The relationship between the effective tax rate and the nominal rate

La relación entre la tasa nominal y la tasa efectiva de impuestos

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Abstract

The main goal of this investigation is to understand the relationship between the nominal rate and the effective tax rate and to evaluate if the differences between them depend on the value of the nominal rate. Based on a sample of 1,530 companies from 5 countries members of the European Union (Denmark, Slovenia, Finland, Luxembourg and the United Kingdom) there's evidence that the effective tax rate is positively related to the nominal rate. The effective tax rate was calculated through the ratio between the value of the tax paid over the result before tax. When the nominal tax rate increases, the effective rate increases equally but with a slower growth. This relationship is softened if we take into account the value of the nominal tax rate, which shows that companies have the ability to manage the results in order to increase savings in tax.

JEL classification: H25, H22, H20
Keywords: Nominal tax rate, Effective tax rate, Income tax, Tax management.

Resumen

El objetivo principal de esta investigación es comprender la relación entre la tasa nominal y la tasa efectiva de impuestos y evaluar si las diferencias entre ellos dependen del valor de la tasa nominal. Con base en una muestra de 1.530 empresas de 5 países miembros de la Unión Europea (Dinamarca, Eslovenia, Finlandia, Luxemburgo y el Reino Unido), hay evidencia de que la tasa efectiva de impuestos está

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relacionada positivamente con la tasa nominal. La tasa efectiva de impuestos se calculó a través de la relación entre el valor del impuesto pagado sobre el resultado antes de impuestos. Cuando aumenta la tasa impositiva nominal, la tasa efectiva aumenta igualmente, pero con un crecimiento más lento. Esta relación se suaviza si tenemos en cuenta el valor de la tasa impositiva nominal, que muestra que las empresas tienen la capacidad de administrar los resultados para aumentar los ahorros en impuestos.

Introduction

Several studies have shown that not only the nominal tax rate but also the effective tax rate over the profit of companies has been decreasing over the years. This has happened due to factors such as globalisation, tax competition between States or as a simple internal tax strategy of each country (Kawano e Slemrod, 2016; Slemrod, 2004; Mutti, 2003; Bretschger e Hettich, 2002). However, it is important to study if the variations in the nominal tax rate have similar effects on corporate taxation or whether they can smooth out this impact, possibly using fiscal management practices.

The differences between the accountability rules and the tax rules imposed to the companies lead to a gap between the accounting result and the taxable profit, which can be calculated by the analysis of its effective tax rate when compared to the legal nominal rate.

Due to lack of literature which relates the effective tax rate to the nominal tax rate, the goal of the present study essentially deals with analysing this relationship and understanding the behaviour of the effective tax rate once there are nominal tax rate changes.

The sample for this study was selected through Bureau van Dijk's Amadeus database. The choice of the countries was done according to the methodology of Watrin, *et al*. (2014), and all the countries where the IFRS was implemented in a similar way were selected. The companies had the option to use them or not. Afterwards the companies of the countries in which the nominal rate hasn't changed for three years (the years in which the study took place, from 2012 to 2014) were excluded. The final sample had a total of 1530 companies of 5 different countries, Denmark, Slovenia, Finland, Luxemburg and the United Kingdom.

It was created a model based on the study of Adhikari *et al*. (2006), in order to study the relationship between the effective tax rate and the nominal rate. This model is composed by the effective tax rate as a dependent variable, the nominal tax rate as the main independent variable and four control variables: the dimension of the company, the leverage, capital intensity and the return on assets.

According to the results obtained, evidence was found for the existence of a positive relationship between the effective tax rate and the nominal rate, even if there was a coefficient inferior to one, which demonstrates that the companies have the ability to manage their results in order to be able to pay less tax.

Literature review

The Constitution of the Portuguese Republic clarifies us about the main objective of taxes: "*The taxation system intends to satisfy the financial needs of the State and other public entities*

and a fair separation of the incomes and the wealth (article 103ᵗʰ, nr.1). Through taxes the State obtains the necessary means to satisfy the collective needs of the population. As it is not the only type of public revenue, the tax on the income of corporate entities becomes very important to the pillar of the financial activity of the State. This tax is calculated upon the application of a nominal rate to the tax base which is found according to the tax rules of each country, and they assume some corrections to the value determined by accounting. It is only natural that through the years the behaviour and characteristics of the nominal rate have been studied by several investigators, who are aware that the State has the power to change it according to the needs of revenue and its taxation strategy (Hanlon e Heitzman 2010).

