TAX AGGRESSIVENESS IN FAMILY- CONTROLLED AND NON-FAMILY-CONTROLED FIRMS

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Abstract

Taxes account for an important cost to businesses and their shareholders, so in order to reduce the tax burden actions are taken by the companies. By using different methods to capture tax aggressiveness and founding family presence we are going to find if family owned firms are more tax aggressive than non-family counterparts. Potential penalties imposed by IRS are likely higher to family owners than CEOs in non-family firms, thus family owned firms are concerned about reputation and penalties. This sometimes forces family firms into a non-aggressive methodology.

In this dissertation, we investigate the factors contributing to a firm’s level of tax aggression. Specifically, using a sample of 291 US listed firms, we model the level of tax aggression as a function of the score of each firm in each of the three important firm-specific variables (a) the Return on Assets (ROA); (b) the index of Property, Plant and Equipment; and (c) the index of Leverage. We estimate an econometric model for binary dependent variable (the probit model), where the dependent variable is the level of tax aggression of each firms, as it is measured by the average ratio of tax expense to net profit, over the period 2005-2013. The results indicate that, by far, the most important factor for a firm’s tax aggression, irrespective of its current level of it, has to do with the firm’s level of leverage. Further, the effect is more pronounced in the case of family-controlled firms, over the aspect of leverage and ROA. Using a panel-data approach, and a between-estimators way of estimating a fixed-effects model we find that that family ownership has no effect on tax aggressiveness, after controlling for the effect of leverage (LEV), profitability (ROA), capital assets (PPE), and firm size (SIZE).
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1 INTRODUCTION

1.1 PROBLEM STATEMENT
Since corporate taxes represent a sizeable expense for companies and their shareholders, the companies’ executives should take actions in order to minimize the corporate tax burden. The idea of minimizing the corporate tax burden could boil down choosing tax aggressiveness as corporate policy benefiting shareholders.

1.2 AIM AND RESEARCH HYPOTHESES OF THE DISSERTATION
This dissertation examines the extent to which family-controlled firms are more or less tax aggressive compared to non-family-controlled firms.

In a family-controlled firm the founding family (of the firm) has kept to key executive positions in the company’s board (see Anderson et al. (2003)). Also, in a family-controlled firm the founding family controls at least five percent (5%) of the company’s equity capital (Chen et al. (2010)).

According to Chen et al. (2008), tax aggressiveness is the “downward management of taxable income through tax planning activities”. These activities could be legal or illegal, both aiming at the minimization of the corporate tax burden.

The most obvious benefit from engaging in a tax-aggressive behavior is, presumably, the savings on the company’s tax bill (see Scholes et al. (2005)), a benefit which could accrue to the firm’s shareholders in the form of higher distributed cash dividends. Against these benefits of tax aggression, the company’s executives should place the potential costs of such corporate behavior. The obvious cost here is the higher future tax bill, augmented by the interest on the company’s initial tax liability, in the IRS overturns the company’s tax positions. Actually, the company’s executives should consider not the value of this potential future tax liability, but its expected value, that is, they should also estimate how likely is for their firm to be audited by the tax authorities (Chen et al., 2010).
There are two ways to quantify empirically the extent of *tax aggressiveness* on the part of a company (Chen *et al.*, 2008). The first way involves employing the so-called “*effective tax rate*”, namely, the proportion of total tax expense to pre-tax income, and the second is to make use of the “*cash effective tax rate*”, that is, the proportion of cash taxes paid to pre-tax profit. In theory, a more tax-aggressive firm will tend to have consistently low cash effective tax rates.

The hypotheses that shall be considered are the following

- Taxes represent a significant cost and a reduction in cash flows leading firms and shareholders to reduce taxes.
- When deciding tax aggressiveness, decision makers weigh the benefits and costs.
- There is a conflict between managerial benefits and owner benefits.
- Family owned companies may actually be less tax aggressive despite the notion that they have the most benefit.

### 1.3 STRUCTURE OF THE DISSERTATION

This dissertation consists of four chapters, including the introductory one. Chapter 2 discusses the econometric methods and the evidence found in similar studies. Chapter 3 introduces the data used in the dissertation, and it develops the empirical approach. Chapter 4 presents empirical findings of the study, and Chapter 5 concludes the study.
2 LITERATURE REVIEW

The chapter starts with an allusion to the three types of a firm’s tax policy, namely tax avoidance, tax aggressiveness, and tax risk (Section 2.1). Then, in the following two sections (Section 2.2. and Section 2.3) an extensive discussion follows on two important papers in the literature.

2.1 TAX POLICIES AND FIRM RISK

Guenther et al. (2010) in their study distinguished among three concepts related to a firm’s tax-policy, namely, among the concepts of tax avoidance, tax aggressiveness, and tax risk. All these policies were discussed in their study because, according to the authors, they are related, in one way or another, with corporate risk, measured by the volatility in stock returns. In what follows, we touch on each type of tax policy, and we also allude to the variables used to quantify a given type of tax behaviour.

2.1.1 Tax Avoidance and the Effective Tax Rate

Tax avoidance can be defined as the firm’s attempt to reduce its current tax liabilities, in an “appropriate” way; this implies that tax authorities would call into question or make the firm to revise these practices (see Higgins et al. 2012). The typical example of a tax-avoidance activity is that of the use of corporate tax shield in order to reduce their tax liabilities. Other examples of tax-avoiding behavior involve use of off-shore tax havens (Desai and Dharmapala, 2004).

According to Dyreng et al., (2008) a firm’s tax-avoidance behaviour can be proxied by its cash Effective Tax Rate (ETR), i.e. the proportion of its cash tax-liabilities to its profit before tax (see Sub-Section 3.1.1). The extent of tax avoidance could be revealed depending on whether the aforementioned ratio remains low consistently over time. In other words, a tax-avoidance policy is consistent with a low ETR ratio over time. Guenther et al. (2013), in their study, estimated the ETR as the ratio of the sum of cash-taxed paid over a period of five years to the sum of the sum of the profit before tax (without any special items) over the same period.
2.1.2 Tax Aggressiveness

In contrast with tax avoidance, tax aggressiveness is the firm’s attempt to reduce its current tax liabilities, in an “inappropriate” way, that is in way, that the tax authorities would call into question these practices in the future (Guenther et al., 2013). Put differently, a tax-aggressive behaviour on the part of the firm essentially involves a kind of earnings manipulation (Desai and Dharmapala, 2004). According to Guenther et al. (2013) a tax-aggressive corporate behaviour, exemplified whenever a firm manages to maintain a low effective tax rate or a high reserve for unrecognized tax benefits, is associated with increased corporate risk, thereby requiring firms to provide risk-taking incentives to managers.

