Size and other Determinants of Corporate Effective Tax Rates in US Listed Companies

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Abstract

This note studies the determinants of corporate Effective Tax Rates (ETR) based on a panel of listed US companies over the period 1992-2009 (Compustat), with a special focus on firm size. We also consider the economic and financial structure of the firms, as well as profitability. The results indicate a non-linear relation between size and ETR, with similar relationships also found for debt and capital intensity. This may explain the conflicting results found in the previous literature.

Keywords: Effective Tax Rate, Corporate Tax Burden, US listed companies, firm size
JEL Classification Codes: H25, H32

1. Introduction

Most business decisions have tax implications and taxation may have significant implications for corporate decisions, so companies should take the tax burden into account when designing their strategies. It is therefore important to know the main determinants of the Effective Tax Rate (ETR) borne by companies.

The corporate tax burden has been the subject of several empirical studies[1] and this one focuses on US companies. [2] For an accurate analysis of the corporate tax burden, it is best to use the ETR because the Statutory Tax Rate (STR) is not a good indicator as it does not take into account temporary differences, tax credits and other fiscal incentives (Government Accountability Office, 2008, p. 1).

Most research on the ETR has been aimed at identifying its determinants. However, as we show in Section III when we perform a comparative analysis of our results, previous studies have found conflicting results for the determinants of ETR, and in particular firm size, for both time intervals and different samples.

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[1] Recently Hanlon and Heitzmanl (2010) and Graham et al. (2012) have published excellent reviews on these topics.
[2] Other studies outside the US can be consulted in Fernández-Rodríguez and Martínez-Arias (2011).

This research focuses on the effect of size and other determinants on the corporate tax burden. With this aim we analyze size both separately as well as combined with other variables which influence taxation, such as leverage, capital and inventory intensities and the profitability. The paper contributes to the literature on ETRs because it adopts a non-linear approach, as opposed to the linear approach often used in previous research, and it also covers an extensive and recent period (1992-2009).

The paper is structured as follows: Section 2 presents the methodology and data, Section 3 shows the main findings and Section 4 concludes.

2. Model and Data

The definitions used in the literature for ETR vary, though almost all studies use the ratio of current income tax expense and pretax income. [3] This is the main option used in this paper. However, in Section III we include a sensitivity analysis with an alternative measure for ETR, the ratio of total corporate income tax expense to pretax income.

In order to identify the determinants of ETRs, the following panel data model is used in its full version:

$$ETR_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 SIZE_{it}^2 + \beta_3 LEV_{it} + \beta_4 LEV_{it}^2 + \beta_5 CAPINT_{it} + \beta_6 CAPINT_{it}^2 +$$
$$\beta_7 INVINT_{it} + \beta_8 ROA_{it} + \beta_9 YEAR + \beta_{10} SECTOR + \varepsilon_{it} \tag{1}$$

The model contains the explanatory variables that are traditionally used in this type of study:

- Size (SIZE): the logarithm of the firm's total assets.
- Leverage (LEV): the ratio of total debt to total assets.
- Capital Intensity (CAPINT): the ratio of property, plant and equipment to total assets.
- Inventory Intensity (INVINT): the ratio of inventories to total assets.
- Return On Assets (ROA): the ratio of earnings before income tax over total assets.

In order to capture any possible non-linearities, the squares of the most relevant variables are also added. In addition, dummies have been included to account for the time effect (YEAR) and the sectoral effect (SECTOR).

The data for this research was obtained from the Compustat data base, which provides information on the financial statements of non-financial, US-listed companies for the period 1992-2009. The sample consists of 2,500 companies for each year, although some do not give information for the whole period. Moreover, the companies have been classified by sector, following the *Standard Industrial Classification* (SIC).

Fig. 1 shows the trend in annual ETR over the period studied. Note that the corporate tax burden dropped from 1992 to 2004 but in 2005 there was a marked rise to a level of about 25%, where it has remained over recent years at about 25%. The highest ETR is for the first year (28.42%) and the lowest for 2004 (21.32%), a difference of seven points. However, the variation between the first and the last year is less than three percentage points, which points to a fair degree of stability throughout this long time series. The results also show a large gap between the ETR and the STR, which remained at about 40% over the whole period. Table 1 shows the descriptive statistics for the variables used in the model (1a) and the correlation matrix (1b).

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[3] See the surveys by Callihan (1994) and Plesko (2003).