Nominal rate

According to Slemrod and Bakija (2017), the nominal tax rate is legally defined and applied to the taxable income allows to determine the tax collection. When Bretschger e Hettich (2002) studied the main factors which influenced the nominal rate of 14 OECD (Organisation for the Economic Cooperation Development) between 1967 and 1996, they concluded that there was a tendency for the tax rate to decrease. This could be one of the possible consequences of globalisation and according to what was foreseen by different theoretical models of tax competition. Kawano and Slemrod (2016) have also achieved evidence that countries seek to propose legal policies to decrease their tax rates and increase their companies' taxable income. In their study they have created a database with several features of the tax result of the companies which belong to OECD countries between 1980 and 2004. Their conclusions state that there is a positive relationship (even if it is narrow) between the tax rates and the tax revenues of the companies. Mutti (2003) investigated the crucial factors of the changes of the tax rates between 60 countries in 1984, 1992 and 1996, and suggests that smaller countries, which are more open to external relationships, have greater tendency to reduce their tax rate over the years when compared to other countries. Devereux *et al*. (2008) investigated the tax competition of OECD countries on taxes levels over the companies and if that competition can explain the fall of tax rates between 1980 and 1990. Evidence suggests that the countries compete amongst themselves and the strategic interaction is present only in open economies, which foretells that decreasing tax rates can be almost fully explained by a more intense competition between countries.

The decrease of institutional barriers to international investment rendered the tax differences between international and national companies more significant (Devereux *et al*., 2008), not only because this result may be achieved by international coordination and articulation of the tax rates, but only because tax competition spontaneously decreases tax differences between international companies and Simmons (2006) also found evidence of this. As one of the goals of the countries' tax strategy is perhaps attracting foreign investment to increase the tax revenues (Clausing, 2007), and once there is a tendency of countries to decrease the tax rate, several authors investigated the relationship between the nominal tax rate and foreign investment. Alena *et al*. (2017) confirmed "*that between countries there are still significant differences in the level of nominal and effective corporate tax burden, especially among a group of old and new EU Member States*." Bénassy-Quéré *et al*. (2000) concluded that foreign investment is sensitive to differences in tax rates. When Gropp e Kostial (2000) investigated the relationship between these two components, they proved that the investment is significantly affected by the tax system not only from the country from where the flow comes from, but also from the

country which is the receptor of the investment. Besides, Gropp and Kostial (2000) concluded that the taxable base is affected by the level of investment, in their study on foreign investment and taxable base. These results are consistent with the results of Bénassy-Quéré *et al*. (2000), once this effect is statistically more significant in countries where foreign investment is tax free.

Thus, the value of the income of each State is not only dependent on the value of the nominal tax rate but also on the "quality" of tax laws, on tax management opportunities, on companies' tax aggressiveness, on the effort tax authorities apply to guarantee the tax laws are abided and the economic conditions that determine the companies' rentability (Clausing, 2007). Smaller countries, with more open economies, will seek lower income maximisation rates and even smaller companies can respond to tax rates variations, increasing the efforts of tax management or even tax evasion. Clausing (2007) stated that changing the nominal rate may not correspond to a proportional changing of the tax value, and thus it is necessary to analyse the effective tax rate as well. Slemrod (2004) studied the variation of the nominal tax rate in 90 countries throughout 4 years (1980, 1985, 1990 and 1995), and verified that both the nominal rate and the effective rate have a decreasing tendency.

However, Castro and Camarillo (2014), analysing the determinants on tax revenue, concluded that the tax gap, measured by the difference between tax capacity and tax revenue, tends to remain stable over time across the 34 countries from the Organisation for Economic Co-operation and Development, over the period between 2001–2011, included in their sample. Castro and Camarillo (2014) suggested that this was due to the fact that the characteristics of the taxation systems of these economies have not significantly changed along the period analysed.

Effective tax rate

The effective rate is a regular measure to calculate the tax volume of companies, evaluate tax planning efficacy (Li *et al*., 2016; Watson, 2015; Phillips *et al*., 2004) and trace tax evasion practices (Kafkalas *et al*., 2014; Chiarini *et al*., 2013; Markle and Shackelford, 2011; Rego, 2003). Once it is the percentage of the profits the companies effectively deliver the State, it could be well defined as the ratio between the total of tax income and the tax base from which they came from, differing from the nominal rate mainly because the tax laws are different from the accountant rules. This leads us to a discrepancy between the taxable profit and the accountant profit. For this reason it is only natural that literature has devoted so much in this area.

