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THE DETERMINANTS OF CAPITAL STRUCTURE OF ITALIAN PUBLIC AND PRIVATE COMPANIES: AN EMPIRICAL ANALYSIS

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Abstract

The present paper analyzes the determinants of capital structure of Italian companies. By employing two samples respectively composed of public and private firms, the paper aims to discover what key factors influence capital structure composition and if such factors differ from public to private companies. The analyzed independent variables are Age, Profitability, Growth, Size, Tangibility, Effective tax rate, Non-debt tax shields and Income variance, and a Fixed effects regression is employed to account for Panel effects, which allows to find their relationship with the companies' leverage. The data analyzed encompasses all non-financial sectors and 5 years between 2018 and 2022.

Keywords: capital structure, leverage, Italian companies, determinants, regression

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INTRODUCTION

The subject of capital structure decisions in finance is crucial for firms' strategic management and resource allocation. Previous studies have explored this topic, but most have focused on US companies and assumed their findings apply globally. However, this thesis concentrates specifically on Italian companies to examine the relationship between eight factors (age, profitability, size, growth, tangibility, earnings volatility, non-debt tax shields, effective tax rate) and capital structure decisions. The study uses two samples of public and private companies to identify potential differences in financing patterns and their underlying causes.

Research on Italian companies' capital structure has been limited compared to other countries, such as the UK, US, Germany, the Netherlands, and northern European countries. Private companies, in particular, have been understudied due to data availability issues. However, private and public firms approach capital structure decisions differently, given their distinct limitations and costs associated with debt and equity financing. This study aims to bridge the knowledge gap and provide valuable insights, especially considering the significant presence of private firms in Italy.

The study begins with a literature review covering the Modigliani-Miller theory, pecking order theory, trade-off theory, signaling theory of debt, and market timing theory. These theories explain how firms make capital structure choices based on factors such as tax rate, probability of default, and preference for internally generated funds or debt issuance.

Next, I select two samples of non-financial companies, ensuring sufficient data coverage over a 5-year period. While data availability is higher for listed companies, obtaining data for non-listed companies is more challenging. Statistical tests indicate that fixed effects panel data regressions are more suitable for interpreting the results compared to standard OLS regression.

The study then analyzes the chosen dependent and independent variables and the proxies used to measure them. Hypotheses are formulated based on previous research and logic, which are then compared to the final regression results. The analysis also includes the geographical distribution and sector composition of the samples to ensure the results are robust and not influenced by specific sectors or regions in Italy.

The regression analysis examines the relationship between the eight independent variables and the dependent variables, which represent leverage. Two different dependent variables for leverage are used to ensure the reliability of the findings, with two separate regressions performed per sample. This allows the research to draw conclusions about the fundamental factors influencing capital structure choices for private and public firms in Italy, as well as the differences between them.

The structure of the paper is organized into chapters, including a literature review, analysis of variables and samples, regression results for both types of companies, and a conclusion.

LITERATURE REVIEW

A BRIEF INTRODUCTION ON CAPITAL STRUCTURE

Capital structure refers to the mix of debt and equity a firm uses to finance its activities. Debt is typically in the form of corporate bonds or loans. Equity, on the other hand, is issued through stock, provides ownership in the company and its issuance can result in dilution of existing ownership stakes. Equity holders benefit from potential increases in stock price and have more flexibility, since they don't have contractual repayment obligations. Debt, instead, allows firms to secure financing without diluting ownership, but failure to repay debt can lead to bankruptcy. Debt also entails interest payments, which decrease net income but are tax-deductible, while dividends reduce retained earnings but are not tax-deductible.

Another important factor when analyzing a company's capital structure is the weighted average cost of capital. It is calculated as a weighted average of the cost of equity and the cost of debt. Equity carries a higher cost because equity holders bear more risk and are repaid last in financial difficulties compared to debt holders.

THE MODIGLIANI MILLER IRRELEVANCE PROPOSITION

The Modigliani Miller irrelevance proposition, formulated by Modigliani and Miller, states that the value of a firm is independent of its capital structure. According to the first proposition, a firm's value is determined by its expected return and is unaffected by its financing decisions. The cost of capital, calculated as the weighted average cost of capital, remains the same regardless of the capital structure. The second proposition suggests that the cost of equity increases with leverage, offsetting the potential benefits of using more debt. These propositions lead to the conclusion that financing choices are irrelevant in determining a firm's value.

It is important to note that the Modigliani Miller theorem assumes a perfect market without taxes, which differs from the real world. In a real world setting, introduced subsequently by the authors, leveraged firms are recognized to have higher value due to the presence of interest tax shields. This revised perspective acknowledges the impact of taxes and suggests that debt financing can reduce tax outflows and enhance a company's value. Additionally, the presence of a tax shield reduces the correlation between the cost of equity and leverage.

Despite its contribution to the understanding of capital structure, the Modigliani Miller theorem has faced criticism for its simplistic assumptions and failure to account for bankruptcy and distress costs. Alternative theories, such as the trade-off theory, pecking order theory, and signaling theory of debt, have emerged to incorporate market imperfections into the framework and provide a more realistic understanding of financing decisions.

THE TRADE OFF THEORY

The Trade-off theory is an extension of the Modigliani-Miller irrelevance theory that considers the costs and benefits of debt financing. Unlike the Modigliani-Miller theorem, which assumed equal costs and benefits of debt, the Trade-off theory recognizes that they are rarely equal. The theory proposes that an optimal capital structure is achieved when the marginal costs and benefits of debt align. Financing decisions are not irrelevant but depend on weighing the costs and benefits.

If the costs of issuing debt outweigh the benefits, it is advantageous for the company not to issue debt as it would reduce the firm's value. Conversely, if the benefits exceed the costs, the company should consider issuing debt. The optimal capital structure minimizes the weighted average cost of capital and varies based on the risk characteristics of the firm and its industry.

While debt offers fiscal advantages, such as interest tax deductibility, it also introduces additional costs, including bankruptcy and distress costs. These costs can reduce the firm's value by an amount equal to the present value of the costs multiplied by the probability of bankruptcy. Therefore, the ideal financing mix occurs when the benefits of debt align with the costs, representing the optimal capital structure.

According to the Trade-off theory, robust firms with high profitability and substantial tangible assets may have higher leverage as they are more resilient against bankruptcy. In contrast, firms with low profitability and limited tangible assets tend to have lower leverage. The theory recognizes that the choice of capital structure depends on various factors and highlights the trade-off between the benefits and costs of debt financing.

THE PECKING ORDER THEORY

The pecking order theory, introduced by Donaldson and further developed by Myers, proposes that firms have a hierarchical preference when choosing their sources of financing. They prioritize internal sources like retained earnings and turn to external financing, specifically debt issuance and equity issuance, when needed. This preference for internal financing is driven by management's desire for control and flexibility, as external financing can limit these aspects and involve higher transaction costs.

The theory is rooted in the concepts of agency problems and transaction costs. Agency problems arise due to the separation of management and ownership in corporations, leading to conflicts of interest. Managers may prioritize their own interests over those of shareholders. To mitigate these issues, firms prefer internally generated funds that are easier to control and do not require external restrictions. Debt is preferred over equity because it is cheaper and does not dilute ownership and control.

The relationship between capital structure and agency costs has been explored by economists such as Jensen and Meckling. They argue that agency costs exist not only with equity holders but also with debtholders, shaping the firm's capital structure decisions. Debt is seen as a tool for reducing agency issues and costs as it imposes repayment obligations on managers.

Myers and Majluf's contribution highlights the role of information asymmetry between managers and the market. Managers possess more information about the company's performance and investment opportunities, leading to higher returns demanded by external investors for debt and equity financing. This makes internal funds more favorable. Equity issuance is considered a last resort due to its higher costs, including underwriting discounts, registration fees, taxes, and expenses.

The pecking order theory suggests that companies should maintain slack by adopting a low-dividend policy and saving retained earnings. It provides insights into firms' financing decisions by emphasizing the prioritization of internal funds, the existence of agency costs, the influence of information asymmetry, and the preference for debt in external financing.

THE SIGNALLING THEORY OF DEBT AND MARKET TIMING THEORY

Ross's theory from the 1970s highlights the use of debt as a tool for communicating information, primarily due to the informational imbalance between company managers and the market. By accruing more debt, a company sends a positive signal about its future prospects, suggesting confidence in its ability to cover debt repayments through sufficient, low-risk profits. The theory differentiates between costly and costless signals, with the increase of debt considered a costly yet credible signal, as false information could lead to bankruptcy.

The "market timing" theory offers a different perspective, suggesting that companies issue equity when their shares are overvalued and buy them back when undervalued. This approach is substantiated by empirical evidence, as research by Baker and Wurgler confirmed a positive correlation between changes in leverage and market timing. Therefore, stock price fluctuations significantly influence the capital structure of a company.

PREVIOUS STUDIES ON DETERMINANTS OF CAPITAL STRUCTURE

Numerous global studies have been conducted, each with a unique perspective, exploring the factors that influence capital structure. These studies differ in their focus, ranging from a single relationship between debt levels and a specific determinant, such as company size, to multivariate analyses. Some studies are specific to a country or a sector, while others conduct cross-country comparisons. For my research, I will investigate multiple determinants of capital structure specifically in Italy. Reviewing existing literature on this subject is crucial to guide further stages of my study.

Summary of single country studies

Several single-country studies have explored the relationship between company characteristics and their capital structure. When examining this matter, researchers have approached it from two different perspectives. The first perspective, utilized by authors such as Baxter and Cragg (1970), Martin and Scott (1972), and subsequently Panno (2003), among others, employed logit analysis to determine whether specific characteristics made a firm more likely to issue debt or equity. Consequently, they primarily focused on individual equity or debt issuances, instead of leverage ratios.

