences in capital structures and combinations of assets of companies. That is due to the reason that the different financing options and investment face different tax methods and these options are probably associated with the size of the company (Shevlin and Porter, 1992).

In addition, there is a potential problem in the structure's validity at these studies because the size of the company is very well known element that applies to many different fields, especially in the industrial sector (Ball & Foster, 1982). Finally, recent studies argue that changes of ETR should not be justified exclusively on changes in tax laws without control of changes in incomes of enterprises (Wilkie, 1988; Shevlin and Porter, 1992). None of the previous studies on ETR has approached extendedly all these threads together.

However, Gupta & Newberry (1992) provide new evidence on the determinants of variability of corporate ETR in a multivariable framework, using longitudinal data of micro levels. Specifically, the correlation between ETR, the size of the company and the variables that mediate for the capital structures and combinations of assets of companies is examined, checking at the same time the profitability of the enterprises. Furthermore, the affiliation to industrial union is examined, because the specific characteristics of a company may differ systematically from the industry. Finally, checks were made for the examination of the impact of TRA86 in these unions and whether ETR are associated with these particular characteristics of the operation after tax reform. In terms of research design, the survey differs from most previous studies, examining the determinants of the variability of ETR with longitudinal data over time.

With the inclusion of a separate incision for each company, the fixed effects regression models that are estimated by panel data offer the advantage of control for non-observed or non-measurable variables, since these variables do not vary much over time. Therefore, the effect of other variables that are not explicitly included in the model (as the degree of inclusion of the foreign factor, the ownership structure,

compensation policies and the corporate culture) may potentially be taken into account (Gupta & Newberry, 1992).

The sample consisted of balanced business groups for the periods 1982-1985 and 1987-1990, that were covering the TRA86 and allowed the examination of the determinants of the variability of ETR in two tax regimes. The multiple regression results are presented for fixed effects models that are exploiting the advantages of panel data (Gupta & Newberry, 1992). Although the main purpose was not the development and testing of the accuracy with which the size of ETR is measured, a matter of considerable disagreement in the literature (Omer et al., 1991; Shevlin & Porter, 1992), the validity of results for the switching of the measures of ETR has been tested.

The empirical results fairly contribute to the policy debate on the taxation of companies. Firstly, the results suggest that ETR are generally not related to the size of the company, when the relationship is examined over time in enterprises with more years of operation (Klassen, 1996). This conclusion is consistent with some of the recent researches. Secondly, the results show that ETR are systematically correlated with the capital structure and mix of assets, which puts into question the tendency of interest groups to simply focus on the size of the company so as to draw conclusions about equality in taxation system (Klassen, 1996).

In addition, the results indicate the importance of controlling for changes in the income of an enterprise in a model that examines the variability of ETR. Finally, the results argue that, while the TRA86 had a significant impact on these relations, ETR continued to connect with several special features of enterprises even after tax reform (Klassen, 1996). This conclusion calls into question the assertion that the TRA86 balanced tax business options, at least in terms of these characteristics.

2.3.1 ETR and business size

The focus on the relationship between ETR and company's size has emerged in the literature mainly because of two opposing views. According to the theory of the political costs, the increased visibility of the largest and most successful businesses forces them to succumb to wider regulatory actions and wealth transfers (Watts & Zimmerman 1986). Because taxes are one of the elements of the overall political costs

incurred by enterprises, this theory suggests that larger companies are facing higher ETR (Zimmerman 1983).

Alternatively, it can be argued that larger companies have more resources to influence the political process towards their advantage, to engage in tax planning and to organize their activities to achieve optimal tax savings (Siegfried 1972). In accordance with this policy or the theory of influence, the larger companies are expected to face lower ETR.

Based on the ETR increase during the period after TRA86 for a similar sample of large enterprises, CTJ (1988) concluded that the tax reform is working efficiently, as it expands the acting field for all businesses (Wheeler, 1988). The main limitation of the studies of CTJ is that the methodology was mostly ad hoc - the sample was not representative, there was no control sample for smaller businesses and there were no significant statistical tests.

Although other studies that have examined more systematically the relationship between company size and ETR are not limited by some of the methodological limitations that are inherent in the studies of CTJ, they have not brought significant results. Using time series data from 1947 until 1981 for all operations in Compustat, Zimmerman (1983) detected evidence of positive but non-monotonic relationship between ETR and company size. However, this relationship had variations by industry (the oil and gas industry showed a greater relationship, while the commercial industry had a negative relationship) and time period (the relationship was statistically significant at the .05 level, only with two-tailed control after 1971) (Zimmerman 1983).

On the contrary, Wilkie & Limberg (1986) observed an inverse relationship between ETR and the size of the company, and Stickney & McGee (1982) argue that the size is not an important factor in the explanation of the variance of ETR. These studies used different empirical procedures, including the selection of samples, time periods, data aggregation methods, definitions and ETR representative sizes. Wilkie & Limberg (1990) tried to include the results of Zimmerman (1983) and Porcano

(1986) and found that different results was largely due to differences in the used empirical processes.

Kern & Morris (1992) expanded the research three years after the TRA86 (1987-1989) and concluded that the results of Zimmerman (1983) are more prominent in different empirical procedures than the results of Porcano (1986) and that important differences in ETR between large and small companies can no longer exist in the period after the TRA86.

Shevlin and Porter (1992) conducted an extensive review of the evidence of CTJ (1988) regarding the impact of TRA86 on ETR of large enterprises, by controlling the changes of business income and comparing the sample CTJ from Fortune 500 to a relatively small sample of enterprises by industry. They found that ETR of large companies rose after TRA86. However, analysis of control samples showed that ETR rose after TRA86 for both small and large companies and that the differences in the ETR of the two groups was not statistically significant either before or after the TRA86. Thus, they concluded that TRA86 had not differentiated impact in relation to small businesses and, therefore, the claim of CTJ that TRA 86 created a more equal competitive field does not extend to firms of different sizes.