Figure 1: Annual versus mean corporate effective tax rates (1992-2009)
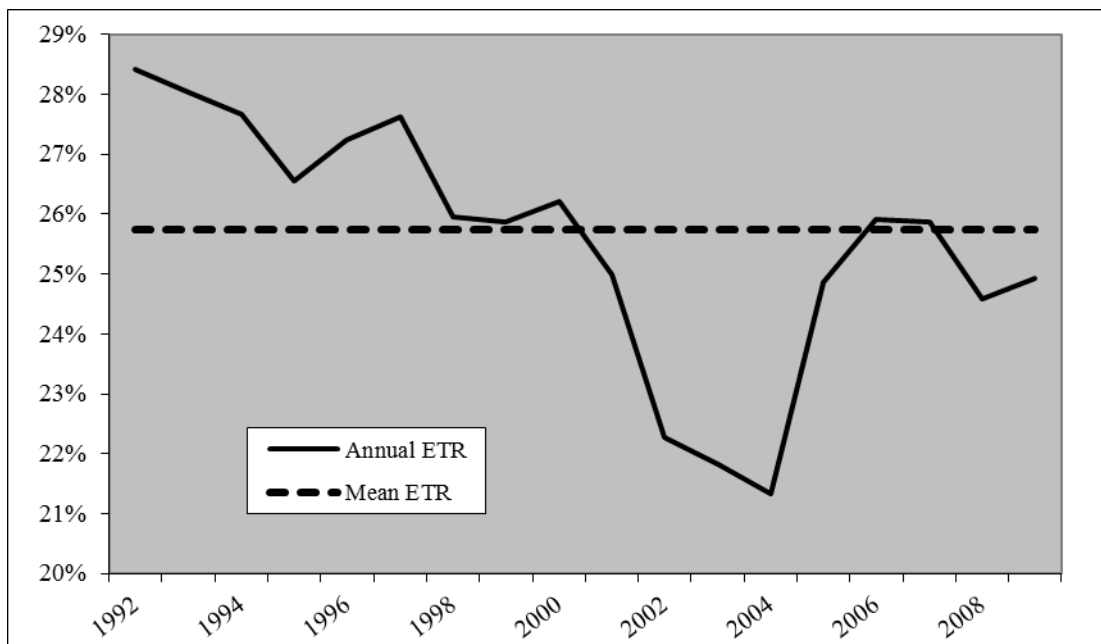
Source: Compustat and own elaboration

Table 1: Descriptive Statistics and correlation matrix

A) Descriptive statistics

	ETR	SIZE	LEV	CAPINT	INVINT	ROA
Mean	0.2542	5,9927	0.3989	0.2817	0.1222	0.0113
Median	0.2836	5,9819	0.3942	0.2137	0.0831	0.0630
Standard deviation	0.1883	2,0957	0.2040	0.2324	0.1344	0.2357
Minimum	0.0000	-6,9078	0.0000	0.0000	0.0000	-1.6740
Maximum	1.0000	13,5896	1.0000	1.0000	0.9206	0.4137
N.Observations	25,751	37,498	36,271	34,525	33,326	33,830

B) Correlation matrix

VARIABLE	ETR	SIZE	LEV	CAPINT	INVINT	ROA
ETR						
SIZE	0.315***					
LEV	0.049***	0.222***				
CAPINT	-0.008	0.235***	0.187***			
INVINT	0.221***	-0.063***	0.125***	-0.157***		
ROA	0.461***	0.349***	-0.016***	0.120***	0.157***	

***, **, * denotes statistical significance at the 1%, 5% and 10% levels, respectively.
Source: Compustat and own elaboration

3. Empirical Results

The main results, which come from the fixed effect model, are shown in Table 2. [4] In order to study the SIZE-ETR relation (1) in greater depth, the model was estimated including other variables such as leverage (2), capital intensity (3), inventory intensity (4) and Return On Assets (5). Finally, the full

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[4] The F-test and the Pagan Lagrange Multiplier test were performed and indicated the presence of individual effects and the advisability of using panel data rather than the pooled model. The Hausman test was then applied. It advised the fixed effects model rather than the random effects model.

model was estimated including all the variables mentioned (6). This gives a good fit in comparison with previous research.

The entity size variable was significant in all the models estimated, showing non-linear behavior characterized by a positive coefficient for values which are low in size and a negative one for high size levels. The former is consistent with the government control hypothesis which predicts higher ETRs for larger companies because of tighter control of their results and taxes. The second supports the hypothesis of greater fiscal planning on the part of larger companies with a view to reducing their tax burden. Since this is a sample of large companies, as they are all listed on the Stock Exchange, the results therefore show that the effect of fiscal planning is greater than government control after a certain size.

Size is the variable that has been most extensively studied in previous research on corporate taxation, either alone or in combination with other variables, with varying results. Some studies found a positive relation between size and ETR (Zimmerman, 1983; Wang, 1991; Omer et al., 1993; Plesko, 2003), but others found the opposite (Porcano, 1986; Chen et al., 2010). There were even studies that found no significant relation between the two variables (Stickney and McGee, 1982). The diversity of these results is perhaps explained by the presence of this non-linear relation between size and ETR, which is maintained in all our estimates.