Guenther et al. (2013), in their study, proxied tax aggressiveness using the ratio of unrecognized tax benefits\(^1\) to the lagged value of total assets.

Figure 2-1 shows framework for corporate tax planning. The relevant tax constructs discussed, and which are depicted in the top half of the figure, are, tax avoidance, tax aggressiveness, tax sheltering, and tax evasion. Apart from the general notion of effective tax planning, all constructs of explicit tax planning are further arranged along the dimensions of legality and compliance. These dimensions represent the presumable degree of lawfulness and perceived compliance of the tax actions likely captured by the individual tax constructs. The legality dimension ranges from perfectly legal, over increasingly “grey-scaled”, to clearly illegal with an intent to defraud. The dimension of compliance stretches from strict compliance, over potentially tax system unfavorable noncompliance, to apparent noncompliance.

The bottom of Figure 2-1 provides some tangible examples for tax actions, which may be subsumed under the corresponding constructs, for example, the investment in tax-favored assets, the choice of a specific depreciation method, opting to defer taxable revenue to future assessment periods, the classification of certain transactions as “tax

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\(^1\) Compustat code: TXTUBEND
exempt”, the shift of income between different tax jurisdictions (e.g. tax havens), engaging in tax-relevant transfer pricing, or the setting up particular tax shelter structures.

Figure 2-1: An Overview of Corporate Tax Planning

2.1.3 Tax Risk
The third tax policy concept examined is that of tax risk, which refers to the uncertainty, i.e. volatility, of a company’s future tax liabilities. Naturally, a firm’s tax liabilities will vary from year to year for a number of reasons, like for example changes in tax laws of the country, or the extent to which a firm consistently and effectively (i.e. without its tax positions being overturned by the tax authorities) engages in a tax-aggressive corporate behaviour. At any rate, the variation in the firm’s tax bill should be taken into consideration during the estimation of the company’s free cash flows.

2.2 THE STUDY OF CHEN ET AL (2010)
Chen et al. (2010), using a panel consisting of 1,003 American companies listed in the S&P 1500 index (the index consists of the S&P 500, S&P Mid Cap 400, and the S&P Small Cap 600 indices) over the period 1996-2000, thus yielding a total of 3,865 firm-
year observations, investigated whether family-controlled firms are less tax aggressive than non-family controlled firms. There were 1,790 firm-year observations (in the sampled data) corresponding to family-firms, and in 1,140 cases of these observations the way the founding family controlled the firm was through the position of the firm’s CEO.

The authors made use of four ratios in order to measure the level of a firm’s tax-aggressiveness. Among these measures, one was the Effective Tax Rate (ETR), i.e., the ratio of “total tax expense” to “pretax income”, and the other was the Cash Effective Tax Rate (cash ETR), namely, the ratio of “cash taxes paid” to “pretax income”.

The econometric model they used involved a cross-sectional model, where the dependent variable, i.e. a measure of tax aggressiveness, was regressed against the following (continuous and binary) explanatory variables.

**Continuous Explanatory Variables**

- The return on assets (ROA) defined as the ratio of the company’s operating income to lagged total assets.
- The firms’ level of Property, Plant, and Equipment as a proportion of lagged assets.
- The firm’s level of intangible assets scaled by lagged assets.
- The firm’s leverage defined as the ratio of long-term debt to lagged total assets.
- The firm’s level of foreign income as a proportion of the firm’s lagged total assets.
- The firm’s equity income in earnings as a proportion of lagged assets.
- The natural logarithm of the company’s market value of its equity (at the beginning of year), as a proxy for the effect of size.
- The market-to-book ratio (at the beginning of year), that is, the ratio of the market value of equity to its book value.
- A variable capturing the firm’s book-tax difference.

**Binary Explanatory Variables**

- A dummy variable to capture the effect of family control on the level of tax aggression; this variable took on the value 1 for family firms, zero for non-
family. Alternatively the binary variable was defined in a way so that it takes on the value 1 if founding family controlled at least 5% of the company and zero otherwise.

- A dummy variable to capture the effect of loss-carry forwards; the binary variable took on the value of 1 if the loss carry forward, as of the beginning of the year, was positive and zero otherwise.

There were various interesting results from this study, and we shall report only those related to the current dissertation. To begin with, it was found that, based on two measures of tax aggressiveness, family-controlled firms were less tax aggressive compared with non-family controlled firms. For example, the Effective Tax Rate (ETR) of family-controlled firms was 0.5% higher than the corresponding rate for the non-family-controlled firms. This difference was even higher in the case of the cash ETR, as a measure of tax aggressiveness; the cash ETR of family-controlled firms was 1.2% higher than the corresponding rate for the non-family-controlled firms.

The effect of ROA on the extent of tax aggressiveness was not clear. On the one hand, based on the ETR, the effect of ROA on tax aggressiveness was positive and statistically significant, while, on the other hand, based on the cash ETR, the effect of ROA on tax aggressiveness was negative and statistically significant. This implies that using the ETR, as the metric of tax aggressiveness, the authors found that the higher the firm’s profitability, the lower the extent of its tax aggression, while using the cash ETR, as the metric of tax aggressiveness, the exact opposite conclusion can be reached, that is, the higher the firm’s profitability, the higher the extent of its tax aggression.

When it comes to the effect of PPE (Property, Plant, and Equipment) on the extent of tax aggressiveness the results of the study were more conclusive. That is, based both on the ETR and the cash ETR, as a measure of tax aggressiveness, the effect of PPE was found to be negative but with different statistical significance. On the one hand, based on the cash ETR, the effect of PPE on tax aggressiveness was negative and statistically insignificant, while, on the other hand, based on the cash ETR, the effect of PPE on tax aggressiveness was negative and statistically significant. At any rate, these findings
imply higher the firm’s level of capital assets, the higher the extent of its tax aggression.