Finally, Manzon & Smith (1994) recently looked at how changes in the ETR in three tax regimes before and after TRA86 connected with the size of the company, using a large sample of firms on Compustat. In regression models, which are also controlled for capital-intensive, it was found that changes in the global ETR in relation to the three tax regimes were not related to the size of the company.

2.3.2 ETR, functions and decisions of enterprises on financing and investments

Most studies have focused on single-variance relationship between enterprise size and ETR. This approach does not take into account the impact of other characteristics of the firm on ETR. There are at least two ways in which business functions can affect ETR. Wilkie (1988) demonstrated that ETR is a function of the relationship of the tax preferences with the accounting income, where the tax preferences are elements that cause different taxable income from the accounting income. Insofar as the tax preferences are not linked proportionately with the

accounting income, ETR can be changed simply because of changes in the accounting income (Wilkie, 1988).

Therefore, for getting a conclusion about whether companies with a particular feature (such as the large size) have benefited from a larger set of tax preferences, it is necessary to test changes in revenue. Further, Wang (1991) supported, by a path analysis, that net operating losses (NOL) affect not only ETR, but also that NOL correlate with the size of the company. Specifically, NOL can cause a positive relationship between business size and ETR because larger companies are less likely to have net operating losses, partly because of their greater diversification (Zimmerman 1983). This relationship indicates the need to test the status of a firm's NOL.

With regard to the financing and investment decisions of firms, these are also likely to affect ETR, because the tax code provides differential treatment in capital decisions and in decisions undertakings for the combination of assets (Wang, 1991). Since the interest is deducted for tax purposes, while dividends don't, companies with higher leverage will have lower ETR.

Alternatively, a positive relationship between ETR and leverage is possible, as companies with high marginal tax rates are most likely to use debt financing. Similarly, the mix of assets of an enterprise could affect ETR, given the tax benefits capital investments provided (Wang, 1991). For example, the tax code usually allows taxpayers to amortize the cost of tangible depreciable assets in times of much more limited than their financial life. So, companies that require greater capital intensity are expected to have the lowest ETR.

Stickney & McGee (1982) provide evidence for the relationship between ETR and a company's capital structure and asset combination. Using the analysis stands for cross sectoral data from financial statements, it was found that a company's leverage and capital intensity show a significant negative relationship with ETR. Although Stickney & McGee (1982) exceeded the fundamental limitation of univariate studies, by examining the effect of multiple characteristics of a company on ETR, their analysis is limited in various ways. Firstly, their items are dated and refer only to a tax

regime. Secondly, they do not test the impact of business operations. And thirdly, the definition of ETR leads to some problems of interpretation regarding their findings.

As in the case of company size, there is great interest in examining whether the law TRA86 influenced the relationship between ETR and the financing and investment behaviour of a business. The interest stems from the goal of TRA86 to balance the competitive conditions between companies, by reducing tax preferences, broadening the tax base and reducing tax rates. For example, TRA86 reduced the tax preferences for capital investment with the abolition of the tax credit investments and lengthening of depreciation schedules (Stickney & McGee, 1982). If TRA86 actually isoskelise the conditions of competition between companies with different capital structures and combinations of assets, then these attributes should no longer be linked to the ETR after tax reform.

2.3.3 ETR and other enterprise characteristics

Of course, the ETR of a business could be related to other factors, apart from the size, capital structure and asset combination. A complete model of ETR volatility would include ideally these other factors. One such factor is the extent of a company's activities abroad. Since the United States impose taxes on world income and limit the ability of taxpayers to offset income taxes from activities abroad (through restrictions on tax relief), global ETR of enterprises with activities abroad would probably be higher if they are operating in countries with a relatively high tax rate. This problem may be exacerbated after 1986, as more companies faced binding restrictions on foreign tax deduction (Collins & Shackelford 1992). Also, as larger companies tend to concentrate a greater proportion of their income from activities abroad (Zimmerman, 1983; Daronco 1990-1991), the extent of those activities of a business is probably associated with its size.

Similarly, the ownership structure of an enterprise, the remuneration policies and the corporate culture may influence the ETR. As regards the structure of ownership, it could be argued that the greater the involvement of managers in owning a business, the more aggressive will be the reduction of taxes in connection with the growing financial reporting income. Klassen (1996) presents data in accordance with

this expectation in the context of the decisions of administrators to sell assets while unrealized gains or losses are outstanding.

However, Guenther (1994) found no evidence for this hypothesis in his study about responses of salary management on tax rate reductions under the Act TRA86. As regards the remuneration policies, it is known that bonus are an important element in the remuneration of managers and that are defined on the basis of either the profit before tax or after tax. So, the motivation of managers to switch between financial and tax information is probably a function of the specific conditions of remuneration plans. Finally, in terms of corporate culture, it is likely that some companies are just more aggressive than others in the pursuit of strategies to minimize taxes.

Some empirical studies have looked at the role of taxes on decisions of companies, such as organizational choice, investment decisions, the combination of financing, dividend policy, activities of mergers and acquisitions, accounting options, compensation and the reactions to political pressures. Unlike the studies on individual taxation, where micro-data are available for public use, the tax return data at the corporate level is confidential. As a result, non-governmental researchers are usually forced to build fiscal variables from the financial statements, leading to a proliferation of measures proposed and to doubts about its accuracy. Gramlich (1992), Callihan (1994), Shackelford & Shevlin (2001) and Maydew (2001) recognize the improvement and evolution of tax rate as important elements for continuing the research field.

Since there is no evidence concerning the information of business tax returns, researchers are developing measures of the financial statements to cover these non-observed characteristics using a variety accounting standards (APB 11, SFAS 96, SFAS 109) for reporting financial income. In the present study the tax measures that are widely used are assessed, comparing financial statements directly with tax revenues that are based on tax models based on the tax rebate and the data at Compustat (Maydew, 2001).

The results suggest that measures of average tax rate (ATR) based on the financial statements, such as those used by the U.S. Congress, the Joint Committee on

Taxation (1984), Porcano (1986), Shevlin (1990) and Zimmerman (1983) are not strongly associated with the statutory charges and produce biased estimates of the tax return of enterprises. The extent of bias seems to be compounded by other economic and demographic variables that are often used to examine the tax burden of enterprises. As dependent variables, the incorrect measuring of the ATR can lead to erroneous conclusions about the size and direction of the factors influencing the tax burden.