The second and predominant research approach, which this study will adopt, measures capital structure through a proxy (i.e., the Debt/Equity ratio) and conducts regressions with proxies of theoretical determinants. The focus of these studies is to observe how debt ratios change with variations in certain variables.

Regarding studies on Italy, many of them concentrate on smaller regions within Italy and there is a dearth of recent research on Italian listed firms. Precisely, studies either focus on a specific region (e.g. Domenichelli (2010) examined the empirical determinants of small and medium-sized enterprises in the Marche region), on a specific setting (Mustilli, Campanella and De Angelo (2018) studied the determinants of Italian listed firms in a deleverage setting, analyzing the five-year period between 2012 and 2017), only take one variable into account (e.g. Baldissera (2022) conducted a study on Italian listed firms to examine whether profitability influenced the debt ratio and equity ratio).

Internationally, studies mostly focus on the U.S. and Western European countries, uncovering relationships between factors such as firm size, tax rate, uniqueness of the business, and debt levels. However, in recent years, there has been an increase in research in the context of

developing countries, which reveals varying relationships between firm characteristics and capital structure.

Lastly, another batch of studies analyze the influence of industry classification on capital structure, however their findings remain inconclusive, with contradictory findings. While some research suggests industry classification is a significant determinant of capital structure, other studies found no statistical support for this claim.

Summary of cross-country studies

The capital structure of companies can be influenced by a variety of factors, including country-specific aspects. While there is an array of studies that have examined the influence of country specific factors, their results often conflict, making it difficult to form definitive conclusions.

Rajan and Zingales (1995) studied a sample of companies from G7 countries and found that while debt levels differ among countries, they become more homogeneous when accounting discrepancies are considered. They argued that institutional differences are not as significant as previously thought, and found similar correlations between leverage and key determinants such as firm size, tangibility, profitability, and market-to-book ratios across these countries.

Aggrwal (1990) carried out separate studies on large European, Latin American, and Asian countries. The study on Asian companies suggested a high dependence of capital structure decisions on geographical location, noting significant differences in debt-to-equity ratios among 20 diverse countries.

Oztekin (2015) examined 37 countries and found that profitability, tangibility, and inflation were consistent determinants of capital structure decisions, although the relationship between firm size and leverage varied. The variations were attributed to factors like differing

institutional environments, investor protection, bankruptcy outcomes, creditor protection, shareholders' rights, and more.

Psillaki and Daskalakis (2009) studied SMEs in Greece, France, Italy, and Portugal, contending that capital structure determinants are more likely to be influenced by firm-specific characteristics rather than country-specific factors. They found similarities in the determinants due to the countries' shared French civil law systems and financial characteristics. They did acknowledge, however, that differences in coefficients and their magnitude could be due to countrywide effects.

Bancel and Mittoo (2004) highlighted the influence of a country's legal system on capital structure choices. They emphasized that availability of external financing is primarily driven by the quality of the legal system, further suggesting the presence of significant differences in the determinants of capital structure among different countries.

MAIN DIFFERENCES BETWEEN PUBLIC AND PRIVATE COMPANIES

In the upcoming research paper, the capital structure of public and private companies will be examined separately due to two primary motivations: the need for further research in the context of private firms, due to such firms constituting the large majority of the economic environment, and the existing differences in the determinants of capital structure between listed and unlisted firms owing to their distinct financing dynamics. The main differences in financing mechanisms include access to capital markets, information asymmetry levels, and ownership concentration.

Numerous studies have tried to apply the trade-off theory and pecking order theory to private firms, but findings have been inconsistent. However, there's general agreement that non-listed firms operate differently from listed ones due to their limited access to financing options and higher agency costs, among other factors.

Private firms usually face increased agency costs due to higher information asymmetry. These firms also tend to avoid equity issuance due to potential dilution of ownership stakes. Moreover, private firms often deal overhang problem and asset substitution problem. The debt overhang problem refers to the issue where highly leveraged firms cannot pursue investment opportunities due to an inability to secure additional financing. The asset substitution problem concerns the possibility of a firm changing its investments and risk profile after obtaining external financing. Private firms, due to their greater flexibility in investment choice, are more affected by these issues.

Generally, non-listed firms are smaller than listed ones, and thus have unique characteristics and challenges. For instance, they tend to have lower tangibility, a higher proportion of current liabilities to total assets, rely heavily on external short-term resources, finance their assets through retained earnings, and bear a higher risk of default.

Given these differences, it is expected that significant disparities will be found in the capital structure of public and private firms and their determinants in the forthcoming research.

METHODOLOGY

This chapter outlines the initial steps of my research, which involves the creation of two distinct samples comprised of Italian public and private firms. For these two samples, I have gathered, cleaned, and analyzed relevant data, before conducting a regression analysis to identify existing correlations with firms' leverage, allowing to determine determinants of a firm's capital structure.

The process begins with the creation of the samples, after which I will identify factors that serve as dependent variables in the analysis and formulate hypotheses regarding their relationships with the firms' capital structures. Following this, I will clarify the selected proxies

used to measure these variables and the proxies used to gauge the independent variables. Subsequently, I will carry out a statistical analysis of the data and categorize it by industry and geographical location. These steps are crucial in facilitating the regressions which will be detailed in Chapter 4.

DATA COLLECTION AND SAMPLES CREATION

The samples were created using data from the Aida Bureau Van Dick database, supplemented with information from Refinitiv Eikon where needed for consistency.

Initially, a sample of 407 public firms was gathered and then filtered to include only active, non-financial firms with available data from 2018-2022 (and some from 2015-2017 needed for calculating growth rate or variances), which resulted in a final public sample of 274 firms.

For non-listed firms, despite a larger pool of around 4 million entities in the Aida database, filters were applied to ensure comparability with the public firm sample, which involved excluding small enterprises (minimum of 50 employees), and filtering for active non-financial firms with data available for the years 2018-2022. This process yielded a final sample of 488 firms.

CHOSEN INDEPENDENT VARIABLES AND HYPOTHESES FORMULATION

The present chapter formulates hypotheses about the relationship between various independent variables and a company's capital structure, drawing from logical reasoning and existing research. These hypotheses will be tested and confirmed or denied through regression analysis. The main determinants under consideration, based on past studies, are age, profitability, size, income variance, growth, tangibility, effective tax rate, and non-debt tax shields.

- *AGE and Capital Structure:* The relationship between a company's age and its capital structure is complex and debated among economists. On one hand, older firms with a

longer history and established reputation are perceived as less risky by creditors, making it easier for them to obtain debt financing, thus they tend to have higher debt capacity and lower costs of debt. Older firms may also exercise more prudence, reducing agency costs and giving assurance to creditors. However, some argue that older firms are more profitable and have access to greater internal resources, which could reduce their reliance on debt. Overall, my paper will assume a positive relationship between age and leverage.

- *PROFITABILITY and Capital Structure:* Economists disagree on the relationship between a company's profitability and its capital structure. The pecking order theory suggests that more profitable firms rely less on external financing and, therefore, have less debt. However, the signaling framework proposes that profitable firms use debt as a signal of their ability to repay, leading to higher leverage. The trade-off theory predicts a positive relationship between debt and profitability, as debt provides tax shields. Furthermore, the relationship may differ between listed and unlisted firms due to agency issues and financing options. For my paper, I will assume that profitability is negatively related to leverage.
- *SIZE and Debt Levels:* Literature suggests a positive correlation between a company's size and its debt levels due to various reasons. Large corporations benefit from greater asset diversification, stable assets, and lower bankruptcy risk, leading to lower default probabilities. They also enjoy economies of scale and can provide more collateral, making it easier to issue debt. Larger firms typically have a longer history and stronger reputation, reducing moral hazard problems related to debt and resulting in more favorable lending terms. However, some studies propose an inverse relationship, suggesting that larger firms may rely more on equity than debt due to reduced information asymmetries which reduce the probability of equity issues being

undervalued. Despite contrary theories, the prevailing view is that there is a positive relationship between company size and leverage.

- *INCOME VARIANCE / EARNINGS VOLATILITY:* Income variance is used as a proxy for default risk in the analysis. The Trade-Off theory suggests a negative relationship between income variance and leverage, as lower income variance reduces the probability of default and lowers the costs associated with debt issuance. However, the Pecking Order theory proposes a positive relationship, assuming that volatile cash flows may lead companies to seek external funding periodically. The agency costs of debt may also be higher in private firms, impacting their borrowing decisions. At this preliminary stage, the negative relationship theory is favored due to broader support among economists.
- *GROWTH:* Growth is measured as historical growth, and economists views differ on the relationship between growth and leverage. The negative view suggests that firms with high growth opportunities prefer to avoid debt to preserve debt capacity for future growth. This negative correlation may also be stronger for listed firms due to the higher range of financing options available. On the other hand, some argue that firms with growth opportunities may have higher leverage to accommodate their expansion. Overall, our paper assumes a negative relationship between growth and leverage.
- *TANGIBILITY:* Tangibility refers to the amount of fixed assets a company possesses. The Trade-Off theory predicts a positive relationship between leverage and tangibility, as tangible assets lower bankruptcy and distress costs and provide collateral for securing debt. However, the relationship may be different for private firms due to information asymmetries and the importance of tangible assets in securing debt. Some view tangibility as inversely related to liquidity, potentially leading to a positive

relationship between tangibility and leverage. Despite these differences, the prevailing hypothesis is that tangibility and leverage are positively related.