Also, the effect of Leverage on the extent of tax aggressiveness was not conclusive. On the one hand, based on the ETR, the effect of leverage on tax aggressiveness was found to be positive but not statistically significant, while, on the other hand, based on the cash ETR, the effect of leverage on tax aggressiveness was found to be negative and statistically significant. This implies that using the cash ETR, as the metric of tax aggressiveness, that (according to the authors’ findings) the higher the firm’s leverage, the higher the extent of its tax aggression.

Finally, the effect of size on the extent of tax aggressiveness was also somewhat conclusive. That is, based both on the ETR and the cash ETR, as a measure of tax aggressiveness, the effect of firm size was found to be negative but with different statistical significance. Namely, on the one hand, based on the cash ETR, the effect of size on tax aggressiveness was negative but statistically insignificant, while, on the other hand, based on the ETR, the effect of size on tax aggressiveness was negative and statistically significant. At any rate, these findings imply higher the firm’s size, the higher the extent of its tax-aggressive behavior.
2.3 THE STUDY OF GUENTHER ET AL (2013)

Guenther et al. (2013) studied how the three concepts of tax policy, namely tax avoidance, tax aggressiveness, and tax risk are related to the overall risk a firm might take on. Using three criteria, an unbalanced panel-data sample was mustered consisting of 2,376 firms (from the Compustat database), observed over various years (from a minimum of 2 years to a maximum of a 20 years), thereby yielding 16,686 company-year observations.

The authors used for the measurement of tax avoidance the cash Effective Tax Rate (\textit{cash ETR}), defined as “the ratio of the sum of the cash tax payments over a five-year period to the sum of income before taxes and special items over the same five-year period”. For the measurement of tax aggression the authors made use the ratio of unrecognized tax benefits to lagged total assets.

Then using these variables, they constructed a limited dependent variable, which was taking on the value of 1, an indication of a high level of Tax Avoidance, if the observation was in the lowest quintile of the distribution of cash ETR and zero otherwise. Also, constructed another limited dependent variable, which was taking on the value 1, in this case an indication of a high level of Tax Aggression, if the observation was in the higher quintile of the distribution of scaled unrecognized tax benefits and zero otherwise.

The above limited dependent variable was regressed against the following explanatory variables.

\textbf{Explanatory Variables}

- The firms’ level of Property, Plant, and Equipment as a proportion of lagged assets.
- The firm’s size
- The firm’s level of foreign sales (from geographic segments) as a proportion of total sales;
- The firm’s level of spending on Research and Development (R&D) as a proportion of lagged assets;
• The firm’s level of Intangible Assets as a proportion of lagged assets
• The level of long-term debt to lagged total assets.

The results of the study revealed that, among other things, corporate tax avoidance has a positive and statistically significant association on the firm’s size, level of Property, Plant, and Equipment (PPE), expenditures on Research and Development (R&D), and leverage. Likewise, the corporate tax aggressiveness was found to have a positive and statistically significant association with the firm’s size, level of Foreign Sales, and expenditures on Research and Development (R&D), while a negative and statistically significant relationship was found between tax aggressiveness and firm’s level of Property, Plant, and Equipment (PPE).
3 METHODOLOGY

3.1 DEFINITION OF THE DEPENDENT VARIABLE AND ECONOMETRIC APPROACH

3.1.1 Measuring Tax Aggressiveness

To develop the model that will be used in order to model tax aggressiveness, we start with the definition of latter.

In line with Chen et al. (2010), we measure (the level of) tax-aggressiveness, $TA_{i,t}$, of firm $i$ in period $t$, as the proportion cash outlays in tax expenses (ctaxexp) to the firm’s profits before taxes (preprofit).

$$ TA_{i,t} = \frac{ctaxexp_{i,t}}{preprofit_{i,t}} $$ 3.1

In the literature (for example see Dyreng et al. (2008)) the above ratio (which, as we have pointed out in the introduction, it is known as the “Cash Effective Tax Rate” (cash ETR), is measured annually, by calculating the ratio of the sum of cash tax outlays during a five-year period to the sum of (positive) profits before tax during the aforementioned period.

3.1.2 Modelling Tax Aggressiveness in a Panel-Data Econometric Model

Since we deal with panel data, we need first to specify a panel-data econometric model. To this end, and in line with the work of Chen et al. (2010), the following basic fixed-effects model (i.e. a type of a panel-data model), shall be estimated to the study’s panel:

$$ TA_{it} = \alpha_i + X'_{it}\beta + M'_{it}\gamma + \varepsilon_{it} $$ 3.2

Where

$TA$ : A measure of tax aggressiveness, defined previous as the cash Effective Tax Rate (ETR)

$X$ : A column-vector with firm-specific variables, which are assumed to affect the level of tax aggressiveness

$\beta$ : A column-vector of the coefficients of the firm-specific variables.
**M**: A column-vector of macroeconomic variables, which may be associated with the firms’ level of tax aggressiveness.

**y**: A column-vector of the coefficients of the macroeconomic variables.

\( \alpha_i \): A variable capturing the unique and firm-specific **fixed-effects**.

\( \varepsilon_{it} \): The disturbance term for each cross-section \( i \) and time period \( t \).

The term \( \alpha_i \) represents a firm-specific variable, which differs among firms, but for any particular firm, its value over the time dimension of the panel is constant. Put differently, the unobserved factor \( \alpha_i \), which is supposed to affect the level of a firm’s tax aggressiveness does not change over time for each company, and hence any changes in extent of tax-aggressive witnessed in each of these firms must be down either to the effect of time-varying firm-specific variables in \( X \), or to the effect of time-varying macroeconomic variables in \( M \). At the same time, the implicit assumption in the fixed-effects variables \( \alpha_i \) (for \( i = 1,2, ..., N \) firms) are correlated with the regressors in \( X \) or \( M \).

The objective in the panel-data model (3.2) is not so much to quantify the fixed-effects \( \alpha_i \), but to get estimates for the parameters \( \beta_k \) in the coefficients’ vector \( \beta \) for the firm-specific explanatory variables. Table 3-1 shows the explanatory variable corresponding to the various coefficients of vector \( \beta \) and the expected signs of the estimates for each coefficient parameter.