Dyreng *et al*. (2014) have investigated the evolution of effective tax rates in the United States of America (USA) for 25 years, and observed an annual average decrease of the ETR (*Effective Tax Rate*) in 0, 4 percentage points which represents a grand total of 10 percentage points during the period of time studied. Loretz (2007) got evidence that smaller countries present a lower effective tax rate, though he concludes bigger countries are more likely to reduce their tax volume through bilateral tax agreements. Wang *et al*. (2014) aimed to study tax rates on incidents over companies rated in China between 2007 and 2011 and analysed the factors which influenced the effective tax rate with or without foreign investment. Their conclusion was that industry, leverage, size and the fact whether they are held by the State or not, are factors which significantly influence the effective tax rate. Rego (2003) concluded that multinational companies with wider foreign operations present a lower ETR. Likewise, Dyreng *et al*. (2014) found that the ETR decreased in a stronger way in multinational companies than

in domestic companies. Several studies also investigated the relationship between the ETR and the size of the company, obtaining conflicted results depending on the way we calculate the ETR, the focussed period of time and the model used (Phillips *et al*. 2004; Shackelford and Shevlin 2001). Katsikas and Lewis (2016) have proven that, in the companies analysed, the size of the company affects the values of the effective tax rates, whereas Belz *et al*. (2015) demonstrated that larger companies have a superior ETR over smaller companies. Earlier Gupta and Newberry (1997) stated that the size of the company is not directly associated with the effective tax rate, and found evidence that a lower ETR is associated with a lower profitability, a larger leverage and a stronger capital intensity. Powers *et al*. (2016) claimed that the companies which use cash flows as indicators to pay bonus, present lower ETR than the companies which use rentability indicators. Besides, the companies which evaluate their CEO's (*Chief executive Office's*) performance through indicators related to the result after taxes have similar ETR when compared with those, which use indicators such as the result before taxes. Yet, they assume different options towards financial reports. Powers *et al*. (2016) examined different measures to evaluate in which way the manager's performance towards obtaining annual bonus influences tax management. This topic is relevant because it could be one of the reasons which influences the difference between the effective rate and the nominal tax rate.

Tax management

Tax management is the result of a number of activities and legal procedures which aim to minimise expenses with taxes, such as investments in tax free assets or maximising tax benefits. These activities may sometimes be too aggressive, harming the State or even violate the law, leading to tax evasion phenonena.

Rego and Wilson (2009) and Bankman (1998) stated that practising an aggressive tax management compensates companies because the prospect of tax authorities detecting any illegal procedure is low. Chen and Chu (2005) and Slemrod (2004) suggested that managers and shareholders agree the level of tax management to uphold. Graham and Tucker (2006) concluded that companies which practice tax management improve their credit *ratings* than those which don't, so the authors supported that tax management should influence the price of shares, once it can reduce bankruptcy costs, improve credit quality and decrease cost of debt. Desai and Dharmapala (2009) also found a positive relationship between tax management and the value of American companies. Armstrong *et al*. (2011) concluded that there is a strong negative relationship between the incentives to the company's manager and effective tax rates, which means that the more the incentive, the less the effective tax rate. Desai and Dharmapala (2006), analysed the impact of incentives on managers and on the culture of the company, and they concluded that both are significantly strong on effective tax rates, though they aren't sure incentives affect the company's tax planning, once changes on the effective tax burden of the company may happen because of involuntary actions from the managers. Badertscher *et al*. (2009) demonstrated that private capital companies increase the efficiency of tax planning where there is investment even after its decrease of capital or capital outflow from those companies. Some researchers suggest that with a major compliance between the tax system and the accounting system, tax aggressiveness and abusive tax management will significantly decrease, thus improving earnings quality and tax compliance (Desai, 2005). On the other hand, other researchers arguing that the relevant financial information necessary to financial demonstrations is considerably different from the information asked by the tax authorities.

They believe an increase on compliance between accounting result and tax result will decrease profit quality (Hanlon *et al*., 2008; Hanlon and Shevlin, 2004). When Lennox *et al*. (2013), studied the relationship between quality of the financial information and possible fraud indicators, they claim that companies which practice an aggressive tax deferral are less likely to manipulate their financial demonstrations in a fraudulent way. Frank *et al*. (2009) developed a measure for aggressive tax deferral which allows tax management detection. Recent studies demonstrated that companies which practice tax management are more profitable, have wider foreign operations, subsidiaries in tax havens, spend more with investigation and development and are less indebted. (Badertscher *et al*., 2009; Graham and Tucker, 2006; Lennox *et al*., 2013).

Objectives, hypothesis and methodology

The main goal of this investigation is to understand the relationship between the nominal rate and the effective tax rate and to evaluate if the differences between them depend on the value of the nominal rate. Through the studied models we will also be able to understand whether the differences between the rates sharpen or reduce, depending on the size of the company, the capital investment, the leverage and the return on assets.