Although the measures of taxable income and obligations that are based on financial statements are fundamental for the simulated marginal tax rates (Marginal Tax Rates – MTR) (Shevlin, 1990, Graham, 1996b), these representative values exhibit significantly improved controls for the MTR for one year than their respective intermediate tax rates and are less sensitive to include other variables in regression models. The estimated correlation between the current and present MTR between the binary variable that measures net operating losses (NOL) is high.

Taxation of companies is becoming increasingly important for the economic decisions of firms. Graham (2003) presents a set of corporate decisions that are influenced by taxes. Since the tax represents a cost to a business, it necessarily affects its performance. Hence, there has been a growing debate about finding ways to reduce the tax burden on businesses. As a result, an extensive bibliography is developed for the investigation of the actual tax rates (Dyreng et al., 2008).

During the investigation of corporate taxation, nominal tax rates rarely report corporate tax expenses. In fact, the tax expenditure of a business is achieved by applying a series of tax and transfer amounts accrued to the amount resulting from multiplying the statutory tax rate and income before taxes (Dyreng et al., 2008). This is due to the differences between accounting and tax systems that have different rules regarding the treatment of certain items in the financial statements. Such differences can be used by administrators for reducing ETR lawfully.

The goal of minimizing the tax cost is marked in a variety of ways by previous researchers, such as for example by Dharmapala & Desai (2006) and Dyreng et al (2008) who define it as tax avoidance to reduce taxes. Wahab & Holland (2012) use

the term tax planning. In addition, Minick & Noga (2010) mentioned it as an alternative to tax management and stated that it consists in the ability to pay small amount of taxes. Tax management feature is associated to some extent with the element of the transfer tax costs. However, Hanlon & Heitzman (2010) explain that the strategies based on transfer of tax costs do not affect the ETR of GAAP. Nevertheless, it is worth noting that due to the time value of money, businesses may choose to pay a low amount of taxes for now and to postpone the payment of other taxes in the future. With the implementation of this strategy, companies are exploring the opportunities for managing taxes.

The actual tax rates are determined by the characteristics of multiple large businesses. The size of companies is one of the features that are expected to affect the ETR. This indicator has been studied extensively in literature and almost all surveys for actual tax rates include it as an indicator with predictive power versus ETR. However, the relationship between business size and ETR can be ambiguous.

Zimmerman (1983) reports that the larger companies are associated with higher real rates, which can be explained by the theory of the political costs.

According to this theory, the actual tax rates are a size of political cost, as taxes paid is an average of wealth transfer from enterprises in other social groups. The effective tax rates are also a size of business success, therefore, if the larger companies have more success than smaller companies, they will be exposed to more political scrutiny. As larger companies are subject to higher scrutiny from the tax authorities, they show reluctance to reduce the actual tax rates. Consequently, the larger companies are expected to have a higher tax burden compared to businesses that have smaller size, since the taxes paid represent the political cost borne by the businesses. Another competitive theory argues that, because the larger companies have more power and more resources for managing taxes, they show lower ETR (Siegfried, 1972).

According to this perspective, Dyreng et al. (2008) and Chatterjee & Hambrick (2007) identify negative relationship between size and ETR. However, other studies indicate that the size of companies has a positive impact on ETR (Desai

& Dharmapala, 2009). These studies confirm the theory of the political costs of Zimmerman (1983). In addition, Gupta & Newberry (1997) argue that the size of companies and ETR do not correlate to each other during the examination of this relationship over time. By analyzing businesses at the U.K, Wahab & Holland (2012) also find mixed relationships between size and ETR depending on the sorting of business sectors.

The analysis of capital structure is also fundamental for the investigation of factors that can affect the effective tax rate on business. The way a company chooses its finances is important due to the different tax treatment of various financial instruments. A company can essentially decide between debt financing and equity financing. If the company decides to finance with equity, although it is a cheaper alternative, it offers advantages, as the fees to investors, i.e. dividends are not deductible for tax purposes (Wahab & Holland, 2012). The deductibility of tax rates leads to a preference for debt financing and not to finance with equity.

As Graham (2003) states, financing decisions of enterprises can also contribute to aligning the interests of shareholders and managers. Business managers with higher levels of leverage are subject to the discipline of financing agreements imposed by creditors by including restrictive clauses. These restrictions reduce the margin available for making decisions that do not maximize value in relation to obtaining personal benefits. Based on this explanation, it is expected that companies with higher leverage will experience lower ETR. Richardson & Lanis (2007) identify a significant negative relationship between leverage - used as a size for the capital structure - and actual tax rates. Due to this advantage associated with the tax breaks, the prediction is in line with the existing literature and, therefore, we expect a negative correlation between financing debt and ETR.

Besides the business financing decisions, investment decisions are also a characteristic that can affect the actual tax rates. As pointed out by Hanlon & Heitzman (2010), the investment decisions of administrators can be restricted to some extent by corporate taxes due to the uncertainty of tax payments and due to the deductions that must be incorporated in the calculation of the present value of an investment. Apart from the possibility to deduct tax rates, the depreciation is an

important element of business expenditure. Therefore, companies that are more capital oriented take greater advantage of the depreciation.

This is even more important since the economic life of the asset is usually greater than the depreciation period (Richardson & Lanis, 2007). Because of the varying methods of depreciation, more capital intensive companies can manage their taxes easier by speeding up or postponing the depreciation costs and, consequently, can benefit from temporary accounting differences. Research and development expenses (R&D) is another aspect associated with the investment decisions of companies that contribute to the reduction of actual tax rates. There are many tax incentives through multiple jurisdictions that promote investment in R&D research and development programs depend on tax rates and credit incentives (Hanlon & Heitzman, 2010).