**Table 3-1**: List of Explanatory Variables and their Expected Signs

<table>
<thead>
<tr>
<th>Type of Variable</th>
<th>Name of Variable</th>
<th>Symbol Used</th>
<th>Study/Expected or Documented effect on TA</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRM-SPECIFIC</td>
<td>Return on Assets</td>
<td>ROA</td>
<td>(-)/(+)</td>
</tr>
<tr>
<td>VARIABLES</td>
<td>Total Leverage</td>
<td>LEV</td>
<td>(-)/(+)</td>
</tr>
<tr>
<td></td>
<td>Fixed Assets</td>
<td>PPE</td>
<td>(-)</td>
</tr>
<tr>
<td></td>
<td>Firm Size</td>
<td>SIZE</td>
<td>(-)</td>
</tr>
</tbody>
</table>

There are several firm-specific variables that the relevant literature (see for example Dyreng et al. 2008; Frank et al. 2008; Rego 2003;) has shown to affect a firm’s level of tax-aggressiveness. The above table shows that the firm-specific variables that will be used in this study are ROA, PPE, LEV, and SIZE capturing corporate aspects such as firms’ profitability, capital assets, leverage, and size.
A firm’s profitability, as this is captured by its Return on Equity (ROA) is related to tax aggressiveness, since research has shown (see for example Anderson and Reeb (2003)) that the higher a firm’s profitability and the lower the loss-carry forwards, the higher effective tax rates.

The level of firm’s Plant, Property, and Equipment (PPE) is relevant for our purposes, since, normally, a firm with a rather highly capital-intensive production needs to consider carefully the different ways to estimate the depreciation expense, it is allowed to make, thereby reducing its tax liability, as the depreciation expense is tax-deductible expense.

Finally, a firm’s Size (size) is included as a control variable since large firms are likely to invest more, than smaller firms, toward setting up sophisticated tax departments in an effort to minimize their tax bill (Guenther et al., 2013).

In this study two way shall be used in order to estimate the fixed-effects model shown in Eq. (3.2). As it was previously pointed out, the objective here to derive estimates for the parameters \( \beta_k \) in the coefficients’ vector \( \beta \) for the firm-specific explanatory variables, after eliminating the effect of the fixed-effects variables \( \alpha_i \). So, two ways of eliminating the fixed-effects (in model (3.2)) shall be discussed. The first is the within estimator and the second if the between estimator.

**Estimation of the Fixed-Effects Model with the Within Estimator**

One way to eliminate the fixed-effects parameters \( \alpha_i \) (i.e. to eliminate the variation of tax aggressiveness at the higher-level unit of the firm) is to estimate model (3.2) with the within estimator.

To derive the within-estimator model, we first take the average of Eq (3.2) over time for each company \( i \) (i.e. the higher-level unit); this averaging process yields the following:

\[
\overline{TA}_i = \alpha_i + \overline{X}'_i \beta + \overline{M}'_i \gamma + \overline{\epsilon}_i \quad 3.3
\]

Note, the fixed-effects \( \alpha_i \), due to their time-invariance, have an average value equal to their actual values, that is, \( \overline{\alpha}_i = \alpha_i \), for \( i = 1,2, \ldots, N \). And subtracting Eq. (3.3) from Eq. (3.2) we get

\[
TA_{it} - \overline{TA}_i = (X'_{it} - \overline{X}'_i) \beta + (M'_{it} - \overline{M}'_i) \gamma + \epsilon_{it} - \overline{\epsilon}_i \quad 3.4
\]

Changing the notation, we could write the above econometric model as

\[
\hat{T}A_{it} = \hat{X}'_{it} \beta + \hat{M}'_{it} \gamma + \hat{\epsilon}_{it} \quad 3.5
\]
Where $T'A_{it} = TA_{it} - \overline{TA}_i$ is the *time-demeaned data* on the explanatory variable $TA$. This fixed-effects transformation, shown by Eq. (3.5), is the so-called the **within-estimator** model. In the above model, any time-invariant characteristic (like the fixed effects $\alpha_i$) has become irrelevant in determining the parameters $\beta_k$ in the coefficients’ vector $\beta$ for the firm-specific explanatory variables.

**Estimation of the Fixed-Effects Model with the Between Estimator**

The estimation of the fixed-effects model using the **between estimator**, essentially involves an OLS estimate of the following cross-sectional regression model (for company $i$)

$$\overline{TA}_i = \beta_0 + \overline{X}'_i \beta + \overline{M}'_i \gamma + \alpha_i + \varepsilon_i$$  \hspace{1cm} (3.6)

The difference with model (3.3) is than a constant term $\beta_0$ has been added to the model. So, according to the between-estimator model (3.6), using the time-averages for $TA$ (the dependent variable), $X$ (the vector of firm-specific variables), and $M$ (the vector of macroeconomic variables) we run a cross-sectional regression. Consistent estimation of model (3.6) requires that the new disturbance term $(\alpha_i + \varepsilon_i)$ is not correlated with the average value of the explanatory variables contained either in vector $X$ or in vector $M$, otherwise the estimation of the between-estimator model (3.6) will yield biased estimates of the parameters $\{\beta_k, \gamma_j\}$ in the coefficients’ vectors $\beta$ and $\gamma$.

In the above between-estimator model, we could also include a dummy variable as follows

$$\overline{TA}_i = \beta_0 + \delta_{fam_i} + \overline{X}'_i \beta + \alpha_i + \varepsilon_i$$  \hspace{1cm} (3.7)

Where

fam: A binary variable taking on the value of 1 for family-controlled firms, and zero otherwise; **family control** is established if family ownership is greater or equal to 5% of total firm equity.