According to existent literature, ETR variation may be partially explained and connected to several characteristics of companies such as the shareholder framework (Badertscher *et al*. 2016; Chen *et al*. 2010), the managers' incentives (Rego and Wilson 2012; Armstrong *et al*., 2011), corporate and government structure (Desai *et al*., 2007), the characteristics of business (Higgins *et al*., 2015), the companies' size (Katsikas and Lewis, 2016; Belz *et al*., 2015; Richardson and Lanis, 2007) and managers' characteristics (Chyz *et al*., 2013). Nevertheless, few studies have been conducted towards analysing the behaviour of effective tax analysis (Guenther, 2014) and its dependence on nominal rate, which makes the effective tax rate expected to be as high as the nominal tax rate. These statements lead to the following research hypothesis:

H1: There is a positive relationship between the effective tax rate and the nominal rate.

Several authors suggest that a tax system is not efficient once the gap between nominal and effective tax rates is high (Gravelle, 2013; Dyreng, *et al*., 2008), because when the State defines a tax rate, they should want to obtain a revenue equivalent to the nominal rate applied to companies' incomes, which doesn't happen very often. Some companies have the ability to reach a big difference between a high nominal tax rate and a low effective tax rate, thus resulting in an uneven tax system whose consequences are everything but desirable (Gravelle, 2013; Dyreng, *et al*., 2008). This can lead to results which are contrary to the first hypothesis, assuming that the higher the nominal rate, the stronger the effort of the companies to maximise savings into tax, so they will have lower effective rates. This leads us to the following second research hypothesis:

H2: The positive relationship between the effective tax rate and the nominal rate is reduced when the nominal rate is higher, once compared with when the nominal rate is lower.

With the goal to study the relationship between the nominal tax rate and the effective rate, we used a model which proves the relationship between the two rates and calculated the necessary variables for it.

Dependent variable – Effective Tax Rate

In the present study we used the traditional ETR calculating formula which was determined through the ratio between the value of the tax paid over the result before the i company's tax in year t (Hoi *et al.*, 2013; Rego and Wilson, 2012)[2] and following Watrin *et al.* (2014) or Graham *et al.* (2017)many companies use an average tax rate (the GAAP effective tax rate, ETR who also used Amadeus database in their studies:

$$ETR_{i,t} = \frac{Taxation_{i,t}}{Pretax\ Net\ Income_{i,t}}$$

In which:

$ETR_{i,t}$ = effective tax rate of the company i in year t;

$Taxation_{i,t}$ = total tax amount (current and deferred) of the company i in year t;

$Pretax\ Net\ Income_{i,t}$ = result before tax of the company i in year t;

Main independent variable – Nominal Tax Rate

In the present study we used the maximum nominal rates of each country provided by the European Commission in its annual Eurostat report from 2015[3], where all maximum nominal rates from each country are described, including surcharges.

Control variables

Several previous studies demonstrated that the companies' features are also related to ETR and can help to explain its variation. According to Adhikari *et al.* (2006) the size of the company (SIZE), the capital structure (LEV), the capital intensity (CAPINT) and profitability (ROA – *Return On Assets*) were used as control variables. These variables had already been previously related to and used with ETR by other authors (Kim and Limpaphayom, 1998; Gupta and Newberry, 1997; Spooner, 1986; Stickney and McGee, 1982).

Derashid and Zhang, (2003), Kim and Limpaphayom, (1998) and Rego, (2003) demonstrated that the size of the company relates negatively with ETR, i.e., bigger companies have a lower effective tax rate. On the other hand, Belz *et al.*, (2015) proved that ETR and the size of the company (SIZE) have a positive relationship. Though there are contradictory results from different authors, the relationship between SIZE and ETR is quite significant, and that is why it was included in the model. The variable SIZE was calculated through the natural logarithm of the asset.

Not only Gupta and Newberry (1997) but also Stickney and McGee (1982) reached the conclusion that the variable LEV and CAPINT are negatively related to ETR because of taxation deduction, of interest payments and of high expense with depreciations connected to

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[2] "Special items" is a variable from the database *Compustat* which includes less frequent accounting events, for instance, write-offs of assets and adjustments from previous years.
[3] European Commission Report - "*Taxation trends in the European Union*" Eurostat (2015) ISSN 2467-0073

the lifetime of assets. The variable LEV was calculated by dividing the total debt by the total asset and CAPINT corresponds to the fixed asset ratio over the total asset[4].

There was also included a variable related to the outcomes, variable ROA, which is represented by the ratio of the outcomes before taxes over the total asset.

Thus, the model used in the present study is the following:

$$ETR_{i,t} = \alpha_0 + \beta_1 NTR_{k,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CAPINT + \beta_6 ROA_{i,t} + \varepsilon_{i,t}$$

In which:

$ETR_{i,t}$ = effective tax rate of the company i in year t;

$NTR_{k,t}$ = nominal tax rate in the country k in year t;

$SIZE_{i,t}$ = size of the company i in year t;

$LEV_{i,t}$ = leverage of the company i in year t;

$CAPINT_{i,t}$= capital intensity of the company i in year t;

$ROA_{i,t}$ = profitability of the company i in year t;

In the next chapter the main results and conclusions will be presented according to the given model.