- *EFFECTIVE TAX RATE:* The effective tax rate, computed as the tax paid divided by earnings before taxes, is an important incentive for companies to choose debt financing over equity. The Trade-Off theory suggests a positive relationship between the effective tax rate and leverage because higher tax rates make debt more attractive due to the tax shield benefit. The statutory corporate tax rate is not a factor, as it is the effective tax rate that influences the borrowing decisions. Therefore, the hypothesis is that the effective tax rate is positively related to leverage.
- *NON-DEBT TAX SHIELDS*: Non-debt tax shields, like depreciation and investment tax credits, can substitute the tax benefits of debt. Companies with significant non-debt tax shields tend to have lower leverage. However, highly profitable firms may utilize both interest and non-debt tax shields, challenging the negative relationship. A profit exhaustion point may exist where both types of tax shields complement each other. Publicly traded firms show a stronger negative correlation due to easier access to equity funding. Barclay and Smith found a positive correlation between tangibility and leverage, impacting the relationship between non-debt tax shields and leverage. Overall, most studies support a negative link between non-debt tax shields and leverage.

CHOSEN PROXIES TO MEASURE LEVERAGE

The previous studies focusing on determinants of capital structure have used different ratios to indicate “capital structure”. The present paragraph details and explains the choice I’ve employed in my study.

The most used ratios are as follows:

- Net financial position divided by total assets (NFP/A), calculated as the ratio between total financial liabilities (minus cash and cash equivalents) and total assets.
- Net financial position divided by total equity (NFP/E), calculated as financial liabilities net of cash divided by Shareholders' funds.
- Total financial liabilities divided by total assets (FL/TA), whose numerator comprises all financial debt, including debt due to bank and debt due to other lenders.
- Total liabilities divided by total assets (TL/TA)
- Lastly, many databases provide some leverage ratios that don't require additional computations. In our case, Aida already calculated the Debt equity ratio (D/E), which they obtained by dividing Total Debt due to banks by total Shareholders' Funds.

Rajan and Zingales (1995) found that different debt measures produce varied results, so the choice of measure depends on the analysis objective. Since the analysis aims to identify instances of debt issuance instead of equity, using "Total liabilities divided by total assets" as a leverage measure could be inappropriate. To the determine the most appropriate variable, regressions were conducted using all variables and only two of them were selected to draw conclusions, while results from the remaining three will be presented in the appendix.

CHOSEN PROXIES FOR THE INDEPENDENT VARIABLES

Regarding the chosen measurements for the independent variables:

- Age is calculated as the number of years between the incorporation date and the current date, specifically as of June 1st, 2023.
- Profitability is measured as the return on assets (ROA), which is obtained by dividing operating income by average assets balance.
- Tangibility is measured by dividing the total tangible fixed assets by the total assets.

- Non debt tax shields are measured by dividing the depreciation amount by total assets. Although depreciation is clearly not the only type of non-debt tax shield, it is assumed as a good proxy for it in this study. The remainder of non-debt tax shields is still accounted for in this study through the effective tax rate variable.
- Growth is measured as the percentage change in total assets from one year to the previous one. As such, growth is to be interpreted as historical growth.
- Effective tax rate is calculated as the ratio between income tax expense and pre-tax net income.
- Size is measured as the natural logarithm of total assets.
- Income variance/Earnings volatility is measured as the standard deviation of the return on assets over the previous 5 years.

MODEL DESCRIPTION

The data analysis and testing procedures were conducted using STATA. Excel was also utilized for sample collection, data cleaning, variable measurement, and certain aspects of descriptive analysis. During the research phase, multiple multivariate regressions were performed for each sample, with a distinct dependent variable in each regression. In this paragraph, I will outline the statistical model utilized and provide a brief overview of its underlying theoretical principles.

Data can be classified into two main types: cross-sectional and time series. Cross-sectional data captures information from different entities or individuals at a specific moment in time. On the other hand, time series data involves collecting observations or measurements continuously (daily, monthly, yearly) over a specific subject for a specific time period. However, there exists a third category known as panel data (also referred to as "longitudinal data"). Panel data combines elements of both time series and cross-sectional data, as it includes observations on

multiple entities over multiple time periods. In my analysis, the data falls into the panel data category, as I will analyze observations regarding multiple firms (274 for the public sample and 488 for the private sample) over multiple time periods (5 years).

Panel data requires the application of a specific analysis methodology commonly referred to as "panel data analysis". The main advantage of panel data regressions compared to "between-group cross sectional regression" (which consists in a simple average of the variables' values throughout the years) lies in capturing dynamic relationships through time and providing more efficient and reliable estimates by exploiting the variation between and across entities. In other words, panel data analysis isolates any time-dependent information and individual-specific effects, making the coefficients associated to the variables more powerful and reliable. The simplest form of panel data regression is Pooled OLS: it is a simple Ordinary Least Squares Model that's performed on panel data. Pooled OLS treats all data points as if they come from a single cross-sectional dataset and does not account for the panel structure. As such, the model can be described with the following equation:

$$Yit = \alpha + \beta 1itX1it + \beta 2X2i + \ldots + \beta itkXitk + \varepsilon it$$

Where Y is the dependent variable and it is equal to the sum of a constant (α) and the explanatory variables (Xik), weighted by their coefficients (βik). vit is the composite error term and it captures all unobserved factors. The OLS-estimated coefficients are those that minimize the sum of squared errors.

Its main advantages are its simplicity and its efficiency. Moreover, Pooled OLS regressions are based on four key assumptions, which are necessary for the model validity: linearity (the dependent variable should be a linear function of the independent variables and the error term), exogeneity (errors have expected value equal to zero and they're uncorrelated to the

regressors), homoskedasticity and non-autocorrelation (errors have constant variance and are uncorrelated among each other), non-multicollinearity (there is no linear relationship among independent variables).

The main shortcoming of Pooled OLS is that it assumes there are no individual or time-specific effects. This is rare in panel data, where single observations may have unique characteristics that don't change over time but affect the dependent variable. Such ignored effects are incorporated into the error terms, which often results not being white noise. Moreover, there often is cross-sectional dependence among observation, which is not considered by Pooled OLS. For this reason, it is often the case that the most appropriate regressions for Panel Data are those that account for panel data effects. For this purpose, two regression types exist, specifically:

- Fixed-effects model: In this model, each entity has its own individual, time-invariant effect, which is correlated to the independent variable and as such there is an individual-specific intercept in the model, which the model accounts for. Precisely, the fixed effects model's equation is:

  $$Yit = \alpha_i + \beta 1itX1it + \beta 2X2i + \ldots + \beta itkXitk + uit$$

  Where, differently from the Pooled OLS model, α_i is the time-invariant individual effect and uit is the error term.
- Random effects model: In this model, each entity has its own individual effect, which, differently from the previous model, is assumed to be a random variable which is not correlated to the independent variable. Specifically, the random effects model's equation is:

  $$Yit = \alpha_i + \beta 1itX1it + \beta 2X2i + \cdots + \beta itkXitk + (vi + uit)$$

Where, differently from the Pooled OLS model and the Fixed Effects model, the error term incorporates the specific individual effects which differs from each firm (vi)

The present paper aims to identify the most suitable panel data analysis methodology for our dataset, out of the three. The first step is to execute a Pooled OLS regression, from which data about its estimated coefficients and error terms will be recorded. I will then assess these results to ensure the assumptions of the OLS model are met. If any of these assumptions prove to be false, this would invalidate the use of the Pooled OLS method. Under such circumstances, resorting to analyzing the data via the Panel data effects model could be necessary. This will be further tested through the Breusch Pagan Lagrange multiplier test, whose purpose is to test whether panel data effects are present in the model. The null hypothesis of such test is that the variance of the entity-specific error terms is zero, and if it is rejected, the Pooled OLS model would not be the most suitable for the analysis. After establishing the presence of panel data effects, the next critical step is to ascertain whether the Fixed Effects or the Random Effects model is more suitable for our data. This determination will be made using the Hausman test, which operates under the null hypothesis that the Random Effects model is more appropriate. However, if this null hypothesis is rejected, it indicates that the Fixed Effects model is the better fit for our data. Once these tests have been carried out, I will perform the regression analysis using the chosen method. The results of this analysis will then be thoroughly examined and interpreted, with the aim of addressing our research question.

DESCRIPTIVE ANALYSIS

In the present paragraph, the data from the two samples will be described and analyzed in depth. Firstly, the paragraph provides a description of the basic statistical features of the data and the variables. The tables in Appendix 5 and 6 provide a summary of the variables in the two samples (public and private), detailing the number of observations, the mean, standard

deviation, and the range of values, encapsulating the minimum and maximum figures. As previously noted, all potential dependent variables are currently displayed, as the final selection of the two most appropriate dependent variables has not yet been made, and three of them will not be included in our final analysis. A notable observation from the table is the balanced nature of the samples: all variables exhibit an equal number of observations and no data is missing.

Examining the dependent variables, the presence of outliers is evident. In fact, in the public sample, there's a large gap between the minimum and maximum values for both the debt-to-equity ratio and the net financial position to total equity. Additionally, the large standard deviations for these variables suggest the influence of extreme observations within the dataset. Similar to the public sample, in the private sample the debt to equity ratio exhibits a considerably high mean compared to the other indicators. This could be attributed to potential computational errors stemming from incomplete information in the Aida database. The standard deviations for the debt-to-equity and the net financial position to total equity ratios are once again exceptionally high.

Turning the attention to the independent variables, several noteworthy points emerge. High standard deviations, as well as substantial gaps between maximum and minimum values, are observed for age, growth, effective tax rate and size, whose mean appears relatively larger compared to the remaining variables. In the private sample, certain concerns arise due to the elevated standard deviations of earnings volatility, size and age, particularly when compared to the rest of the variables. These high standard deviations, coupled with considerable gaps between maximum and minimum values, could potentially be driving their high mean values. Therefore, it's plausible to conclude that some extreme values exist within these data.