So, for family-controlled firms, i.e. for firms with $fam_i = 1$, the above between-estimator model becomes
\[ \overline{TA}_i = \beta_0 + \delta + \overline{X}'_i \beta + \alpha_i + \bar{\epsilon}_i \]  \hspace{1cm} (3.8)

While, for non-family-controlled firms, i.e. for firms for which \( \text{fam}_i = 0 \), the between-estimator model (3.6) becomes

\[ \overline{TA}_i = \beta_0 + \overline{X}'_i \beta + \alpha_i + \bar{\epsilon}_i \]  \hspace{1cm} (3.9)

Hence in the econometric specification (3.6), the object of interest is on the slope parameter \( \delta \) of the dummy variable \( \text{fam} \), which captures the effect of family control on practices of tax-aggressiveness on the part of the different types of firms. Given that \( \overline{TA}_i \) stands for the average cash ETR for firm \( i \), over the time dimension of the panel, and that high (low) values of \( \overline{TA}_i \) indicate a low (high) level of tax aggression, we see that if family-controlled firms (i.e. firms for which \( \text{fam}_i = 1 \)), we see that if family-controlled firms are less tax aggressive compared to non-family-controlled firms, i.e when \( \overline{TA}_{i \in f} > \overline{TA}_{i \notin f} \), (where \( f \) represents the set of family-controlled firms and \( f' \) the set of non-family-controlled firms), then a positive sign on the parameter \( \delta \) is expected. By contrast, if family-controlled firms are more tax aggressive compared to non-family-controlled firms, i.e if \( \overline{TA}_{i \notin f} < \overline{TA}_{i \notin f} \), then a negative sign on the parameter \( \delta \) should be expected.

Note, in model (3.7), the inclusion of control variables, that is, of the firm-specific variables that have been shown to be correlated with the tax aggressiveness on the part of the firms, ensures that the differences, if any, in the level of tax aggression between family-controlled and non-family-controllers firms are not attributed to other factors, besides the type of firm ownership.

### 3.1.3 Modelling the Probability of Engaging in a Tax-Aggressive Behavior

In modelling the probability of engaging in a tax-aggressive behavior we define the (observed) dependent variable \( Y_i \) as a binary variable, having only two possible outcomes: 0 (if the firm is tax aggressive) and 1 (if the firm is no tax-aggressive). Hence \( \{y_i\}_{i=1}^{N} \) is the set of realizations for this variable, and these realizations are affected by a set \( X_i \) of explanatory variables. In our case we deal with \( N = 291 \) firms under consideration. The binary realizations in \( \{y_i\}_{i=1}^{N} \) occur according to the following observability rule

\[
y_i = \begin{cases} 
1 & \text{if } y_i^* > 0 \\
0 & \text{otherwise}
\end{cases} \]  \hspace{1cm} (3.10)
Under the above $y_i^*$ is the latent realization of the latent variable $Y_i^* = f(X_i, U_i; \beta)$, for which we assume the following linear model holds true,

$$
Y_i^* = X_i'\beta + U_i
$$

where

$U_i$: The unobserved disturbance term for the $i$th realization, and $i = 1, ..., N$

According to the above observability rule (3.10), and the specification for the latent variable $Y_i^*$ we obtain

$$
\Pr(Y_i = 1|X_i) = G_u(X_i'\beta)
$$

where

$G_u(\cdot)$: The cumulative distribution function for the disturbance term $U_i$

By specifying an appropriate distribution function for $U_i$ and by knowing the values of $\beta$ we can estimate the probability that $Y = 1$. Assuming a normal distribution, with zero mean and unit variance, for the disturbance term $U_i$, that is, $U_i \sim N(0, \sigma_U^2)$, we get

$$
\Pr(Y_i = 1|X_i) = \Phi\left(\frac{X_i'\beta}{\sigma_u}\right)
$$

where

$\Phi(\cdot)$: The standard normal cumulative distribution function (cdf)

Since there is an infinity of combinations of values $\beta$ and $\sigma_U^2$, it is customary to adopt that scaling convention $\sigma_u^2 = 1$. The above model for estimating the probability that $Y = 1$ is known as the probit model.

### 3.2 DATA

The data used in this study are panel data, that is, they form a combination of cross-section and time-series data. The cross-sectional component of the data involves the
American firms, while the time-series component involves the years of the period 2005-2012. The source of our data concerning the family-controlled businesses are derived from the **Global Family Business Index**, an index comprising the largest 500 family firms around the globe. The index is compiled by the Center for Family Business at the University of St.Gallen, Switzerland, in cooperation with EY's Global Family Business Center of Excellence.

Fig. 3-2 presents the how average value of the measure of tax aggression varies across the companies (i.e. the cross-sections of the panel) over the time dimension of the panel.

*Figure 3-1: Average Cash Effective Tax Rate (ETR) for the Companies in the Sample*

The measure of tax aggression used is the ratio of cash tax expense to pre-tax income. In Fig. 3-2 the average value of the aforementioned ratio across the 291 firms was 5.74% with a very high standard deviation of 5.67%.

Table 3-2 reports the composition of the sample, which consists of 2,633 firm-years from 1,003 firms, spanning the period 2005-2012. Of the 2,633 firm-year observations
in the sample, 1,132, that is, about 43% are family-firm observations, and the remaining are non-family firm observations.

Panel A of Table 3-2 presents the descriptive statistics of firm-specific variables, separately family-controlled firms, while Part B reports the same descriptive statistics separately for non-family-controlled firms. One thing that stands out right away is that family firms seem to be less tax aggressive than non-family firms, as their effective tax rate was higher than that of non-family controlled firms by 0.21%. Further, in line with previous research (like that for example of Anderson and Reeb (2003)), the ROA for family-controlled firms is higher than that of non-family controlled; the mean ROA for family controlled firms is 3.55%, while the mean ROA for non-family controlled firm is 3.16%. Also, we see that family firms have higher leverage (with a mean leverage of 0.1951) compared with non-family firms (with a mean leverage of 0.10), they are less capital intensity (with a mean PPE ratio of 71.79% compared with a corresponding ratio of 73.8% for non-family controlled firms), and in general they are smaller than non-family firms; the average size for family-controlled firms was 4,975, while the average size for nonfamily-controlled firms was 5,801.