In accordance with Richardson & Lanis (2007), capital volume and expenses in R&D are supposed to have a negative impact on ETR. In addition, the researchers tested the effect of stock volume on ETR. However, unlike the capital volume and expenses in R&D, they found that companies with higher stock volume show higher ETR.

As regards those assets variables, Gupta & Newberry (1997) argue that both capital volume and cost in R&D have a negative and significant impact on ETR. They indicate that the negative relationship between stock volume and ETRs may be due to the substitution effect between inventory investment and capital investments. Regarding the volume of stock, Derashid & Dharmapala (2009) do not detect a significant impact to the ETR, but, on the contrary, they detect a negative relationship between capital volume and ETR. Further, Minnick & Noga (2010) in their study of determinants of ETR in BRIC countries also identify a positive correlation between the volume of stock and ETR.

In contrast to these surveys, the study of Wahab & Holland (2012) does not include assets variables as explanatory variables of ETR. For example, it is argued that the tax benefits that are associated with the capital volume and lead to differences

between the accounting and tax account will be identified by the deferred element of effective tax rate.

Therefore, the capital volume will not affect ETR. Unlike Wahab & Holland (2012), the effect of asset variables is examined as attributes of firms with a chance to influence and determine ETR. An indicator capable to affect the effective tax rate is the profitability of enterprises. In particular, when calculating profitability based on income before taxes, it is expected that the more profitable companies will pay more taxes. A positive correlation between the profitability of businesses and ETR is detected by Gupta & Newberry (1997), Richardson & Lanis (2007) and Minick & Noga (2010).

Instead, there are available surveys that support that profitable companies can benefit from tax exemptions and can use the tax deductions and tax credits more effectively and thus they exhibit greater differences of tax accounting (Manzon & Plesko, 2002). As pointed out by Manzon & Plesko (2002) the most profitable businesses have lower costs associated with the management of taxes because they have more resources to invest in tax planning activities that will contribute to reduction of actual tax rates.

In addition, firms with higher incomes before taxes have more incentives to reduce their tax burden and, consequently, the ETR. In accordance with the prospect of more profitable businesses that exhibit lower ETR, Derashid & Zhang (2003) identify negative effect of business profitability on the ETR.

Some of the financial and operational indicators described above are a result of decisions by managers. The main purpose of the actions and choices of managers should be to maximize the value of fixed-income, seeking ever-maximizing projects and efficient business processes. Financial and investment decisions are somehow a result of management's discretion and, therefore, companies may experience conflicts between the interests of shareholders and managers interests (Shevlin, 1990). These decisions affect the determinants of economic and functional characteristics of enterprises, therefore the relationship between these characteristics and ETRs are a result of power managers ' decision-making.

As the effective tax rate is also a key factor for business performance, administrators must take account of this variable and include it in their decisions. Efforts to reduce ETR are important to shareholders because by this way they increase the available result in their earnings. However, administrators can manage taxes without aiming to reduce the actual tax rates. As it is pointed out by Dharmapala & Desai (2006), managing taxes can be costly for shareholders, because administrators can disguise the selfish pursuit of activities through the objective of reducing taxes. Therefore, together with economic and functional determinants of ETR, corporate governance mechanisms must be included in regressions of ETR of companies (Chen et al., 2010; Minick & Noga, 2010; Wahab & Holland, 2012).

The separation of ownership and control is one of the main reasons for the existence of problems originator - trustee (Shevlin, 1990). As mentioned above, administrators may not care to reduce the actual tax rates, in order to increase the profits of shareholders because it does not directly affect their profits. Managing property is a governance mechanism that encourages the alignment of interests of managers with those of shareholders and, consequently, contributes to reduce originator - trustee problems.

As it is stated by Florackis (2008), this phenomenon of alignment is achieved by minimizing the incentive of managers for the continuation of projects with negative returns. Ozkan & Ozkan (2004) declare that as the cost of management actions will refer to administrators too, this can limit the willingness of placing resources in actions of non-value maximization. If managers hold significant percentage shares, reduction of ETR will benefit them and, consequently, they will have incentives to take economic decisions that contribute to the reduction of actual tax rates. On the other hand, Derashid & Zhang (2003) argue that companies owned by their managers have less incentive to manage taxes, because administrators-owners do not wish to invest in risky activities.

Although managerial ownership contributes to the alignment of incentives, there is a contrary theory about the effect of managerial ownership on maximization of value activities. It is also stated that after a certain level of managerial ownership, administrators have enough power to act in accordance with their own interests (Fraile

& Fradejas, 2014). With the presence of a higher managerial ownership, shareholders who are not administrators may have difficulties in monitoring the attitude of managers, as the latter can exercise more control without inclusion of the control and pressure exerted by external shareholders (Ozkan & Ozkan, 2004). Therefore, high levels of managerial ownership contribute to the phenomenon of consolidation and reduce the threat of dismissal caused by ineffective management. Studying the relationship between managerial ownership and cost, Florackis (2008) notes that after a 10% managerial ownership there is positive impact on cost management, confirming the consolidation effect.

Hanlon & Heitzman (2010) also verify that the monitoring of shareholders will only be effective if the managerial ownership is not too high to cause the phenomenon of consolidation. The analysis of the structure of ownership in the context of corporate governance mechanisms should also take into account the concentration of ownership. The concentration of ownership is also an alternative way to reduce management problems. In accordance with Florackis (2008), shareholders with small holdings have little motivation for tracking management, but if they hold a significant share, they will be interested in the checking and effective control of management.

Shareholders assume all the costs associated with monitoring activities, therefore, a large percentage of ownership justifies the active monitoring of management. In this way, the administrative discretion is avoided and it therefore helps to alleviate joint problems between shareholders and managers (Ozkan & Ozkan, 2004). However, the reduction of problems through joint ownership concentration may be compromised because of a conflict with others. Companies with shareholders holding a large percentage of shares may face problems of representation between large and minority shareholders. This is particularly important because the large shareholders have enough force to engage in activities that allow them to derive personal benefits at the expense of minority shareholders (Ozkan & Ozkan, 2004).