These extreme and anomalous values are statistically known as "outliers". Outliers are data points that significantly stray from the mean of a particular variable or population, and can

distort predictions, as pointed out by Osborne and Overbay (2004), who noted that outliers can increase error variance, reduce normality, and result in biased estimates. For this reason, in my research, I have chosen to eliminate those observations that represented an outlier for all five years in exam, with the help of box plots shown in appendix.

OUTLIERS CORRECTION

Tables 1 and 2 present the same data as the ones in appendix, but after the removal of observations which significantly deviated from the mean.

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
D/E	1290	.573	0.579	0	2.96
TL/TA	1290	.545	.187	.119	.894
NFP/E	1290	.326	.531	-.541	2.232
NFP/A	1290	.095	.156	-.273	.419
FL/TA	1290	.369	.162	.048	.758
Age	1290	25.112	14.958	5	71
Size	1290	11.445	1.653	8.472	15.546
Profitability	1290	.042	.055	-.1189	.1706
Tangibility	1290	.096	.107	.002	.443
Growth	1290	.141	.205	-.165	.957
Effective tax rate	1290	.136	.198	-.555	.711
Non debt tax shield	1290	.025	.023	.001	.108
Income variance	1290	.034	.026	.002	.119

Table 1: summary statistics of the public sample

As anticipated, after the cleaning phase, in the public sample we notice a substantial decrease in the debt-to-equity ratio (around 24 percentage points) and the net financial position to total equity ratio (around 18 percentage points). This is concurrent with a decrease in their standard deviation and a narrowing gap between their minimum and maximum values. The other dependent variables have either slightly decreased or slightly increased in mean, but no significant change has been detected.

Additionally, there are considerable reductions in the means of age, growth, and effective tax rate, along with their standard deviations. We also observe that, while the standard deviation of the variable size has substantially decreased, its mean has remained almost unchanged. This suggests that outliers were present on both sides of the mean. The other independent variables have experienced either a minor increase or a minor decrease in their mean.

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
D/E	2195	.526	.793	0	4.1
TL/TA	2195	.655	.186	.244	.957
NFP/E	2195	.225	.788	-1.36	3.43
NFP/A	2195	.036	.164	-.328	.421
FL/TA	2195	.321	.165	.059	.717
Age	2195	30.803	16.046	7	72
Size	2195	10.425	1.081	8.066	12.787
Profitability	2195	.052	.058	-.087	.217
Tangibility	2195	.195	.181	.002	.682
Growth	2195	.078	.134	-.182	.505
Effective tax rate	2195	.229	.179	0	.846
Non debt tax shield	2195	.034	.023	.003	.111
Income variance	2195	.767	1.463	.018	6.544

Table 2: summary statistics of the private sample

As anticipated, for the private sample too we observed a significant drop in the mean and standard deviation of both the debt to Equity ratio and the net financial position to total equity ratio. The means of the remaining dependent variables remained fairly stable, while their standard deviations experienced a slight decrease.

As for the independent variables, there was a notable change in the standard deviations of earnings volatility and age, which also influenced their means. Surprisingly, the mean and standard deviation of size weren't impacted to the same extent. Moreover, the standard deviation of profitability nearly halved and that of effective tax rate fell by 30 percentage

points, resulting in significant shifts in their means. The remaining variables did not experience substantial changes.

Following this initial reprocessing of the samples, some key distinctions between the summary statistics of public and private companies can now be highlighted. Precisely, the means of the debt-to-equity ratio and financial liabilities to total assets ratio are comparable in both samples. However, the standard deviation of these indicators is greater in the unlisted sample, suggesting a higher variability among observations. The mean of the total liabilities to total assets ratio in the private sample is nearly double that of the public sample. Yet, both the mean of the net financial position to total assets ratio and of the financial liabilities to total assets ratio are higher for public companies. Part of this discrepancy might be due to a prevalence of operating liabilities (which constitute a part of total liabilities but not of net financial position) in private firms due to their lower bargaining power.

Concerning independent variables, private firms in our sample possess a greater average age than public firms by about 5 years, and a higher standard deviation is observed. The average size of public companies in the sample surpasses that of private companies. Instead, when it comes to tangibility, private firms have nearly twice the average value compared to their public counterparts. Private companies show a marginally higher average profitability than public firms, although this difference may be specific to the samples and not extend to all Italian firms. On the other hand, public firms show a higher average growth, suggesting they have been expanding their balance sheets more over the years under scrutiny. Interestingly, public firms are subject to a lower average effective tax rate than unlisted firms. They also take advantage of lower average debt tax shields. This pattern could be attributed to the prevalent use of corporate tax strategies among public firms as suggested by Johansson, Skeie, and others in

2017. As for earnings volatility, it is doubled in private firms when compared to public firms. This finding aligns with expectations as public firms could prioritize maintaining stable profits.

Industry composition

As previously noted, my thesis will not focus on sector-specific factors but will instead explore if there are certain elements that influence the relationship between specific variables and leverage for Italian companies (belonging to all sectors). Nonetheless, analyzing what industries are represented in the samples might lead to interesting results. For this reason, this paragraph shows the classification based on the Global Industry Classification Standard (GICS), which splits firms into 8 sectors: materials, healthcare, industrials, information technology, consumer, communication services, real estate, and utilities.

Appendix 7 provides an overview of the sectorial composition within the public sample. Evidently, the consumer sector is the most prominent, accounting for 29% of the total, followed by the industrials sector at 24%. Real estate, energy, materials, and healthcare have the lowest representation, in line with these sectors' characteristics in Italy. Other sectors like information technology and communication services account for approximately 10% each.

Appendix 8 delineates the sector distribution within the private sample. The consumer sector dominates with 44%, followed by the industrials sector with 20%. Real estate, energy, communication services, and utilities are less represented, each making up less than 2% of the sample. Healthcare, materials, and information technology show a solid presence, at 6%, 10%, and 11% respectively.

Upon comparison, there are notable distinctions between the two samples. Firstly, the consumer sector displays a significantly higher presence in the non-listed sample (44% versus 29%), while the industrial sector demonstrates an equivalent representation in both. In contrast, communication services account for 10% of the listed sample, but merely 2% of the non-listed

sample. Conversely, the materials sector constitutes 10% of the non-listed sample, compared to 6% of the listed one. Despite these disparities, the overall sector compositions between the two samples are not drastically dissimilar. Therefore, it is plausible to conjecture that only a minimal portion of the differences we will observe between the two samples' capital structure determinants can be attributed to variances in sector composition, under the presumption that the sector does exert influence on capital structure determinants, which is, however, a point of dissent among economists (see Chapter 1).

Geographic location

Regarding geographical distribution of firms within the country, when categorized into North and South, our samples manifest as indicated in Appendix 9.

Firms located in the North account for 81% of the public sample and 88% of the private sample, while firms from the South comprise 19% of the public sample and 12% of the private sample. Predominantly, the sample leans more towards representing the Northern environment. This faithfully portrays the Italian environment, where the number of large firms in the North vastly outnumbers those in the South. Additionally, it's interesting to note that the geographic disparity persists consistently across both samples. This implies that any variation in our results will not be skewed by differences in the geographic composition of the two samples.

REGRESSION ANALYSIS AND RESULTS

Following the initial descriptive section, my paper will proceed with executing regressions and analyzing the corresponding results. This chapter is be divided into three parts: the first focuses on the public sample, while the second centers on the private sample. Both sections maintain the same format and cover identical topics. Initially, the data will be subjected to tests to identify the most suitable regression methodology for its analysis. Subsequently, the

regressions will be conducted, and the results will be scrutinized to address the research question. The third part compares the results of the two samples.

REGRESSION ANALYSIS AND RESULTS INTERPRETATION: PUBLIC COMPANIES

Before proceeding with the requisite regressions, it's essential to test the data. The present chapter will lay out all necessary test results, and subsequently, will present the outcomes of the appropriate regressions.

CORRELATION ANALYSIS

Correlation analysis is beneficial for investigating the relationship among all variables that will be utilized in subsequent regression analyses. Appendix 10 presents the correlation matrix, offering insights into the correlation coefficients of the variables under scrutiny.

Including variables that exhibit excessive correlation might influence the outcome of the regression analysis. However, as can be seen in Table 8, this doesn't seem to be a problem for the present study as the correlations between variables are generally low. The only exceptions might be the faint correlation between variables Age and Size and the correlation between variables Non-debt tax shields and Tangibility. The latter is expected, as non-debt tax shields are calculated as depreciation/total assets, and depreciation directly depends on the quantity of fixed assets. Predictably, moreover, there's a noticeable positive correlation amongst the dependent variables. This is expected, as they all collectively indicate a firm's level of indebtedness. Nonetheless, it won't pose any problem since they will not be included in the same regression analysis.

OLS REGRESSION

As previously outlined in the "model description" paragraph (see Chapter 3), in my research I am employing panel data. This makes it relevant to determine the right regression model.

Initially, I will proceed with an Pooled Ordinary Least Squares (OLS) regression, whose results will be stored and collected in Appendix 11. This will be followed by a sequence of statistical tests to verify whether the assumptions for the OLS regression hold true. Subsequently, I will test the presence of panel data effects to discern if either fixed effects or random effects analysis offer a more accurate portrayal of the results.