<table>
<thead>
<tr>
<th>Part A</th>
<th>FAMILY CONTROLLED</th>
<th>Tax</th>
<th>LEV</th>
<th>PPE</th>
<th>ROA</th>
<th>PRICE</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>0</td>
<td>-118.648</td>
<td>9.385</td>
<td>0.1195</td>
<td>0.31</td>
<td>37.44</td>
<td></td>
</tr>
<tr>
<td>1st Qu</td>
<td>1.004</td>
<td>-3.8263</td>
<td>45.84</td>
<td>0.8507</td>
<td>22.15</td>
<td>618.65</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>3.069</td>
<td>0.5121</td>
<td>65.586</td>
<td>1.6069</td>
<td>35.3</td>
<td>1702.28</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>5.032</td>
<td>0.1951</td>
<td>71.798</td>
<td>3.5661</td>
<td>40.37</td>
<td>4975.21</td>
<td></td>
</tr>
<tr>
<td>3rd Qu</td>
<td>7.438</td>
<td>5.9382</td>
<td>91.276</td>
<td>4.4182</td>
<td>53.37</td>
<td>5536.75</td>
<td></td>
</tr>
<tr>
<td>Max</td>
<td>19.95</td>
<td>63.7022</td>
<td>264.077</td>
<td>80.2553</td>
<td>262.2</td>
<td>527309</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part B</th>
<th>NON-FAMILY CONTROLLED</th>
<th>Tax</th>
<th>LEV</th>
<th>PPE</th>
<th>ROA</th>
<th>PRICE</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>0</td>
<td>-455.857</td>
<td>11.6</td>
<td>0.108</td>
<td>0.41</td>
<td>71.48</td>
<td></td>
</tr>
<tr>
<td>1st Qu</td>
<td>0.9509</td>
<td>-3.9782</td>
<td>44.91</td>
<td>0.7505</td>
<td>23.05</td>
<td>742.96</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>2.4088</td>
<td>0.8385</td>
<td>64.92</td>
<td>1.7364</td>
<td>34.94</td>
<td>1854.82</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>4.8235</td>
<td>0.1021</td>
<td>73.81</td>
<td>3.1632</td>
<td>40.78</td>
<td>5801.94</td>
<td></td>
</tr>
<tr>
<td>Quarters</td>
<td>3rd Qu</td>
<td>6th Qu</td>
<td>9th Qu</td>
<td>4th Qu</td>
<td>5th Qu</td>
<td>6th Qu</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>Max.</td>
<td>19.9514</td>
<td>66.1173</td>
<td>978.49</td>
<td>21.8254</td>
<td>532.17</td>
<td>85963</td>
<td></td>
</tr>
</tbody>
</table>

Notes: * statistically significant estimates at the 5% level of confidence. Lev (leverage) = (debt /assets)
PPE = (PPE/Assets) * 100; ROA = (Op.Inc./ Assets) * 100; Size = value of assets

**Figure 3-2:** Average Cash Effective Tax Rate (ETR) in each year

95% confidence interval around the mean
4 EMPIRICAL RESULTS

4.1 ECONOMETRIC RESULTS

Our goal is to model the dependent variable of tax aggressiveness with a panel consisting of 339 American firms (cross sections), observed over 2005-2012. Tax-aggressiveness, $TA_{1,t}$, is computed as the ratio of tax expense (taxexp) to pre-tax profits (preprofit). This measure, which is also known as the Effective Tax Rate (ETR). The first approach in modeling this variable involves a panel-data approach and the second a probability approach through the estimation of a probit model.

### 4.1.1 The Panel Data Model

Table 4-1 shows the estimated the fixed-effects model using the within-estimator approach (see model (3.5)). To see how the results of Table 4-1 can be interpreted, we examine the effect of ROA on the dependent variable, i.e. the ratio of tax expense to pre-tax income. We consider for example the effect of ROA on tax aggression in the case of family-controlled firms.

#### Table 4-1: Estimation of Fixed-Effects Model with the Within Estimator

**Part A**

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEV</td>
<td>0.0032**</td>
<td>0.0033**</td>
<td>0.0036*</td>
</tr>
<tr>
<td>PPE</td>
<td>-0.0004</td>
<td>-0.0004</td>
<td>-0.0007</td>
</tr>
<tr>
<td>ROA</td>
<td>-0.0534*</td>
<td>-0.0543*</td>
<td>-0.0554*</td>
</tr>
<tr>
<td>SIZE</td>
<td>-0.0029</td>
<td>-0.0012</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td></td>
<td></td>
<td>0.0000*</td>
</tr>
</tbody>
</table>

**Part B**

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
From Part C (Model 1) of Table 4-1, we see that in the case of non-family-controlled firms the estimated slope coefficient for the effect of the explanatory variable ROA, on the level of a firm’s tax aggressiveness, is -0.1139 ($\hat{\beta}_{ROA,f}$). The negative sign of the estimated slope coefficient $\hat{\beta}_{ROA,f}$ shows that there is a negative relationship between the explanatory variable ROA and the dependent variable. And given that high (low) values of the dependent variable $\bar{T}'A_{it}$ (which represents the cash ETR of firm $i$ in year $i$) indicate a low (high) level of tax aggression, the negative relationship between the firm’s ROA and $\bar{T}'A_{it}$ shows that, for non-family-controlled firms, the higher the firm’s profitability, the lower the value of $\bar{T}'A_{it}$, and thus the higher the level of tax aggression.

Note in Part C, model 1, of Table 4-1 the effect of the explanatory variables LEV and PPE, on the level of a firm’s tax aggressiveness, is not statistically significant, and hence we may conclude
that for non-family-controlled firms, corporate leverage and the level of capital assets are not important in determining the effect of tax aggression.

We could quantify the effect of ROA on the dependent variable, i.e. on the level of cash TRS, by using as a base-case change in the level of ROA the value of the semi-interquartile range in the distribution of ROA’s values. A variables semi-interquartile range (IQR) is computed as the difference between the value of 75th percentile (Q3) and the 25th percentile (Q1) of the distribution of the variable’s data values, and this difference is divided by two.

So for example, in the case of non-family firms the value of the third quartile for the variable ROA is $Q_3=4.38$ (see Table 3-1), while the value of the first quartile for the same variable is $Q_1=0.75$, and hence the semi-interquartile range will be $IQR=(4.45-0.75)/2=1.78$. So, in the case of non-family firms for every 1.81 percentage-point increase of their ROA, their tax cash-expense (as a percentage of pretax income) is expected to fall by $20.67 (= -0.1139 \times 1.81)$ basis points.