The controlled shareholders will have more incentives to force administrators to reduce the actual tax rates, as the benefits from higher earnings will also be higher. Chen et al. (2010) observe the relationship between fiscal aggression and ownership

structure, analyzing the behavior of family enterprises. On the one hand, family businesses with higher concentration of ownership benefit from tax administration activities because of tax savings. On the other hand, fiscal aggression causes costs associated with penalties, price discounts imposed by minority shareholders and a capital loss of reputation.

For these reasons, the family businesses with higher concentration of ownership are less aggressive than non-family businesses. Apart from the possibilities of managerial ownership for reducing the problems of representation depending on the level of obtaining confidential information, the concentration of ownership can also have a positive influence. As it is pointed out by Fraile & Fradejas (2014), the concentration of ownership might affect the willingness of shareholders to actively monitor the behavior of managers. The concentration of ownership can contribute to maximization of activities' value and reduce the problem of representation or intensify the conflicts between majority and minority shareholders.

3   METHODOLOGY

3.1   Data and variables

The indices used, as well as the sample variables in the empirical part of the survey retrieved from the DataStream database for the whole range of the analysis. In particular, for the analysis of the study model, the model was created in the context of deferred taxation as the sample was significantly affected by the lack of a number of variables that indicate the specific benchmark of the model.

In addition to the DataStream database, there were data where their analysis came from the bibliographic survey conducted in the labor survey at the level of analysis of the variables analyzed after the collection of all the data.

The variables used are analyzed in detail in the follow-up of empirical research as well as their contribution to the results, presenting what has been done for the purposes of extensive research on the subject chosen but also for academic purposes after using the results in other similar surveys.

The research combines two basic papers concerning the factors affecting the effective tax rates, which are the ones of Plesko (2003) and Gupta & Newberry (1997). The analysis was conducted in three European Countries: Germany, France and Spain. The companies are listed in the stock exchanges of the aforementioned European countries. Two distinct time periods were selected for the analysis: the year 2010 and 2015.

The choice of the sample of countries and time periods was based on the fact that few data were available especially for deferred taxes before 2010. After winsorisation (keep tax rates that fall between the -1 to +1 interval), the final sample of firms is as follows: Germany 238 firms, France 114 firms and Spain 84 firms. The variables are presented in the following table:

Table 1: Variables used in the models

Variable	Measurement	Author
τret1	Tax after credits/Net income	Plesko(2003)
τret2	Tax after credits/Income subject to tax	Plesko(2003)
τgn1	Current income tax expense/EBIT	Gupta & Newberry (1997)
τgn2	Current income tax expense/operating cash flow before interest and taxes	Gupta & Newberry (1997)
τporc	Current income tax expense/Pretax income minus equity income (loss) from unconsolidated subsidiaries plus income (loss) from minority interests	Porcano (1986)
τzimm	Total tax expense minus change in deferred tax liability/operating cash flow before interest and taxes	Zimmermann (1983)
size	Log of total assets	Plesko (2003); Gupta & Newberry (1997)
capint	Property, plant and equipment/Total Assets	Plesko (2003); Gupta & Newberry (1997)
invint	Total inventories/Total assets	Gupta & Newberry (1997)
roa	Pretax Income/Total Assets	Plesko (2003); Gupta & Newberry (1997)
leverage	Long-Term Debt/Total Assets	Plesko (2003); Gupta & Newberry (1997)

As the table above shows, the tax-return based measures used for the analysis are the ones used in the research of Plesko (2003), i.e TACNI and TACIST (τret1, τret2 respectively). Those tax-return based measures are then compared with the financial statement based measures of tax rates. Those are the ones proposed by Gupta and Newberry (τgn1, τgn2), the one proposed by Porcano (τporc) and Zimmermann (τzimm). The rest variables were used by both Plesko (2003) and Gupta and Newberry (1997). Those variables are the size, capital intensity (capint), inventory intensity (invint), return on assets (roa) and leverage.

3.2 Models and methods

The objective of the research is to estimate the effect of the measurement error in average tax rates. In order to estimate the reliability ratios, we use the following regression:

$$\tau financial = a + b_1 \tau tax + \sum_{i=2}^{n} b_i X_i$$

Equation 1

Therefore, the tax-return based measures are regressed on the financial statement measures, i.e the ones proposed by Gupta and Newberry (1997), as well as the ones of Porcano (1986) and Zimmermann (1983). The rest explanatory variables are the size, capital intensity, inventory intensity, return on assets and leverage. First, the correlation coefficients between the financial statement and tax return based measures were extracted. The correlation coefficients were extracted for each country and year separately. Then, the reliability ratios were estimated. The reliability ratios are the estimates of b_1 coefficients of the univariate, bivariate and multivariate regressions, as Plesko (2003) proposed. Higher values of the reliability ratio imply less noise in the observed data, and therefore this is a desirable property. The univariate regression involves as only explanatory variable the tax-return measures (τret1, τret2) on each financial statement based measure. The bivariate regression involves as additional explanatory variable the size of the firm. The multivariate regression involves as additional explanatory variables capital intensity, inventory intensity, return on assets and leverage.

RESULTS

3.3 Descriptive Statistics

In this section, the descriptive statistics for the variables used in the analysis are presented, by year and country. In order to test for significant differences within the same country, t-tests were implemented. In order to test for significant differences between countries during the same year, oneway ANOVA test was implemented.