In this study, I conducted five Pooled OLS regressions, each focusing on a different dependent variable. Among these variables, I found that Net Financial Position to Total Equity and Financial Liabilities to Total Assets yielded the most insightful data. This decision was based on logical reasoning, explanatory power and number of significant coefficients of the different regressions. The chosen indicators, NFP/Total Equity and Financial Liabilities to Total Assets, offer comprehensive representations of financial debt, taking all forms of financial debt into account and excluding non-financial debt. Furthermore, the two regressions differ in how they include cash: NFP/Total Equity includes it, leading to a lower ratio for firms with larger cash holdings, while Financial Liabilities to Total Assets does not consider cash. As such, this approach helps prevent liquidity considerations from influencing our research results. We selected these two indicators because they provided a higher level of information, indicated by a higher R2 value, and displayed the greatest number of significant values. These choices remained consistent across both samples, ensuring the reliability and robustness of our subsequent analysis. In the present chapter, I will therefore only focus on these two ratios as dependent variables. However, due to their lack of substantive insights or logical coherence, results from the other 5 regressions will not be discussed further in my dissertation. Results from all five regressions can be found in appendix 12.

TESTING OLS ASSUMPTIONS

The validity of the Pooled OLS model was evaluated to determine if it's an appropriate method for analyzing the samples and deriving results. This paragraph serves as a summary of these results, which are elaborated in Appendix 13. Specifically, the Pooled OLS model for the variables NFP/Equity and Financial Liabilities/Total assets complied with the conditions of linearity, normality, and multicollinearity. However, the model failed to meet the homoscedasticity assumption, indicating that the Pooled OLS method isn't suitable for the data under consideration, and alternative regression methods will need to be explored.

TESTING FOR PANEL DATA EFFECTS

Given that neither dependent variable satisfies the homoscedasticity assumption, it is necessary to investigate potential panel data effects to determine if a fixed effects or random effects model better fits our data. It's important to acknowledge that one ratio might be better suited to a random effects model while the other may fit a fixed effects model more effectively. If this is the case, I will proceed with two distinct regression types, as the ultimate objective is to achieve the most accurate results regardless of the regression type that was utilized.

Lagrange multiplier test

The Breusch-Pagan Lagrange Multiplier (LM) test is used to detect spatial dependence or correlation in panel data models, indicating whether panel effects are present in the data. The null hypothesis of this test suggests that there are no significant differences over time within the same units and no spatial correlation, meaning that Pooled Ordinary Least Squares (OLS) regression could be suitable. However, if spatial correlation exists, the OLS method could lead to biased and inefficient estimates. Hence, if the null hypothesis is rejected, other regression methods may be more appropriate. The p-values of both tests (shown in Appendix 14) in this

case are 0, which leads me to reject the null hypothesis that Pooled OLS is sufficient for interpreting the data. Therefore, it's necessary to use panel data regressions for this analysis.

Hausman test

The Hausman test is a statistical method used in panel data analysis to determine whether a fixed effects (FE) or random effects (RE) model is more suitable. The FE model accounts for time-invariant individual-specific effects, whereas the RE model assumes these effects aren't correlated with the observed independent variables. The Hausman test compares the estimated coefficients from the FE and RE models to evaluate if individual-specific effects significantly improve the model's fit. If the test favors the FE model, this suggests these effects correlate with the independent variables and should be included in the analysis, making the fixed effects regression more accurate. If the RE model is preferred, the individual-specific effects do not correlate and can be excluded.

In this case, the Hausman test results in Appendix 15 indicate that the fixed effects model is more appropriate than the random effects one. Therefore, the subsequent analysis in the paper will be based on the fixed effects model, while the findings from the random effects analysis can be found in the Appendix.

REGRESSION RESULTS AND ANALYSIS

This paragraph will present the outcomes of the Fixed Effects regression. As established in the previous section, this regression model is considered to be the most suitable for our dataset. Moreover, the presence of heteroscedasticity in the previous regression prompts me to use robust standard errors. I will interpret and analyze these results to identify the factors influencing the capital structure of Italian public companies. The findings will be compared against initial hypotheses, and an explanation will be provided for both similarities and differences to what initially hypothesized.

Tables 3 and 4 show that for the two regression models R2 stands at 36.6% and 26.5%. These percentages represent the proportion of the total variance that the models can explain. As previously discussed in earlier sections, these R-squared values are suitable for our particular type of regression analysis. This is due to the inherent complexities of such models, where it's challenging to encapsulate the entire variability with a single model. Furthermore, the F-test values of 32.24 and 19.83, with accompanying p-values of 0.000 in both instances, enable to reject the null hypothesis that all coefficients are equal to zero. This suggests that the variables in our model significantly contribute to explaining the variance in the dependent variable.

NFP/E	**Coef.**	**Robust St.Err.**	**t-value**	**p-value**	**Sign.**
Age	.060	.19	0.31	.758	
Size	-.28	.095	-2.96	.003	***
Profitability	-.63	.221	-2.81	.005	***
Tangibility	2.913	.511	5.69	0	***
Growth	.034	.07	0.47	.641	
Effective tax rate	.031	.016	1.85	.031	**
Non-debt tax shields	-.322	1.378	-0.23	.815	
Income variance	-1.013	0.191	-5.3	0	**
Constant	1.497	.907	1.65	.045	**
R-squared	0.366	F-test		32.24	
*** p<.01, ** p<.05, * p<.1		Prob > F		0.000	

Table 3: Fixed effects regression results for the NFP/E regression, public sample

FL/TA	**Coef.**	**Robust St.Err.**	**t-value**	**p-value**	**Sign.**
Age	.012	.004	2.87	.002	***
Size	-.043	.019	-2.33	.020	**
Profitability	-.154	.074	-2.2	.026	**
Tangibility	.405	.119	3.41	.001	***
Growth	.054	.095	0.57	.568	
Effective tax rate	.009	.026	0.35	.728	

Non-debt tax shields	-.622	.928	0.67	.254	
Income variance	-.185	.098	-1.89	.058	**
Constant	.939	.237	3.97	0	***
R-squared	0.265		F-test	19.83	
*** p<.01, ** p<.05, * p<.1			Prob > F	0.000	

Table 4: Fixed effects regression results for the FL/TA regression, public sample

Having established that the two regressions account for a significant portion of the total variability, it is now possible to interpret the results. This will allow to determine the key factors influencing the capital structure of public companies in Italy. Overall, I find that the significant variables are: Age, Size, Profitability, Tangibility, Effective tax rate and Income Variance. I'll scrutinize each variable individually, comparing our results with the hypotheses initially set forth.

AGE: The "age" variable in both regression models shows a positive association with the dependent variable, with coefficients of 6% and 1.2%. This implies that for each additional year a company ages, its leverage increases by 1.2 and 6 percentage points. While not substantially large, these percentages suggest that more mature companies tend to have slightly higher leverage. However, it is important to note that the statistical significance of this positive correlation is confirmed at a 1% level in only one of the two regression models, with the other model showing no significant correlation.

These findings support our initial hypothesis, which proposed a positive relationship between a company's age and its leverage. It validates the belief that mature firms, due to their established track record and stronger creditor relationships, are likely to access debt under more favorable terms. However, this positive correlation contradicts the pecking order theory, which is based on the assumption that more mature firms are also more profitable. Since the correlation matrix reveals a negligible negative correlation between a firm's age and its profitability within our data sample, the pecking order theory might not apply in this case.

SIZE: In both models, the variable "size" emerges as a significant factor, at the 5% and 1% significance levels respectively. Interestingly, size exhibits a negative correlation with leverage levels. Specifically, in the NFP/E model, a unit increase in size corresponds to a 2.3% decrease in leverage, while in the FL/TA model, a unit increase leads to an 8.3% drop in leverage. Although this effect might seem extreme, it is important to remember that size is measured as natural logarithm of total Assets. Thus, a unit increase corresponds to total Assets increasing by e times. This result contradicts our initial hypothesis, which postulated that bigger firms, due to their lower default risks and greater asset diversification, should display higher leverage. However, certain previous studies, such as Titman and Wessels, found that listed companies can gain a sort of size premium when issuing equity. This suggests that the observed negative relationship could be a consequence of firms favoring equity over debt to avoid the potential undervaluation of their equity issues.

PROFITABILITY: In both models, the "profitability" variable is statistically significant at a 5% level, presenting negative coefficients of -63% and -15.4%. This aligns with our initial prediction and indicates that firms with higher profitability tend to utilize less leverage. Such findings, indeed, support the pecking order theory, which postulates that firms with higher profitability often have increased retained earnings. These firms tend to use these earnings to finance their investments instead of relying on debt, suggesting the pecking order theory correctly describes the conduct of firms within the Italian business landscape when it comes to the relationship between leverage and profitability. However, this is in stark contrast to the trade-off theory, which posits that more profitable firms will leverage more debt to maximize tax benefits. Furthermore, the findings align with most recent studies on the matter, as it's quite uncommon to empirically identify a negative correlation between profitability and debt.

GROWTH: The "growth" variable demonstrates a positive correlation with leverage, which is contrary to our initial hypothesis. However, this relationship is statistically insignificant, implying that growth may not play a crucial role when firms deliberate capital structure decisions. This is in stark contrast to various capital structure theories referenced earlier.

As discussed when formulating hypotheses, the impact of growth on capital structure decisions remains a contentious issue among economists. Some suggest a positive correlation, while others advocate for a negative one. This disagreement could indicate that different firms weigh the impacts of growth differently when making decisions, resulting in growth becoming an inconsequential component when viewed in an aggregate context. Nevertheless, it could hold significance at the level of individual firms.

TANGIBILITY: In terms of statistical significance, tangibility stands out as the most consequential factor in the entire model. Indeed, in both models, the coefficients are significantly different from zero at a level below 1%. These coefficients suggest a positive correlation between tangibility and leverage. According to the first model, a 1% rise in the proportion of tangible assets could lead to an increase in leverage by 2.9 percentage points. The second model implies that a similar 1% surge results in a 0.4% growth in leverage. In essence, this suggests that tangibility is a critical determinant of a firm's propensity to opt for debt financing. This result aligns with our initial hypothesis. Both the pecking order theory and the trade-off theory, as well as most capital structure theories, affirm that a firm with a larger proportion of tangible assets will encounter less information asymmetry, lower default risk, and a greater capacity to provide collateral to its creditors. This, in turn, reduces the cost of debt.