From Part B of Table 4-1, we see that the estimated slope coefficient for family firms is $-0.0325$; In the case of family firms we have the value of the third quartile for the variable ROA is $Q_3=4.42$ (see Table 3-1) while the value of the first quartile for the same variable is $Q_1=0.85$, and hence the semi-interquartile range will be $IQR=(4.42-0.85)/2=1.78$. So, in the case of family firms for every 1.78 percentage-point increase of their ROA, their tax cash-expense (as a percentage of pretax income) is expected to fall by $5.79 (= -0.0325 \times 1.78)$ basis points.

Table 4-2 shows the estimation results of the fixed-effects model using the *between estimator*. Hence we examine the effect of family ownership on tax aggressiveness, after controlling for the effect of other variables, which have been documented in the literature to have a bearing on the level of tax aggressiveness. What we need to notice is the statistical significance of the parameter of the dummy variable fam; this binary variable is defined to take the value 1 for non-family-controlled firms, and zero family-controlled firms, where family control is established if family ownership is greater or equal to 5% or they hold positions in top management.

---

2 That is, we have $IQR=(Q_3-Q_1)/2$
Table 4-2: The Results of Estimating the Fixed-Effects Model with the Between Estimator

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>9.6311*</td>
<td>10.5370*</td>
</tr>
<tr>
<td>LEV</td>
<td>-0.0937</td>
<td>-0.0856</td>
</tr>
<tr>
<td>PPE</td>
<td>-0.0377*</td>
<td>-0.0275*</td>
</tr>
<tr>
<td>ROA</td>
<td>-0.3735*</td>
<td>-0.5092*</td>
</tr>
<tr>
<td>Size</td>
<td>-0.0002*</td>
<td>0.0132</td>
</tr>
<tr>
<td>Fam</td>
<td>0.0960</td>
<td>0.0132</td>
</tr>
</tbody>
</table>

Notes: * statistically significant estimates at the 5% level of confidence

Since the estimated value of the parameter of the dummy variable fam in both model specifications (presented in the above table) is not statistically significant we conclude that family ownership has no effect on tax aggressiveness, after controlling for the effect of leverage (LEV), profitability (ROA), capital assets (PPE), and firm size (SIZE).

The estimate for the effect of SIZE is negative and statistically significant, that is, the larger a firm’s size the lower the cash ETR and hence the greater the extent of tax aggression on the part of the firm. In other words, this finding indicates that larger firms invest more, compared with smaller firms, of their resources in developing sophisticated tax departments in order to maximize their tax savings.

4.1.2 The Results from the Probit Model Estimates

In Fig. 3-23 we saw that ratio of cash tax expense to pre-tax income (i.e. the measure of tax aggression used in the dissertation) had an average value (across the 291 firms) of 5.74% with a very high standard deviation of 5.67%, and a median value of 3.58%. In order to apply the probit model (see Eq. (3.12)), we need first to construct the (observed) binary variable $Y_i$, with two possible outcomes: 0 (if the firm is tax aggressive) and 1 (if the firm is no tax-aggressive). Specifically, we assume that tax-aggressive firms are those with a mean ratio of cash tax expense to pre-tax income ($\overline{TA}_i$) less than the median value of 3.58%, and a non-tax-aggressive firms are those with a mean ratio of cash tax expense to pre-tax income greater or equal to the median value of 3.58%. So, the binary variable $Y_i$ is constructed as follows.
\[ Y_i = \begin{cases} 1 & \text{if } \overline{TA}_i < 0.0358 \text{ (tax aggression)} \\ 0 & \text{if } \overline{TA}_i \geq 0.0358 \text{ (no tax aggression)} \end{cases} \]

Hence the binary realizations \( \{y_i\}_{i=1}^{291} \) for the binary random variable \( Y_i \), involve 146 values of 0s (i.e. no tax-aggressive firms, for which the mean ratio of cash tax expense to pre-tax income \( \overline{TA}_i \) less than the median value of 3.58%), and 145 values of 1s (i.e. tax-aggressive firms, for which the mean ratio of cash tax expense to pre-tax income \( \overline{TA}_i \) was less than the median value of 3.58%).

**Table 4-3:** The Results of Estimating the Probit Model

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.8946*</td>
<td>-2.2420*</td>
</tr>
<tr>
<td>LEV</td>
<td>0.0319**</td>
<td>0.0444**</td>
</tr>
<tr>
<td>PPE</td>
<td>0.0058**</td>
<td>-0.0032</td>
</tr>
<tr>
<td>ROA</td>
<td>0.1378*</td>
<td>0.3460*</td>
</tr>
<tr>
<td>Size</td>
<td></td>
<td>0.0004*</td>
</tr>
<tr>
<td>Fam</td>
<td>0.1795</td>
<td>0.3582**</td>
</tr>
<tr>
<td>( \overline{R}^2 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: * statistically significant estimates at the 5% level of confidence. ** statistically significant estimates at the 10% level of confidence. The dependent binary variable \( Y_i \), with two possible outcomes: 0 (if the firm is not tax aggressive) and 1 (if the firm is tax-aggressive). Tax-aggressive firms are those with a mean ratio of cash tax expense to pre-tax income \( \overline{TA}_i \) less than the median value of 3.58%, and non-tax-aggressive firms are those with a corresponding ratio greater or equal to the median value of 3.58%. LEV (leverage) = (debt/assets)*100; PPE = (PPE/Assets)*100; ROA = (Op.Inc./Assets)*100; Size = value of assets. Fam (dummy variable) = 1 for non-family-controlled firms, and zero otherwise; family control is established if family ownership is greater or equal to 5% or they hold positions in top management, while “family” are considered the members of the founding family, either by blood or marriage.

The estimated probit regression model shown under the heading Model 1 has the following representation

\[
P(Y_i = 1|X_i) = \Phi(-0.8946 + 0.0319 \text{ LEV}_i + 0.0058 \text{ PPE}_i + 0.1378 \text{ ROA}_i + 0.1795 \text{ Fam}_i)
\]

For family firm (i.e. \( \text{Fam}_i = 0 \)) the above specification has as follows
While for non-family firm (i.e. $Fam_i = 1$) we have
\[
P(Y_i = 1 | X_i) = \Phi(-0.8946 + 0.1795 + 0.0319 \times \text{LEV}_i + 0.0058 \times \text{PPE}_i + 0.1378 \times \text{ROA}_i)
\]

The positive (negative) sign of any slope coefficient $\beta_j$, associated with the firm-specific variable $X_j$, indicates that the estimated probability that firm $i$ engages in a tax-aggressive behavior increases (decreases) as the values of the variable $X_j$ increase.