Moreover, there were other interesting non-linear relations with the ETR, namely those relating to debt and capital intensity. Although in research on debt there is usually an inverse relation with ETR (Stickney and McGee, 1982; Plesko, 2003), in some papers the opposite was found (Chen et al., 2010). When debt is very low the deductibility of interest is probably not sufficient to lead to a drop in tax burden. However, with high levels of debt, very high interest deductibility is able to reduce company tax pressure.

Regarding capital intensity, the most widely-obtained result is an inverse relation with ETR (Stickney and McGee, 1982; Gupta and Newberry, 1997), although once again not all studies have reached the same conclusion (Plesko, 2003). Again, the change in sign in CAPINT-ETR indicates that when levels of property, plant and equipment are low, companies are unable to reduce their tax burden. On the other hand, after a certain level of capital intensity, companies note a reduction in ETR caused by the deductibility of high depreciation.

Whit respect to inventory intensity, a variable that has been little used in the literature, the results show a positive relation with ETR, as in Gupta and Newberry (1997). That is, companies that have higher levels of stocks are subject to greater tax pressure. Finally, as in all prior research (Stickney and McGee, 1982; Wilkie and Limberg, 1993; Gupta and Newberry, 1997; Plesko, 2003; Chen et al., 2010), business profitability has a positive effect on tax burden.

Moreover, we have conducted a sensitivity analysis with an alternative measure of ETR, arriving at similar conclusions (Table 3). As stated above, the new definition of ETR is the ratio of total corporate income tax expense and pretax income, so it takes into account the deferred tax.

Table 2: Determinants of corporate effective tax rates (main measure)

	Expected sign	Models					
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
SIZE	+/-	0.0410*** (17.01)	0.0518*** (17.57)	0.0414*** (17.13)	0.0421** (17.21)	0.0534*** (16.11)	0.0594*** (16.34)
$SIZE^2$	+/-	-0.0012*** (-4.93)	-0.0021*** (-7.58)	-0.0012*** (-5.05)	-0.0012*** (-4.78)	-0.0022*** (-7.53)	-0.0027*** (-8.27)
LEV	+/-		0.1107*** (4.94)				0.1230*** (5.08)
LEV^2	+/-		-0.1356*** (-5.61)				-0.1503*** (-5.87)
CAPINT	+/-			0.0552*** (2.18)			0.0837*** (2.96)
$CAPINT^2$	+/-			-0.0775** (-2.58)			-0.1267*** (-3.85)
INVINT	+				0.0937*** (5.24)		0.0982*** (4.97)

Table 2: Determinants of corporate effective tax rates (main measure) - continued

ROA	+					0.0449*** (7.12)	0.0488*** (6.99)
Year Dummy		Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummy		Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2		0.1876	0.2019	0.2015	0.2405	0.2583	0.3431
Nº observations		25,733	25,025	25,684	24,857	25,151	23,753

***, **, * denotes statistical significance at the 1%, 5% and 10% levels, respectively.

Table 3: Determinants of corporate effective tax rates (alternative measure)

	Expected sign	Models					
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
SIZE	+/-	0.0453*** (25.30)	0.0572*** (26.61)	0.0452*** (28.18)	0.0460*** (25.19)	0.0538*** (22.40)	0.0581*** (22.21)
$SIZE^2$	+/-	-0.0014*** (-8.23)	-0.0024*** (-12.32)	-0.0014*** (-8.10)	-0.0015*** (-8.30)	-0.0022*** (-10.56)	-0.0026*** (-11.45)
LEV	+/-		0.1030*** (6.37)				0.1193*** (6.80)
LEV^2	+/-		-0.1362*** (-7.80)				-0.1438*** (-7.76)
CAPINT	+/-			0.0270 (1.46)			0.0484** (2.38)
$CAPINT^2$	+/-			-0.0189 (-0.87)			-0.0524** (-2.23)
INVINT	+				0.0537*** (4.08)		0.0530*** (3.72)
ROA	+					0.0779*** (16.50)	0.0834*** (16.10)
Year Dummy		Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummy		Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2		0.2919	0.2998	0.2914	0.3221	0.4242	0.4544
Nº observations		28,228	27,484	28,181	27,182	27,614	26,014

***, **, * denotes statistical significance at the 1%, 5% and 10% levels, respectively.

4. Concluding Remarks

This paper analyses the determinants of company taxation in US listed companies based on a panel for the period 1992-2009 taken from Compustat, paying special attention to size. We consider the ETR as the ratio of current income tax expense to pretax income; however, in order to achieve more robust results, the estimations are also performed with an alternative measure.

Our results indicate a non-linear relation between size and ETR, with smaller companies being subject to a greater tax burden. After a certain size, the effect of tax planning exceeds that of government control so companies are able to reduce their ETRs. Two other very interesting non-linear relations with ETR were obtained for debt and capital intensity, indicating that companies can only reduce their tax pressure after certain levels of debt and capital intensity have been reached.

The conclusions drawn in this study are relevant because previous research had always indicated linear relations between these variables and ETR, which might explain the contradictory results in the literature.

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