EFFECTIVE TAX RATE: The variable "effective tax rate" exhibits a positive correlation with a firm's leverage. This relationship is statistically significant at a 5% confidence level in

the first model, but not in the second. The coefficients of 3.1% and 0.9%, respectively, suggest that this relationship, while present, is relatively small. However, the positive sign aligns with our initial hypotheses, indicating that a rise in the tax rate is associated with an increase in debt. As per the trade-off theory, companies can take advantage of greater tax shields. Consequently, the larger the tax shield, the more beneficial debt financing becomes for a company. This is also in line with the pecking order theory, which posits that a higher tax rate (that decreases a company's profitability) makes debt financing more attractive.

NON-DEBT TAX SHIELDS: The variable "non-debt tax shields" shows a negative correlation with a firm's leverage, aligning with our initial hypothesis. This expectation stemmed from the notion that a firm already benefiting from substantial tax shields derived from non-debt components might not find debt as an attractive source of tax shielding, particularly if the firm isn't highly profitable and thus reaches its profit exhaustion point quickly. However, this coefficient isn't statistically significant at a 1%, 5%, or 10% confidence level in either model. Consequently, the principal inference here is that non-debt tax shields don't significantly impact capital structure decisions. To put it another way, firms that already take advantage of tax shields resulting from depreciation neither decrease nor increase their dependency on debt.

EARNINGS VOLATILITY: The variable "earnings volatility" exhibits a significant deviation from zero in both models at a 5% confidence level. Both models demonstrate a negative correlation, with coefficients of -0.185 and -1.083 respectively. This indicates that earnings volatility greatly influences capital structure decisions, as it logically serves as a crucial factor under consideration. Earnings volatility effectively proxies for risk and likelihood of default, and according to the trade-off theory, higher volatility should correlate with lower leverage, a trend reflected in our regression results. Contrarily, these findings do not align with

the pecking order theory, which would suggest that higher earnings variability does not automatically mean that companies always resort to internal financing for their investments. Furthermore, earnings volatility is a common variable in much of the previous research, and the results are often in line with our findings.

REGRESSION ANALYSIS AND RESULTS INTERPRETATION: PRIVATE COMPANIES

The present chapter follows the same structure as the previous one, encompassing all necessary statistical tests to obtain significant regression outcomes, which will then be commented and analyzed. Since the theoretical basis was already explained in the previous paragraph, and to avoid redundant information, this chapter will solely present the test results and provide a commentary on them.

CORRELATION ANALYSIS

The table in Appendix 17 displays the correlation matrix, providing a view of the correlation coefficients for the variables in exam.

As can be seen in Table 24, the correlations between variables are generally low. The only exceptions might be the faint correlation between variables Age and Tangibility and the correlation between variables Earnings Volatility and Profitability. As already explored, there's a noticeable positive correlation amongst the dependent variables, which is expected. This won't pose any problem since they will not be included in the same regression analysis.

OLS REGRESSION

We conducted 5 Pooled OLS regressions, shown in Appendix 18, each using one of the five dependent variables under consideration. From these results, I found that Net Financial Position to Total Equity and Financial Liabilities to Total Assets offered the most valuable insights. The selection of these two indicators was based on logical reasoning and their ability to provide the

highest explanatory power with a significant number of coefficients. These indicators encompass all forms of financial debt, unlike Debt to Equity (which only includes bank debt) and exclude non-financial debt (unlike Total liabilities to Total assets). This differentiation is particularly important for private firms, which often obtain financing from external grants rather than bank debt. Additionally, these two indicators offer a higher level of information, as indicated by a higher R2, and a greater number of significant values, which remained consistent across both samples in the subsequent chapter.

TESTING ASSUMPTIONS

This paragraph provides a short overview of the findings, which are extensively detailed in the appendix. Specifically, our results validate that the Pooled OLS analysis meets the requirements of linearity, normality, and multicollinearity. However, the condition of homoscedasticity is not satisfied. Since a critical assumption of the model is not met, this undermines the entire model's validity, suggesting that it's essential to test for panel effects.

TESTING FOR PANEL DATA EFFECTS

Since the assumptions of homoscedasticity are not met for either of the independent variables, it becomes essential to examine the presence of panel data effects. This investigation will help determine whether a fixed effects or random effects model is more appropriate for our data. As already mentioned in the public sample analysis, it is worth noting that the data might indicate a random effects model as more suitable for one ratio and a fixed effects model for the other. In such a scenario, I will proceed with two separate regression models to ensure I obtain the best results in pursuit of our final objective.

Lagrange multiplier test

Tables in Appendix 21 report the test results of the Lagrange multiplier test, which indicate that the Pooled OLS method is not suitable and efficient for explaining the data under

examination. Consequently, it is necessary to conduct a regression that accounts for panel effects. In the subsequent paragraph, I will determine whether a fixed effects regression or a random effects regression is the most appropriate model.

Hausman test

The outcomes of the Hausman test (shown in Appendix 22) reveal that, for both ratios, the fixed effects regression is the most suitable for modeling the data and would yield the most accurate and efficient results. In both cases, indeed, the null hypothesis (i.e. the better fit of the random effects model) is rejected, solidifying the preference for the fixed effects regression. As such, in the subsequent section, I will present and discuss the results of the fixed effects regression. The results of the random effects regression will be included in Appendix 23.

REGRESSION RESULTS AND ANALYSIS

Below, the results of the fixed effects regressions are shown.

NFP/E	**Coef.**	**Robust St.Err.**	**t-value**	**p-value**	**Sign.**
Age	-.066	.025	-2.64	.004	***
Size	.187	.102	1.83	.068	*
Profitability	-2.04	.671	-5.04	0	***
Tangibility	.851	.36	2.37	.018	**
Growth	-.167	.118	-1.41	.158	
Effective tax rate	.054	.843	0.64	.521	
Non-debt tax shields	1.08	1.588	0.68	.496	
Earnings volatility	.064	.032	1.99	.048	**
Constant	.77	.934	0.82	.41	
R-squared	**0.289**		**F-test**	**9.737**	
**** p<.01, ** p<.05, * p<.1*			**Prob > F**	**0.000**	

Table 5: Fixed effects regression results for the NFP/E regression, private sample

FL/TA	Coef.	Robust St.Err.	t-value	p-value	Sign.
Age	-.011	.003	-3.66	0.00	***
Size	.116	.038	2.99	0.00	***
Profitability	-.818	.244	-3.34	0.00	***
Tangibility	.192	.067	2.86	.004	***
Growth	-.051	.022	-2.32	.021	**
Effective tax rate	.002	.017	0.12	.902	
Non-debt tax shields	-.007	.321	-0.02	.982	
Earnings volatility	.020	.01	-2.11	.033	**
Constant	-.529	.178	-2.97	.003	***
R-squared	**0.331**	**F-test**		**10.594**	
**** p<.01, ** p<.05, * p<.1*		**Prob > F**		**0.000**	

Table 6: Fixed effects regression results for the FL/TA regression, private sample

The R-squared values are .289 and .331 for the respective models, indicating that these percentages of the variance are explained by the two models. Both R-squared values are considered appropriate for the model in exam and suggest that such model has a reasonable explanatory power. The F- test values of 9.793 and 19.594, with Prob > F equal to zero, allow to reject the null hypothesis that all coefficients are equal to zero. Thus, overall, the variables in our model contribute to the explanation of the dependent variable.

It is therefore now possible to interpret the results. This will allow to determine the key factors influencing the capital structure of private companies in Italy. Overall, I find that the significant variables are Age, Size, Profitability, Tangibility, Growth and Income Variance. Below, we'll scrutinize each variable individually, comparing our results with the hypotheses initially set forth.

AGE: In both models, the relationship between age and leverage is statistically significant at a 1% confidence level, with coefficients of -6.6% and -1.1% respectively. This finding contradicts our initial hypothesis, which suggested a negative relationship due to enhanced

reputation and stronger creditor connections for older firms. As such, our finding may suggest that for non-listed firms, debt markets do not necessarily perceive older age as a strong indicator of reputation. Another potential explanation could be that older firms have more retained earnings, and prefer to use those to finance their investments, in line with the pecking order theory. Additionally, it could be attributed to the fact that older firms exhibit a more risk-averse behavior, opting for conservative financial management practices, leading them to prefer lower leverage ratios to protect their financial position, whilst younger firms are more prone towards risk and thus tend to be more levered.

GROWTH: Growth is only statistically significant, at a 1% confidence level, in the Net Financial Position to Equity model, where the coefficient for growth specifically -5.1%. This finding aligns with our initial hypothesis, indicating that higher-growth firms tend to have lower leverage, and it suggests that private high-growth Italian firms prefer to avoid taking on debt to maintain better capacity for future opportunities. In fact, they may be cautious about the risk of encountering a debt overhang problem, which could hinder their ability to secure additional financing in the future and force them to turn down positive NPV projects. Additionally, debt can limit their financial flexibility, reducing the funds available for reinvestment in future growth initiatives. This may lead higher-growth firms to lean towards avoiding debt. Furthermore, the negative relationship between growth and leverage could also indicate that high-growth firms face higher distress risk, resulting in increased distress and bankruptcy costs. As a consequence, they may find it challenging to negotiate favorable borrowing terms, leading them to avoid incurring debt.

PROFITABILITY: In both models, the relationship between profitability and leverage is highly significant, with coefficients of -2.04 and -0.82, respectively, at a 1% confidence level. This finding is aligned to our initial hypothesis, which was based on the pecking order theory,

positing that profitable firms rely more on internal financing (i.e., their internally generated cash flows and retained earnings) to support their growth and investment needs, leading them to have a reduced reliance on external financing such as debt. Profitable firms may prioritize maintaining flexibility to pursue future investment opportunities and avoid potential constraints associated with debt. However, our results contradict the trade-off theory, which suggests that more profitable firms would increase their leverage to take advantage of higher tax shields.