Data

In view of the link between the accounting and taxation has in this issue and allow an analysis of companies with similar characteristics to the accounting system, were selected the companies from all EU countries which were available in Bureau van Dijk's Amadeus database, which has the application of IFRS as optional in individual financial demonstrations (Watrin *et al.*, 2014) according to the most recent European Commission (2013)5, which we can check on Table 1.

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[4] The variable of the fixed assets is represented by the addition of the variables "*Intangible fixed assets*" "*Tangible fixed assets*" "*Other fixed assets*" of Amadeus database.
    [5] *Check http://ec.europa.eu/internal_market/accounting/docs/legal_framework/20140718-ias-use-of-options_en.pdf [05.07.2016]*

Table 1
Application of IFRS in individual DF´s in the European Union member
States (2013).

Mandatory	Forbidden	Optional
Bulgary	Austria	Denmark
Cyprus	Germany	Slovenia
Croatia	Belgium	Finland
Estonia	Slovakia	Ireland
Greece	Spain	Italy
Latvia	France	Luxembourg
Lituania	Hungary	Netherlands
Malta	Romania	Poland
Czech Republic	Sweden	Portugal
		United Kingdom

Source: European Commission

From the universe of the 10 countries which obey the rule presented, those in which the nominal tax rate didn't suffer changes between 2012 and 2014 were excluded. The reason for this was to check the effects a change in the nominal rate has in the effective tax rate. Thus, Ireland, Italy, Netherlands, Poland and Portugal were excluded. On Table 2 we can observe the steps for the sample selection. The choice of the period of time (2012 to 2014) was defined in a way that the most updated data of the companies available may be studied and during a period of time which minimises bias in the results. Since the financial sector has different characteristics from the rest, and companies from this sector aren't being analysed in this research, all companies from this sector have been excluded from the sample. According to the methodology of Adhikari *et al*. (2006) and Gupta and Newberry (1997), companies with lower ETR's or equal to zero and over one have also been eliminated, because not only negative ETR's but also the ones over 1 represent unusual cases which can cause bias to the results. Finally, when excluding *outliers* all companies which in each variable were outside the range of the average plus/minus twice the standard deviation were selected. We then reached a sample of 1530 companies from 5 countries: Denmark, Finland, Luxembourg, Slovenia and the United Kingdom.

Table 2
Selection of the Sample.

Procedures followed	Number of companies
1. Selection of the companies of the 5 countries with available data[1]	90.162
2. Exclusion of the companies from the financial sector	32.884
4. Elimination of *outliers*	4.724
5. Elimination of the companies with ETR ≤ 0 e > 1	1.530

[1] Denmark, Finland, Luxembourg, Slovenia and the United Kingdom.
Source: Own Elaboration

On Table 3 we can observe that the least represented country in the sample is Luxembourg, with only 37 selected companies out of the 1530 total companies of the sample, which corresponds to 2.42% of the sample. On the other hand, the best represented country is the United Kingdom with 800 companies, which represents 52. 29% of the sample. Denmark is the second best represented country, with 25. 75% of the sample and 394 companies.

Table 3
Distribution of the Companies by Country.

Country	Number of Companies	%
Denmark	394	25.75%
Slovenia	40	2.61%
Finland	259	16.93%
Luxembourg	37	2.42%
United Kingdom	800	52.29%
Total	**1.530**	**100%**

Source: Own Elaboration

Out of the countries of the sample, Slovenia is the country with the lowest nominal rate throughout the 3 years with an average rate of 17.33% during the analysed period of time, as opposing to Luxembourg which represents the highest rate of all 5 countries, with an average of 29.07% which can be seen on Table 4. The presented nominal rates represent the maximum rate from each country (including surcharges).

Table 4
Nominal tax rate by Country.

Country	2012	2013	2014	Average
Denmark	25.0%	25.0%	24.5%	24.83%
Slovenia	18.0%	17.0%	17.0%	17.33%
Finland	24.5%	24.5%	20.0%	23.00%
Luxembourg	28.8%	29.2%	29.2%	29.07%
United Kingdom	24.0%	23.0%	21.0%	22.67%

Source: European Commission - "Taxation trends in the European Union" Eurostat (2015) ISSN 2467-0073.

Results

On Table 5, we can analyse the evolution of the effective tax rate, the total asset, the results before tax (RAI), the paid tax and the sample's companies' net profit (RL). It is proven that, in general, the presented variables registered a growth with an exception of the effective rate, which presents a decrease throughout the 3 years.

Table 5
Averages of the Effective Rate, the Asset, the RAI, the Paid Tax and the RL.