Table 2: Descriptive statistics for the variables of the model

		Germany				France				Spain		
Descriptive Statistics												
2010												
	N	Mean	Median	St.dev.	N	Mean	Median	St.dev.	N	Mean	Median	St.dev.
τret1	238	0.31	0.363	0.304	114	0.407	0.432	0.396	66	0.264	0.302	0.387
τret2	238	0.18	0.266	0.279	114	0.277	0.306	0.249	66	0.122	0.232	0.434
τgn1	238	0.063	0.131	0.724	114	0.068	0.152	1.139	66	-0.025	0.116	1.051
τgn2	238	0.107	0.124	0.698	114	0.002	0.108	0.928	66	-0.276	0.054	2.015
τporc	238	0.173	0.256	0.27	114	0.266	0.29	0.247	66	0.153	0.22	0.238
τzimm	238	0.218	0.144	1.197	114	-0.106	0.161	3.054	66	0.082	0.111	1.494
size	238	12.917	12.466	2.15	114	13.337	12.923	2.185	66	14.001	14.002	2.371
capint	238	0.227	0.199	0.185	114	0.2	0.168	0.172	66	0.339	0.297	0.231
invint	238	0.13	0.122	0.112	114	0.123	0.093	0.137	66	0.113	0.082	0.125
roa	238	0.067	0.062	0.098	114	0.068	0.058	0.102	66	0.051	0.045	0.093
leverage	238	0.165	0.122	0.208	114	0.154	0.147	0.14	66	0.227	0.201	0.179
2015												
	N	Mean	Median	St.dev.	N	Mean	Median	St.dev.	N	Mean	Median	St.dev.

τfin1	238	0.477	0.408	0.743	114	0.422	0.422	0.422	66	0.297	0.294	0.393
τfin2	238	0.239	0.29	0.255	114	0.234	0.297	0.282	66	0.167	0.227	0.246
τgn1	238	0.283	0.259	1.093	114	0.278	0.225	1.501	66	0.227	0.203	1.267
τgn2	238	0.235	0.201	0.648	114	0.024	0.151	0.847	66	0.201	0.188	1.195
τporc	238	0.23	0.282	0.248	114	0.22	0.278	0.282	66	0.165	0.218	0.239
τzimm	238	0.147	0.177	0.876	114	0.06	0.169	2.943	66	0.229	0.173	1.318
size	238	13.161	12.714	2.153	114	13.638	13.258	2.177	66	14.038	13.953	2.395
capint	238	0.226	0.185	0.191	114	0.194	0.149	0.167	66	0.324	0.268	0.241
invint	238	0.129	0.116	0.119	114	0.122	0.092	0.13	66	0.104	0.045	0.121
roa	238	0.055	0.055	0.096	114	0.05	0.047	0.104	66	0.047	0.05	0.106
leverage	238	0.154	0.114	0.172	114	0.15	0.149	0.114	66	0.233	0.232	0.158

Beginning with the results concerning Germany, the difference in TACNI tax-return based measure of average tax rates between 2010 and 2015 is statistically significant (p=0.002). However, this difference is not statistically significant for France and Spain (p=0.735, p=0.648 respectively). For 2010, the difference in means among the countries is statistically significant, as the oneway ANOVA test showed (p=0.013). Specifically, based on the post hoc Bonferroni, Sidak and Scheffe analyses, there is significant difference between Germany and France (p=0.043, p=0.050, p=0.043 for each post hoc analysis respectively), with the latter having a lower tax rate measure on average. For 2015, as the oneway ANOVA test showed, there is not statistically significant difference in mean between the countries (p=0.114).

As for the second tax-return based measure, TACIST, the difference in means for Germany is again statistically significant (p=0.017), but this does not apply for France (p=0.259) and Spain (p=0.476). For 2010, the difference in means among the countries is statistically significant (p=0.002). As the post hoc analyses showed, there is significant difference in means between Germany and France (p=0.015, p=0.020, p=0.015) and between France and Spain (p=0.003, p=0.004, p=0.003). Germany has

higher tax rate measure compared to France, whilst France has lower tax rate measure compared to Spain. For 2015, the oneway ANOVA test showed that there are not statistically significant differences in means among the countries (p=0.135).

Then, the difference in means for the first measure introduced by Gupta and Newberry (τgn1) between 2010 and 2015 is statistically significant (p=0.006). For France and Spain, the difference is not statistically significant (p=0.1267, p=0.179 respectively). As the oneway ANOVA test for 2010 revealed, there are no statistically significant differences in mean among the countries (p=0.759). The same applies for 2015 (p=0.946).

As for the second measure introduced by Gupta and Newberry (τgn2), the difference in means is again statistically significant (p=0.020). The same applies for Spain (p=0.091). However, for France the difference is not statistically significant (p=0.825). For this measure, the oneway ANOVA test revealed that there are significant differences in means for 2010 among the countries (p=0.038). The post hoc Bonferroni, Sidak and Scheffe analyses showed that there is statistically significant difference between Germany and Spain (p=0.032, p=0.038, p=0.032 respectively for each post hoc analysis). Specifically, Germany has lower average tax rate as measured by Gupta and Newberry. The same applies for 2015, as the oneway ANOVA showed that there are significant differences in means among the countries (p=0.072). As the post hoc analyses showed, there is significant difference between Germany and France (p=0.069, p=0.076, p=0.068 respectively). Germany's tax rate measure is lower than the one of France on average.

Furthermore, as for the financial statement measure proposed by Porcano (1986), the difference in means is statistically significant for Germany (p=0.018), but this does not apply for France (p=0.230) and Spain (p=0.768). For 2010, the oneway ANOVA test showed that there are significant differences in means among the countries (p=0.003). Specifically, the post hoc analyses showed that there are significant differences between Germany and France (p=0.005, p=0.008, p=0.005) and between France and Spain (p=0.015, p=0.019, p=0.015). Germany has higher tax rate measure compared to France, whilst France has lower tax rate measure compared

to Spain. For 2015, the oneway ANOVA test showed that there are not significant differences in means among the countries (p=0.191).

The difference in means for the measure proposed by Zimmermann is not statistically significant for any of the countries (p=0.501, p=0.732, p=0.562 respectively). For this measure, there are not significant differences in means among the countries neither in 2010 (p=0.336) nor in 2015 (p=0.815). As for size, for Germany and France there are significant differences in means between 2010 and 2015 (p=0.000), whilst this does not apply for Spain (p=0.514). For 2010, the oneway ANOVA test showed that there is statistically significant difference in means among the countries (p=0.002). Post hoc analyses showed that this difference is significant between Germany and Spain (p=0.001, p=0.002, p=0.001). For 2015, again the difference in means is statistically significant (p=0.009). Post hoc analyses showed that this difference is significant between Germany and Spain (p=0.013, p=0.017, p=0.013).