SIZE: Size is a statistically significant factor only in the Financial Liabilities to Total assets model, with a coefficient of 0.116. This positive relationship aligns with our initial hypothesis and finds support in various economic theories. It suggests that as private firms grow in size, they diversify their operations and gain the ability to provide more collateral, reducing the probability of default. This improved risk profile strengthens borrowing terms and makes debt more attractive, prompting firms to increase their leverage. Size, like age, may also be considered an indicator of reputation, which would again prompt creditors to lend on more favorable terms.

TANGIBILITY: Tangibility has a significant impact on capital structure in both models, with a 5% confidence level. The coefficients are 0.851 and 0.192, indicating a positive relationship. This finding supports our initial hypothesis, highlighting that firms with more tangible assets can offer greater collateral, allowing them to borrow more. Tangibility, indeed, emerges as a crucial factor influencing capital structure decisions, as it enables firms to issue secured debt, using tangible assets as collateral. Moreover, the reduced bankruptcy and distress costs associated with the maintenance of fair value reduces the bankruptcy costs and enhances the attractiveness of debt, in line with the trade-off theory.

NON-DEBT TAX SHIELDS: The relationship between leverage and non-debt tax shields appears positive in the first model, but slightly negative in the second, although neither

coefficient is statistically significant at a 5% confidence level. This contradiction suggests that non-debt tax shields may not play a significant role in firms' capital structure decisions. Contrary to our initial hypothesis, it appears that the presence of non-debt tax shields may not have a substantial impact on the amount of debt firms use for financing. These tax shields might not significantly influence firms' borrowing decisions, indicating that other factors may have a more dominant role in shaping their capital structure choices.

EFFECTIVE TAX RATE: The relationship between leverage and effective tax rate is positive for Italian private firms, in line with the trade-off theory and supported by extensive economic research. Tax shields, which result from interest payments being tax-deductible, are often considered a significant attraction of leverage according to various economic theories, including Modigliani Miller and the Trade-off theory. However, surprisingly, our analysis shows that this relationship is statistically insignificant in both Net Financial Position to Equity and Financial Liabilities to Total Asset models. While the effective tax rate is typically regarded as a crucial factor in capital structure decisions, it is possible that our specific sample of private firms could be influencing this result. Further investigation may be needed to understand the underlying reasons for this unexpected finding.

EARNINGS VOLATILITY: The relationship between earnings volatility and leverage is statistically significant in both models at a 5% confidence level, with p-values of 4.8% and 3.1%, respectively. The coefficients are positive, amounting to 6.4% and 2%. This indicates that private firms with more volatile income tend to have higher leverage, which contradicts our initial hypothesis. However, it is important to note that the magnitude of these coefficients is relatively small. This suggests that firms with highly variable and unpredictable earnings may need to rely on debt financing to fund their investments and projects, as their cash flows might not be sufficient or predictable enough. On the other hand, the effect of higher income

variance on the probability of default could counterbalance this, making it more challenging for such firms to obtain favorable debt financing at acceptable rates. As a result, the two opposing effects may be balancing each other, explaining the small and close-to-zero positive coefficients.

PUBLIC AND PRIVATE COMPANIES COMPARISON

Appendix 24 presents a comprehensive comparison between the initial hypotheses and the final findings for both the public sample and the private sample. Thus, it serves as a crucial tool in addressing the primary research questions of the paper: "What are the key determinants of capital structure in the Italian environment, and how do they vary among public and private firms?". Whereas the table below offers a concise summary of the study's outcomes, in this concluding paragraph of the research, I will delve into analyzing these differences and provide explanations for potential variations observed.

Upon analysis, I observe some notable differences between the public and private samples. In the public sample, only one variable (size) differs from the initial hypothesis, while in the private sample, two variables (age and income variance) exhibit behavior contrary to the initial assumptions. A plausible explanation for this divergence could be the prevalence of previous economic research focused on listed companies and the extreme variability of previous research related to private companies, which highlights their distinctiveness based on local environments or specific samples.

One of the primary distinctions between the two sets of results lies in the contrasting relationship between leverage and age: the public subsample shows a positive correlation between age and leverage, whereas the private subsample exhibits a negative correlation. Age's positive association with leverage in the public subsample could be attributed to the notion that older firms often enjoy a stronger reputation and possess well-established creditor connections.

On the other hand, the private sample included relatively younger firms. As a result, these younger private companies might have had to rely more heavily on borrowing to support their growth compared to their older counterparts, who likely adopted more risk-averse financial management policies, while listed companies tend to adopt a more risk-neutral approach to avoid adverse reactions from the stock market. Nevertheless, despite plausible explanations, the observed relationship remains puzzling.

Another noteworthy contrast between the two lies in the relationship between size and leverage. In the private sample, size demonstrates a positive correlation with leverage, while in the public sample, it exhibits a negative correlation. This positive link in the private sector was anticipated, given that an increase in size is associated with greater asset diversification and reduced asset volatility. As for the public sector, I interpret these diverging results considering Titman and Wessel's theory: public firms always have the option of issuing equity for external financing, and size is linked to a premium. Conversely, such premium is not present for private companies, leading them to rely more on debt as a source of financing. This explains why larger listed firms are less leveraged than unlisted firms. Furthermore, the significantly higher coefficient associated with private firms (0.116) compared to the coefficients linked to public firms (-0.028 and -0.043) could serve as further evidence that the appeal of the size premium when issuing equity is mitigated by the aforementioned advantages of size.

Another disparity in results pertains to the coefficient associated with earnings volatility. Notably, in the public sample, there is a negative correlation between earnings volatility and debt, whereas in the private sample, this correlation is positive. The negative relationship in the public sample can be intuitively understood. A firm with higher earnings volatility is considered riskier, making it potentially more challenging for such a firm to secure borrowing on favorable terms. On the other hand, it is puzzling to explain the difference between public

and private firms regarding their response to earnings volatility. Specifically, why do listed firms with volatile earnings tend to borrow less, while unlisted firms tend to borrow more? One plausible explanation could be that private firms have more limited borrowing options, which forces them to rely on borrowing, especially when their earnings are low or uncertain. This situation might not be as applicable to public firms since they have a broader range of borrowing alternatives available to them. Upon examining the coefficients, it becomes apparent that the relationship is significantly stronger (in absolute value) for the public firm sample. This suggests that in the private sample, both effects could exist, but the positive relationship effect described in the previous paragraph holds slightly more influence.

A further contrast between the two samples emerges concerning two variables: "growth" and "effective tax rate." In the private sample, "growth" shows statistical significance, while in the public sample, it does not. Conversely, "effective tax rate" exhibits a significant relationship with leverage in the public sample but not in the private sample. These findings suggest that, at least within the scope of our sample, private firms consider their growth when determining leverage, while public firms do not. On the other hand, the effective tax rate seems to influence leverage decisions for public firms but not for private firms. One potential explanation for this disparity is that private firms face more limited financing options and may resort to debt when internally generated funds are insufficient. Consequently, they are more likely to encounter the debt overhang problem, leading to a notable (negative) relationship between growth and leverage. Public firms, on the other hand, have a broader range of financing opportunities, which may diminish the impact and fear of the debt overhang problem, hence the lack of association between growth and leverage. Regarding the positive relationship between the effective tax rate and leverage in the public sample and its absence in the private sample, the exact reason remains challenging to determine. As previously mentioned, this discrepancy could be attributed to incomplete or inaccurate information concerning private firms in our

sample due to data limitations and verification challenges. This potential data-related issue may be influencing the observed differences between the two samples.

The remaining variables, instead, show consistency across both samples. Firstly, non-debt tax shields are found to be insignificant in both models. This indicates that Italian firms, in general, do not base their leverage decisions on the presence of non-debt tax shields. Secondly, both profitability and tangibility are significant factors both for private and public Italian companies, and play crucial roles in their capital structure decisions. Additionally, both the public and private samples contain an equal number of non-significant variables, precisely two. This suggests that both models encompass a sufficiently high number of determinant variables influencing capital structure decisions.

Profitability exhibits a negative correlation with leverage in both models, with coefficients of -0.63/-0.154 and -2.04/-0.818 for Italian public and private firms, respectively. This implies that higher profitability is associated with lower leverage for both types of firms.

Several reasons contribute to this pattern. First, profitable firms, whether public or private, tend to have more retained earnings. Additionally, profitable firms are more likely to repay their debts early, resulting in lower debt levels on their balance sheets. The stronger relationship observed in private firms may be due to their inability to use debt as a signal of profitability to the market. Furthermore, private firms encounter higher information asymmetries, leading to increased borrowing costs.

On the other hand, tangibility displays a positive correlation with leverage, with coefficients of 2.913/0.405 and 0.851/0.192 for Italian listed and non-listed firms, respectively. This indicates that tangibility is indeed a pivotal factor in shaping capital structure decisions. Higher tangibility translates to increased collateral potential, reduced bankruptcy costs, and diminished information asymmetry. This holds particularly true in the Italian context, where research

reveals that post-crisis, banks significantly tightened their corporate lending policies, imposing more guarantees and verifications before lending (Russo et al., 2022). Furthermore, the stronger relationship between tangibility and leverage observed in listed firms within our sample might be attributed to banks frequently applying covenants to firms they perceive as riskier, such as unlisted firms. Given that being listed already represents a form of guarantee, covenants may decrease the significance of tangibility for unlisted firms in the decision-making process.