YEARS	Effective Rate[1]	Asset[2]	RAI[2]	Paid Tax[2]	RL[2]
2012	23.52	723.83	96.95	21.71	75.24
2013	23.50	839.06	112.00	24.85	87.16
2014	22.31	997.28	140.09	29.42	110.66
Total Average	23.11	853.39	116.35	25.32	91.02

[1] Percentage values;
[2] Values.in thousands of euros.

Source: Own Elaboration

The period under review, defined by the european economic upturn, also shows some recovery as far as companies profitability is concerned and as far as their greater tendency to invest, once the average value of the active increases approximately 270 thousand euros, keeping up with the ascendant movement registered not only in the net profit but also in RAI. Nevertheless, and as Dyreng *et al*., (2014) or Slemrod (2004) had already identified, we observe that the average ETR has significantly decreased in this period, which may result on the drop of the nominal rates of the majority of these countries presented on table 4.

On Table 6, there is the descriptive statistics of each of the variables included in the model, the average, the median, the standard deviation, minimum and maximum. The dependent variable (ETR) presents an average of 23.1%, whilst in the nominal rate variable we can see that the lowest value is 17% and the maximums 29.2%, which corresponds to an average of 23.3%. It is also visible that the average of the ETR, LEV and ROA variables are higher than the average of the sample variables of Adhikari *et al.* (2006).

Table 6
Descriptive statistics.

Variable	Average	Median	Standard Deviation	Minimum	Maximum
ETR	0.231	0.215	0.099	0.000	1.000
NTR	0.233	0.240	0.020	0.170	0.292
SIZE	2.273	2.187	0.806	0.227	3.929
LEV	0.193	0.000	0.993	0.000	34.360
CAPINT	0.238	0.110	0.283	-0.007	1.044
ROA	0.480	0.192	0.975	-16.432	10.595

ETR	*Effective Tax Rate – Ration between the paid tax and the result before tax*
NTR	*Nominal Tax Rate*
SIZE	*Size – Natural logarithm of the asset*
LEV	*Leverage – ratio between the financial indebtedness and the total asset*
CAPINT	*Capital Intensity – ratio between the fixed asset and the total asset*
ROA	*Return On Assets – ration between the result before tax and the total asset*

Source: Own Elaboration

On Table 7 there are the *Pearson* correlation coefficients of the variables of the studied model to test for multicollinearity. We can see there is no strong relationship between each variable of the model, which is reason enough to include them all. Except for the correlation between ROA and SIZE (correlation coefficient = –0.428), the correlations between all other independent variables are less than 0.30, indicating that multicollinearity is not a problem in our regression analysis.

Table 7
Correlation matrix.

	ETR	NTR	SIZE	LEV	CAPINT	ROA
ETR	1.000					
NTR	0.162**	1.000				
SIZE	0.070**	0.052**	1.000			
LEV	-0.030*	-0.009	0.111**	1.000		
CAPINT	0.071**	0.073**	0.200**	0.193**	1.000	
ROA	-0.107**	-0.110**	-0.428**	-0.291**	-0.205**	1.000

ETR *Effective Tax Rate – Ration between the paid tax and the result before tax*

NTR *Nominal Tax Rate*

SIZE *Size – Natural logarithm of the asset*

LEV *Leverage – ratio between the financial indebtedness and the total asset*

CAPINT *Capital Intensity – ratio between the fixed asset and the total asset*

ROA *Return On Assets – ration between the result before tax and the total asset*

*,** statistically significant to a level of significancy of 0.05 and 0.01, respectively.

Source: Own Elaboration

Model of Linear Regression (Results)

As previously mentioned in the development of the hypothesis, it is estimated that the bigger the nominal rate is, the higher the effective tax rate, thus establishing a positive relationship between both rates in order that it validates Hypothesis 1.

On Table 8 there are the results of the predictive model of regression, and it was used the method of estimation of the ordinary squared minimums to estimate the corresponding parameters.

Except for the coefficient variable SIZE, the other coefficients are statistically significant to a level of significancy of 0. 01. There were not detected any multicollinearity problems between every explanatory variables included in the model, once the value of VIF (*Variance Inflation Factor*) is always lower than 2.

Table 8
Relationship between the Effective Tax Rate and the Nominal Tax Rate.

$$ETR_{i,t} = \alpha_0 + \beta_1 NTR_{k,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CAPINT\ \beta_6 + ROA_{i,t} + \varepsilon_{i,t}\ (1)$$

Independent variables	Explanatory signal	Coefficient	t
Constant	?	0.0613***	3.552
NTR	+	0.7110***	10.06
SIZE	+/-	0.0025	1.27
LEV	-	-0.0067***	-4.42
CAPINT	-	0.0174***	3.31
ROA	?	-0.0093***	-5.46
Adj. R2		0.040	

N=4.590

ETR   *Effective Tax Rate – Ration between the paid tax and the result before tax*
NTR   *Nominal Tax Rate*
SIZE   *Size – Natural logarithm of the asset*
LEV   *Leverage – ratio between the financial indebtedness and the total asset*
CAPINT *Capital Intensity – ratio between the fixed asset and the total asset*
ROA   *Return On Assets – ration between the result before tax and the total asset*
*,**,*** statistically significant to a level of significancy of 0.1, 0.05 e 0.01, respectively.