As for capital intensity, there are no significant differences in means between 2010 and 2015 for any of the countries (p=0.859, p=0.160, p=0.260). The latter holds for inventory intensity as well (p=0.936, p=0.976, p=0.283). When it comes to capital intensity, for 2010 there is significant difference in means among the countries (p=0.000). Specifically, the difference is significant between Germany and Spain (p=0.000) and France and Spain (p=0.000). The same holds for 2015, as there is statistically significant difference in capital intensity among the countries (p=0.000) and specifically between Germany and Spain (p=0.000) as well as France and Spain (p=0.000). For inventory intensity, there is not statistically significant difference among the countries, neither in 2010 (p=0.564) nor in 2015 (p=0.314).

As for the return on assets, there is significant difference in means between 2010 and 2015 for Germany (p=0.082) and France (p=0.060). For Spain, this difference is not statistically significant (p=0.740). As the oneway ANOVA test showed, there is not statistically significant difference in means among the countries neither in 2010 (p=0.482) nor in 2015 (p=0.780). As for leverage, there are no statistically significant differences in means between 2010 and 2015 for any of the countries (p=0.367, p=0.622, p=0.786). However, there are significant differences in means among the

countries for 2010 (p=0.039) and 2015 (p=0.001) as the oneway ANOVA test showed. In 2010 there is significant difference between Germany and Spain (p=0.059, p=0.066, p=0.058) as well as between France and Spain (p=0.063, p=0.069, p=0.061). In 2015, there is again significant difference in leverage between Germany and Spain (p=0.001, p=0.002, p=0.001) as well as between France and Spain (p=0.005, p=0.006, p=0.005). In the following section, the reliability results from the univariate, bivariate and multivariate regression as presented in the previous chapter.

3.4 Reliability ratios of average tax rate measures

In this section, the estimated reliability ratios of average tax rate measures are presented, based on the correlation coefficients, as well as on the univariate, bivariate and multivariate regressions. Those regressions were run for each country and year separately, in order to make a direct comparison at country and year level.

As the table below shows, the financial statement measure proposed by Porcano (1986) seems to have the highest reliability ratios for all three countries and for both time periods. Coefficients are for most cases statistically significant and close to unity. The latter applies for the univariate, bivariate and the multivariate models. We also observe that the rest measures proposed have low reliability ratios when the coefficient is statistically significant, or they are statistically insignificant, suggesting that they are zero. To this end, the most important remark of the analysis is that most of the financial statement based measures of average tax rates have significant measurement errors in determining the statutory corporate tax burden. A notable exception is the measure proposed by Porcano (1986), which provides high reliability ratios for both years and for all countries of the sample.

We also observe that when we add more explanatory variables in the model, such as firm characteristics, there is a positive effect in the reliability ratio. This is reported only for the measure proposed by Porcano (1986). To this end, we can conclude that firm characteristics play a significant role in determining the statutory corporate tax burden.

Table 3: Estimated Reliability ratios

Measure	P	Univariate β	Bivariate β	Multivariate β	Measure	ρ	Univariate β	Bivariate β	Multivariate β
Panel A. Tax measure: tax after credits/net income (TACNI)					**Panel B. Tax measure: tax after credits/income subject to tax (TACIST)**				
Germany					**Germany**				
2010					**2010**				
τgn1	0.184***(0.005)	0.078**(0.029)	0.080**(0.023)	0.051(0.150)	τgn1	0.215***(0.001)	0.082*(0.059)	0.086**(0.047)	0.054(0.231)
τgn2	0.075(0.252)	0.033(0.215)	0.036(0.165)	0.019(0.460)	τgn2	0.106(0.104)	0.042(0.185)	0.046(0.148)	0.027(0.406)
τporc	0.864***(0.000)	0.974***(0.000)	0.976***(0.000)	0.986***(0.000)	τporc	0.978***(0.000)	1.008***(0.000)	1.008***(0.000)	1.013***(0.000)
τzimm	-0.002(0.980)	-0.000(0.983)	-0.001(0.971)	-0.005(0.814)	τzimm	-0.068(0.298)	-0.016(0.605)	-0.016(0.598)	-0.021(0.498)
2015					**2015**				
τgn1	0.077(0.237)	0.052(0.417)	0.054(0.417)	0.045(0.505)	τgn1	-0.055(0.400)	-0.013(0.840)	-0.014(0.822)	-0.018(0.773)
τgn2	0.044(0.499)	0.050(0.290)	0.049(0.301)	0.046(0.353)	τgn2	0.008(0.906)	0.003(0.913)	0.004(0.881)	0.001(0.980)
τporc	0.649***(0.000)	1.944***(0.000)	1.974***(0.000)	2.025***(0.000)	τporc	0.9903***(0.000)	1.018***(0.000)	1.017***(0.000)	1.019***(0.000)
τzimm	0.044(0.505)	0.037(0.556)	0.037(0.550)	0.040(0.534)	τzimm	0.012(0.853)	0.004(0.872)	0.003(0.895)	-0.008(0.704)