Next, we estimate the probability of engaging in a tax-aggressive behavior. We estimate this probability, for family-controlled and non-family-controlled firms, using as base values of the control variables (i.e. LEV, PPE, and ROA) their average value. In Table 3-2 we saw that family firms had a mean leverage of 0.1951, while for non-family firms the corresponding ratio was 0.10, and also the former’s PPE ratio was 71.79% compared with a corresponding ratio of 73.8% for the latter firms. Also, we know that the mean ROA for family controlled firms is 3.55%, while that for non-family-controlled firms is 3.16% (see Table 3-2).

Substituting the average values of LEV, PPE and ROA into the equation for the family-controlled firm we find that the probability that a family-controlled firm will engage in a tax-aggressive behavior is 50.6%
\[
P(Y_i = 1 | X_i) = \Phi(-0.8946 + 0.0319 \times 0.1951 + 0.0058 \times 71.79 + 0.1378 \times 3.55)
\]
\[
= \Phi(0.0147)
\]
\[
= 0.5058
\]

Likewise, substituting the average values of LEV, PPE and ROA into the equation for the non-family-controlled firm we find that the probability that a nonfamily-controlled firm will engage in a tax-aggressive behavior is close to 56%
\[
P(Y_i = 1 | X_i) = \Phi(-0.8946 + 0.1795 + 0.0319 \times 0.10 + 0.0058 \times 73.8 + 0.1378 \times 3.16)
\]
\[
= \Phi(0.149)
\]
\[
= 0.5592
\]

Note, in the probit regression specification 1, the estimate for the dummy variable $Fam_i$ is not statistically significant. This implies that the difference of 5.4 percentage points, between the probability that a nonfamily-controlled firm will engage in a tax-aggressive behavior (which is 56%) and the probability that a family-controlled firm will engage in a similar behavior (which is 50.6%), is not considered to be statistically significant.
In the second model specification for probit regression model the estimated slope parameter for the dummy variable $Fam_i$ is in this case statistically significant; this model specification has the following representation

$$P(Y_i = 1|X_i) = \Phi(-2.24 + 0.0444\text{LEV}_i - 0.0032\text{PPE}_i + 0.346 \text{ROA}_i + 0.0004\text{SIZE}_i + 0.3582Fam_i)$$

Again for the family-controlled firms, for which we have $Fam_i = 0$, the above model specification becomes as as follows

$$P(Y_i = 1|X_i) = \Phi(-2.24 + 0.0444\text{LEV}_i - 0.0032\text{PPE}_i + 0.346 \text{ROA}_i + 0.0004\text{SIZE}_i + 0.3582)$$

While for non-family controlled firms (for which we have $Fam_i = 1$) the model specification is

$$P(Y_i = 1|X_i) = \Phi(-2.24 + 0.0444\text{LEV}_i - 0.0032\text{PPE}_i + 0.346 \text{ROA}_i + 0.0004\text{SIZE}_i + 0.3582)$$

Again we estimate the probability of engaging in a tax aggressive behavior, for family-controlled and non-family-controlled firms, using as base the average values of all now firm-specific variables (i.e. LEV, PPE, ROA, and SIZE). As we previously pointed out the average values of LEV, PPE, and ROA for family-controlled firms were 0.1951, 71.79 and 3.55, respectively. Further, the average size for family-controlled firms was 4,975. For non-family firms the average values of LEV, PPE, and ROA were 0.10, 73.8% and 3.16%, respectively, while the average size for such firms was 5,801.

Substituting the average values of LEV, PPE, ROA and SIZE into the equation for the family-controlled firm we find that the probability that a family-controlled firm will engage in a tax-aggressive behavior is 83%

$$P(Y_i = 1|X_i) = \Phi(-2.24 + 0.0444(0.1951) - 0.0032(71.79) + 0.346(3.55) + 0.0004(4,975))$$

$$= \Phi(0.98)$$

$$= 0.837$$

Likewise, substituting the average values of LEV, PPE and ROA into the equation for the non family-controlled firm we find that the probability that a nonfamily-controlled firm will engage in a tax-aggressive behavior is close to 56%
Note, in the probit regression specification 1, the estimate for the dummy variable $Fam_i$ is not statistically significant. This implies that the difference of 5.4 percentage points, between the probability that a nonfamily-controlled firm will engage in a tax-aggressive behavior (which is 56%) and the probability that a family-controlled firm will engage in a similar behavior (which is 50.6%), is not considered to be statistically significant.
5 CONCLUSIONS

In this dissertation, we examined the determinants of tax aggression in a sample of family-controlled and non-family controlled US firm. The variable that was used to capture the level of tax aggression was the ratio of cash tax expense to pretax income. In theory, family firms could be more tax aggressive compared to their non-family peer, if the owners enjoy greater tax-savings benefits. Using a cross-sectionally averaged regression, with a dummy variable and control variables (firm-specific variables), we found that family ownership does not influence the level of the firms’ on tax aggressiveness, after controlling for the effect of firm-specific variable like leverage, profitability, capital assets, and firm size.

The econometric approach involved the use of ordered probit model, in order to examine the determinants of tax aggression.

Specifically, with the ordered probit we modeled the level of tax aggression of 339 American firms (based on average values over the period 2005-2012), using as explanatory variables the score of each firms in three important firm-specific variables (1) the return on assets (ROA), (2) the PPE index and (3) the leverage index.

The level of tax aggression was measured by the firm’s tax-aggression scores over the period 2005-2012. Specifically, the level of tax aggression of a firm could take one four distinct values ranging from 1, if that firm was ranked on the basis of its average level of tax aggression in the first quartile of all American firms, to 4, if the firm was ranked the fourth quartile. From the estimation of the ordered probit model, all the coefficients of the explanatory variables, ie the ROA, the PPE index, and the leverage index, were found to be statistically significant, in determining the level of tax aggression.

The estimation results showed that by far, for all levels of tax aggression, the leverage is the most important factor that they need to correct for.
REFERENCES