Source: Own Elaboration

The results are evidence of a positive relationship between the effective tax rate and the nominal rate, confirming the Hypothesis 1. The positive relationship between the two variables demonstrate that, on average, when the nominal rate increases one percentage point, the effective rate only increases 0.71 percentage points, which could mean that companies have the capability to manage their results, decreasing the amount of paid tax.

The companies with a higher leverage and a lower return on asset (ROA) really pay less tax. These results confirm the study of Adhikari *et al*. (2006). The negative relationship between the variable LEV and ETR may probably be explained through the interest payment which is tax deductible due to a higher leverage (Gupta and Newberry, 1997; Stickney and McGee, 1982).

In the Hypothesis 2 it is tested if when the nominal rate increases the companies have more tendency to decrease the paid tax, thus alleviating the positive relationship between ETR and

NTR. In order to answer that research question (H2) a second model was created where two variables were added. A Dummy variable, which is equal to 1 when the nominal rate applied by that company is over the average of nominal rates of that year and equal to 0 when the nominal rate of the company is less than the sample average in that year, and the Dummy NTR variable comes from the product between the Dummy variable and the nominal tax rate (NTR).

This way, the model used in this study for H2 is as follows:

$$ETR_{i,t} = \alpha_0 + \beta_1 NTR_{k,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CAPINT + \beta_6 ROA_{i,t} \quad (2)$$

$$+\beta_7 Dummy_{i,t} + \beta_8 DummyNTR_{k,t} + \varepsilon_{i,t}$$

In which:

$ETR_{i,t}$ = effective tax rate of the company i in year t;

$NTR_{k,t}$ = nominal tax rate of the country k in year t;

$SIZE_{i,t}$ = size of the company i in year t;

$LEV_{i,t}$ = leverage of the company i in year t;

$CAPINT_{i,t}$ = capital intensity of the company i in year t;

$ROA_{i,t}$ = profitability of the company i in year t;

$Dummy_{i,t}$ = 1 when the nominal tax rate of the company i is higher than the average nominal rate of the sample in year t;

$DummyNTR_{k,t}$ = product between the *Dummy* variable and the nominal rate of the country k in year t;

On Table 9 we can analyse the changes of the results of the regression when introducing the two new variables. As estimated, the relationship between ETR and NTR was softened by introducing the two new variables, maintaining however the positive relationship. This result confirms the second research hypothesis.

The fact that NTR coefficient lowered is evidence that, when the nominal rate increases 1 percentage point, the effective rate increases an average of only 0.31 percentage point and not 0,71 of the model of the hypothesis 1. This result confirms the conclusions of Dyreng, *et al*. (2008) and Gravelle (2013)"ISSN" : "0001-4826", "abstract" : "We develop and describe a new measure of long‐run corporate tax avoidance that is based on the ability to pay a low amount of cash taxes per dollar of pre‐tax earnings over long time periods. We label this measure the "long‐run cash effective tax rate." We use the long‐run cash effective tax rate to examine (1 that the higher the nominal tax rate, the higher the effort of the companies to decrease the value of the tax to pay.

Table 9
The relationship between the effective rate and the nominal tax rate
(influence of the value off the nominal tax rate).

$$ETR_{i,t} = \alpha_0 + \beta_1 NTR_{k,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CAPINT \beta_6 + ROA_{i,t} \; (2)$$

$$+\beta_7 Dummy_{i,t} + \beta_8 DummyNTR_{k,t} + \varepsilon_{i,t}$$

Independent variables	Estimated signal	ETR	t
Constant	?	0.1339***	5.75
NTR	+	0.3148***	3.05
SIZE	+/-	0.0048**	2.44
LEV	-	-0.0047***	-3.10
CAPINT	-	0.0059	1.11
ROA	?	-0.0038**	-2.18
Dummy	?	0.3973***	6.49
DummyNTR	+	-1.443***	-6.22
Adj. R2		0.071	

N=52.248

ETR	*Effective Tax Rate – Ration between the paid tax and the result before tax*
NTR	*Nominal Tax Rate*
SIZE	*Size – Natural logarithm of the asset*
LEV	*Leverage – ratio between the financial indebtedness and the total asset*
CAPINT	*Capital Intensity – ratio between the fixed asset and the total asset*
ROA	*Return On Assets – ration between the result before tax and the total asset*
Dummy	*is equal to 1 when the nominal rate of the company i is higher than the average nominal rate of the sample in year t*

DummyNTR product between the Dummy variable and the nominal rate of the country k in year t;
*,**,*** statistically significant to a level of significancy of 0.1, 0.05 and 0.01, respectively.