	France					France			
	2010					**2010**			
τgn1	-0.207**(0.027)	-0.072(0.197)	-0.070(0.215)	-0.041(0.482)	τgn1	0.165*(0.080)	0.036(0.472)	0.038(0.458)	-0.008(0.758)
τgn2	0.113(0.230)	0.048(0.602)	0.052(0.582)	-0.030(0.528)	τgn2	-0.185**(0.049)	-0.050(0.319)	-0.046(0.351)	-0.015(0.521)
τporc	0.164*(0.081)	0.262(0.722)	0.254(0.733)	1.587***(0.000)	τporc	0.997***(0.000)	1.004***(0.000)	1.001***(0.000)	1.012***(0.000)
τzimm	0.102(0.280)	0.013(0.175)	0.013(0.179)	0.015(0.167)	τzimm	0.157*(0.096)	0.013**(0.014)	0.012**(0.012)	0.010**(0.032)
	2015					**2015**			
τgn1	0.000(0.998)	0.000(0.999)	0.000(0.998)	0.029(0.551)	τgn1	-0.127(0.179)	-0.024(0.534)	-0.024(0.536)	0.013(0.553)
τgn2	-0.077(0.417)	-0.038(0.255)	-0.042(0.215)	-0.023(0.562)	τgn2	-0.135(0.153)	-0.045(0.151)	-0.047(0.121)	-0.023(0.364)
τporc	0.746***(0.000)	1.114***(0.000)	1.105***(0.000)	1.177***(0.006)	τporc	0.984***(0.000)	0.982***(0.000)	0.977***(0.000)	0.997***(0.000)
τzimm	0.172*(0.067)	-0.025*(0.088)	-0.026*(0.074)	-0.027*(0.075)	τzimm	-0.280***(0.003)	-0.027(0.155)	-0.027(0.145)	-0.030(0.130)
	Spain					**Spain**			
	2010					**2010**			
τgn1	0.2107*(0.089)	0.078(0.146)	0.085(0.128)	0.099(0.089)	τgn1	0.294**(.016)	0.122(0.291)	0.130(0.262)	0.147(0.223)
τgn2	0.263**(0.033)	0.051**(0.011)	0.050**(0.010)	0.031**(0.026)	τgn2	0.279**(0.024)	0.060*(0.054)	0.060*(0.053)	0.025(0.168)

τporc	0.839***(0.000)	1.364***(0.000)	1.371***(0.000)	1.820***(0.000)	τporc	0.818***(0.000)	1.491***(0.001)	1.502***(0.001)	1.862***(0.004)
τzimm	0.038(0.763)	0.009(0.771)	0.008(0.802)	-0.022(0.287)	τzimm	0.088(0.484)	0.025(0.554)	0.025(0.524)	-0.017(0.396)
2015					**2015**				
τgn1	0.083(0.510)	0.026(0.433)	0.029(0.378)	0.025(0.518)	τgn1	0.195(0.118)	0.038(0.187)	0.041(0.156)	0.035(0.256)
τgn2	-0.008(0.952)	-0.003(0.917)	-0.001(0.960)	-0.006(0.809)	τgn2	-0.058(0.642)	-0.012(0.566)	-0.011(0.585)	-0.017(0.475)
τporc	0.882***(0.000)	1.449***(0.000)	1.448***(0.000)	1.475***(0.000)	τporc	0.986***(0.000)	1.015***(0.000)	1.013***(0.000)	1.011***(0.000)
τzimm	0.173(0.164)	0.052(0.132)	0.051(0.148)	0.068*(0.081)	τzimm	0.175(0.160)	0.033*(0.088)	0.032(0.111)	0.049**(0.027)

Notes: 1. The regressions took into consideration heterogeneity and robust standard errors were extracted. 2. The p-values of the coefficients are reported in parentheses. 3.***significant at 1% level, **significant at 5% level, *significant at 10% level.

4 CONCLUSION

The research focused on the examination of the measurement errors concerning the commonly used financial statement based measures concerning the corporate average tax rates. The research is based on previous studies, that proposed those financial statement measures as proxies of the statutory tax burden, as well as on studies that attempted to evaluate whether those measures can capture efficiently information concerning the statutory tax burden.

The dissertation focuses on the listed companies of three European countries, Germany, France and Spain, for two years, 2010 and 2015. The methodology followed is the one proposed by Plesko (2003). Specifically, the tax return based measures were compared to the financial statement based measures, in order to evaluate the bias of the latter. As corporate taxation is very important for numerous decisions concerning the companies, it is important to have reliable measures in order to assess the corporate tax burden. The financial statement measures used were the ones proposed by Gupta and Newberry (1997), Porcano (1986) and Zimmermann (1983).

The results showed that for all three countries and especially for Germany and France, Porcano (1986) model has the highest reliability ratios for both years examined. However, for the rest financial statement based measures, the reliability ratios are either insignificant and therefore zero, implying very high noise. Those measures are therefore inappropriate for the approximation of the statutory tax burden. This is consistent with the findings of Plesko (2003) who concluded that the financial statement based measures are rather inappropriate for the approximation of the statutory tax burden. However, Plesko (2003) did not find that Porcano (1986) measure had any value in approximating the statutory tax burden. Differences in the results were expected, since the period of examination is different, as well as the sample of the countries. Plesko (2003) examined the U.S listed companies, for the year 1992.

Although the results shed light in the approximation and measurement of the statutory tax burden through financial statement based measures, there are limitations

that should be referred. First, the sample of the research is not representative of the population examined, i.e the listed companies in Germany, France and Spain. The reason is that only the companies with available data for 2010 and 2015 were involved in the final sample. This is important, since the results are not representative of the population examined, due to the lack of random sampling. Furthermore, as for the countries involved in the final sample, only the ones that provided data concerning deferred taxes were involved in the research. It would have been more interesting to involve more South European countries in the sample, apart from Spain, in order to compare Central European/core EMU countries with South European countries. Moreover, the selection of 2010 and 2015 years of examination was not again random, since for those years more data was available concerning deferred taxes. Since the years selected are during the crisis, the results may have noise due to the ongoing crisis. Last but not least, not all financial statement based measures were used in the analysis for further examination, since no data could be found.

The results clearly show that more research is needed for this subject, since there is need for more reliable measures concerning the corporate tax burden, or else efficient tax rates. Miscalculation of the corporate tax burden is highly important, given the impact on corporate decisions. More measures need to be developed, that are more appropriate. In the future, it would be interesting to compare the case of the U.S listed and the European listed companies. Maybe the different accounting environment (U.S GAAP, IFRS) changes the reliability of the financial statement based measures. Thus, more research is needed to examine whether the choice of accounting principles impacts the reliability of the aforementioned measures. Then, since the results may be driven by the general economic conditions, such as recessions, it needs also to be taken into consideration. Some measures may be more reliable in specific points of the business cycle. Last but not least, it is important to examine whether there are differences at country-level, even when the same accounting principles are used. In general, there are some aspects that need to be further investigated in order to draw conclusions concerning the reliability of financial statement based measures.

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