Source: Own elaboration

All variables included in this new model are statistically significant to a level of significancy of 0, 01, except for the variables SIZE, CAPINT and ROA. The variable CAPINT is not statistically significant to any of the levels of significancy, SIZE and ROA are statistically significant to a level of significancy of 0. 05. The control variables approximately present the same coefficient than in the first model, which indicates stability in the results. There were also not detected problems of multicollinearity between the explanatory variables included in the model.

With this model we conclude that the increase of the nominal rate influences the difference between the effective tax rate and the nominal rate and the effort of the companies in practising tax management, thus increasing tax saving.

Conclusion and discussion

In general, the present study had the goal to investigate the relationship between the effective rate and the nominal tax rate over the income of corporate entities. The sample for this study was selected from Bureau van Dijk's Amadeus database. In order to study the relationship between the rates, companies from 5 countries were selected: Denmark, Finland, Luxembourg, Slovenia and the United Kingdom. The choice of the countries followed the method of Watrin *et al*. (2014), in which all the countries using IFRS which followed them in a similar way were selected, keeping as optional the choice of the accounting system for the individual accounts of each company and that, in the 3 years studied, registered changes in the nominal rate.

When determining the effective tax rate, a calculation formula was used as it had been done by several authors such as Graham *et al*. (2017), Watrin *et al*. (2014), Hoi *et al*. (2013) and Rego and Wilson (2012), by dividing the total tax by the result before tax.

In order to relate with the effective tax rate, the maximum nominal rate of each country was used according to the European Commission. There were still control variables used, such as the size of the company (SIZE), the capital structure (LEV), the capital intensity (CAPINT) and a profitability variable (ROA – Return On Assets). These variables were used by Adhikari *et al*. (2006), following the studies of Gupta and Newberry, (1997) and Stickney and McGee (1982).

After the study of the model, the results indicate, as previously estimated, that there is a positive relationship between the effective rate and the nominal tax rate. This leads us to conclude that, on average, when the nominal tax rate increases, the effective rate also increases.

The results also show that the effective rate increases less than the nominal tax rate, which confirms the conclusions of previous studies where companies have the ability to decrease the total tax to pay through tax management.

Notwithstanding the average of the ETR and NTR be approximately the same, the median between these two variables may betray that not all companies can minimise their invoice in the same way, which paves the way for the study of its tax management.

It was also possible to check that the larger companies, perhaps more enabled to develop an efficient tax management, are related to larger ETR, such as it had been previously proven by Belz *et al*. (2015) in contradiction with what had been observed by Gupta and Newberry (1997). By the same token we can explain the fact that companies with larger ROA present decreasing ETR, which proves the studies of Badertscher *et al*. (2009), Graham and Tucker (2006) and Lennox *et al*. (2013) who demonstrated that the companies which practise tax management are the most profitable than those which do not.

The second research issue was related to the tax management earlier mentioned, which was related to studying if with the increase of the nominal rate the companies will have more tendency to increase their efforts in decreasing the paid tax. Thus, it would be estimated that assuming the value of the nominal tax rate, the positive relationship between the nominal rate and the effective rate proven in the first model would be reduced.

This way, two variables were added to the model related to the value of the nominal rate. As it had been estimated, the relationship between the two rates remained positive, but with a weaker

relationship. We concluded that on average the companies have the ability to reach a beneficial difference between the effective rate and the nominal tax rate through tax management, and this conclusion is according to the results of Dyreng, *et al*. (2008) and Gravelle (2013).

It is then empirically demonstrated that, for the companies studied, the relationship between the effective rate and the nominal tax rate is positive, and this relationship is reduced once there is an increase of the nominal tax rate.

This way, the study contributes to the literature because it allows understanding that the companies have the ability to manage their results in order to save tax. In a macroeconomic outlook, with the increase of the nominal tax rate we get more revenue by increasing the nominal tax rate. Nevertheless, it is necessary to consider that the higher the nominal tax rate, the more companies wish to decrease the value of the tax to pay.

It is not to be faded into oblivion that some limitations are associated to the present study, mainly because the results proved little overall grip to the model. However, previous researches related to the effective tax rate also mostly show a weak grip to the model. Still, in this context, the fact that in the sample selected there are companies with lack of data in Amadeus is a limitation, which compels the exclusion of many companies, thus leading to different results if they were all included.

As suggestions to future research we suggest the research on the relationship between the effective rate and the nominal rate in the remaining European countries, increasing the time-lapse and checking in which countries tax management is more frequent.

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