CONCLUSION

Capital structure continues to be an area of significant interest and research from various perspectives, presenting immense potential for valuable insights in the field of corporate finance. Although many economists, such as Modigliani and Miller, Myers, Ross, to name a few examples, have laid the foundational groundwork for this topic, there still exists a wealth of unexplored areas within the domain of capital structure theory, particularly in relation to country-specific factors and private companies.

In this regard, my research focused on filling this void by delving into the determinants of capital structure specific to Italian companies, both public and private. While existing literature has shed light on capital structure dynamics in a global context, the intricacies of country-specific factors and their influence on Italian businesses have been relatively underexplored and discussed. Furthermore, with Italy being home to a vast majority of private companies, which play a pivotal role in the country's economy, understanding the distinct aspects of their capital structure becomes even more crucial.

The motivation behind this study stems from the realization that Italian companies may face unique challenges and opportunities when it comes to capital structure decisions. The research methodology employed involves gathering and analyzing data from two diverse samples of

Italian public and private companies, spanning various industries and sizes. By considering multiple variables and financial indicators, I seek to identify patterns and correlations that can reveal the drivers behind the capital structure choices made by these companies.

To achieve my research goal, I conducted two separate regressions for each sample, with consistent independent variables (age, size, profitability, tangibility, growth, effective tax rate, non-debt tax shields, and income variance). However, the dependent variables differed between the regressions, with one using Net Financial Position to Total Equity and the other using Financial Liabilities to Total Assets. These two variables were selected as they were the most appropriate for our specific regression and yielded the best results.

In the public sample, findings revealed that age, tangibility, and effective tax rate displayed a positive relationship with leverage, while profitability, size, and income variance exhibited a negative relationship. Most of these relationships aligned with initial hypotheses and were consistent with previous research, except for the unexpected negative relationship between firm leverage and size. However, this relationship has been observed in other studies related to different countries. This suggests that Italian firms may prefer external financing through equity to capitalize on the size premium enjoyed by larger companies. Conversely, growth and non-debt tax shields were found to be insignificant factors in the capital structure decisions of Italian public companies.

In the private sample, my research revealed that size, tangibility, and earnings volatility demonstrated a positive relationship with leverage, while age, growth, and profitability exhibited a negative relationship. The unexpected negative relationship with age may be attributed to the fact that more mature companies tend to have more retained earnings, and are more risk averse. Moreover, both non-debt tax shields and effective tax rate did not show a significant relationship with leverage. The insignificant relationship for non-debt tax shields is

consistent with the findings in the public sample. However, the insignificant relationship for effective tax rate in seems unlikely and may be attributed to potential limitations in the dataset used to collect data on private companies (Aida).

While the results for both samples exhibited similarities and differences, I observed that the hypotheses for public companies were more accurate, possibly due to the abundance of theoretical resources available for this sector. Notably, growth was insignificant for public companies but significant for private companies, while the opposite was true for the effective tax rate. I attribute this discrepancy to the relatively lower financing options available to private companies, leading to a higher risk and fear of encountering the debt overhang problem. Moreover, the relationship between size and leverage, as well as earnings volatility and leverage, differed between the two samples. The first one may be due to the size premium that public firms can benefit from when issuing equity, influencing their capital structure decisions differently. Similarly, the contrasting relationship with earnings volatility could be attributed to private firms having more limited borrowing options and thus relying on debt when earnings are low or uncertain.

In conclusion, this study significantly enhances the comprehension of the factors influencing capital structure decisions among Italian firms. The research shed light on the specific factors that influence capital structure choices for both private and public companies in Italy. We can conclude that there are notable distinctions in the capital structure determinants between these two types of companies. These differences are likely attributable to the limited financing options, lesser reliance on equity capital markets, and higher information asymmetries faced by private firms. The unique characteristics of public and private companies highlight the significance of considering their individual attributes when analyzing capital structure dynamics.

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APPENDIX

APPENDIX 1. TRADE OFF THEORY ILLUSTRATIONS

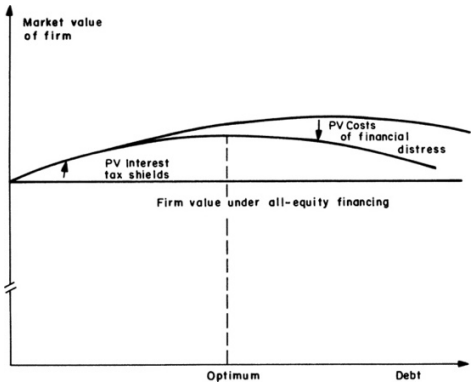


Figure 1: relationship between firm value and Debt Levels under the Trade Off Theory. Source: CFA Institute

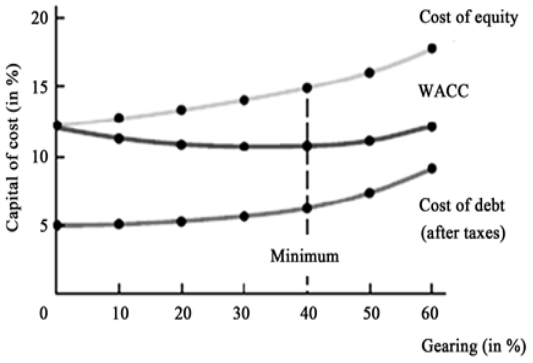


Figure 2: relationship between WACC, cost of debt and equity under the Trade off Theory. Source: Scientific Research Publishing

APPENDIX 2. HYPOTHESIZED RELATIONSHIPS

Variable	Relationship
Age	+
Profitability	+
Size	+
Income variance	-
Growth	-
Tangibility	+
Effective tax rate	+
Non-debt tax shields	-

APPENDIX 3. MEASUREMENTS FOR THE DEPENDENT VARIABLE

Variable	Measurement
Leverage	• Net Financial Position / Total Assets • Net Financial Position / Total Liabilities • Total Financial Liabilities / Total Assets • Total Liabilities / Total Assets • Debt / Equity

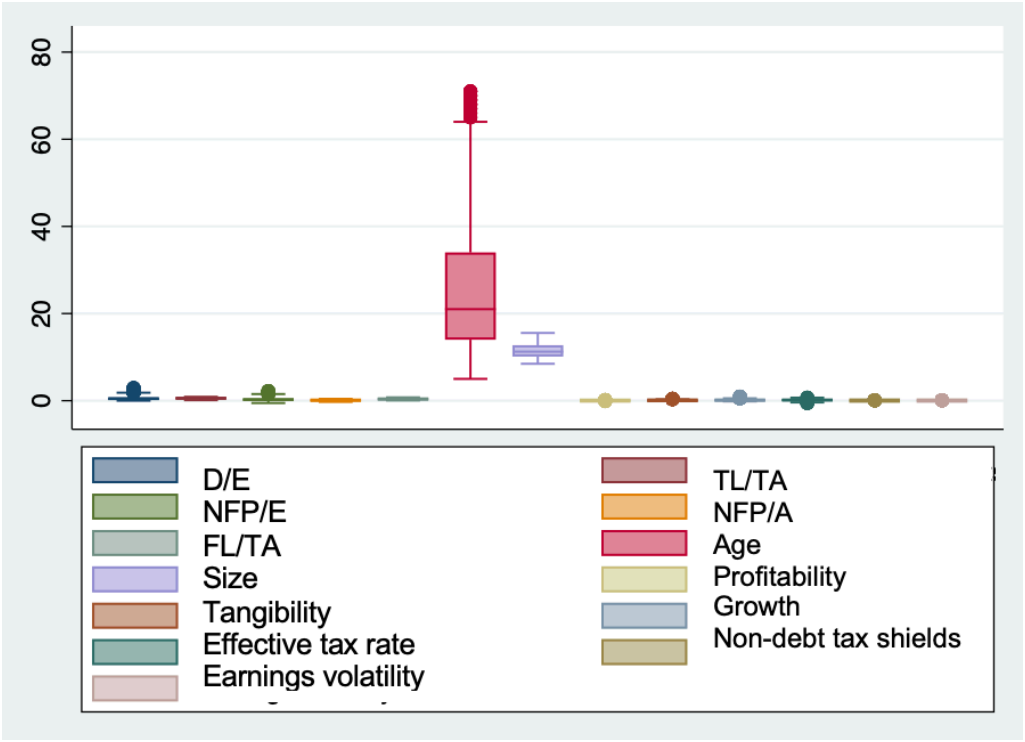
APPENDIX 4. MEASUREMENTS FOR THE INDEPENDENT VARIABLE

Variable	Measurement
Size	Ln (Total Assets)
Age	Number of years between the current date and the incorporation date
Profitability	Return On Assets
Growth	% Change in Total Assets between t and t-1
Effective tax rate	Income tax expense/pretax income
Tangibility	Total tangible fixed assets /total assets
Non debt tax shields	Depreciation/Total assets
Earnings volatility	Standard deviation of ROA over the past 5 years

APPENDIX 5. DESCRIPTIVE STATISTICS and BOX PLOTS PUBLIC SAMPLE BEFORE OUTLIERS' REMOVAL

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
D/E	1370	.810	1.828	-5.49	41.84
TL/TA	1370	.542	.234	0	1.301
NFP/E	1370	.506	1.223	-5.018	8.23
NFP/A	1370	.089	0.521	-1.89	0.941
FL/TA	1370	.378	.214	0	1.686
Age	1370	27.993	23.703	5	139
Size	1370	11.515	2.103	4.998	18.565
Profitability	1370	.018	.149	-4.113	.507
Tangibility	1370	.118	.154	0	.904
Growth	1370	.356	4.031	-.995	110.390
Effective tax rate	1370	.212	4.730	-65.83	116.076
Non debt tax shield	1370	.039	.210	0	6.662
Income variance	1370	.042	.070	.0002	1.813

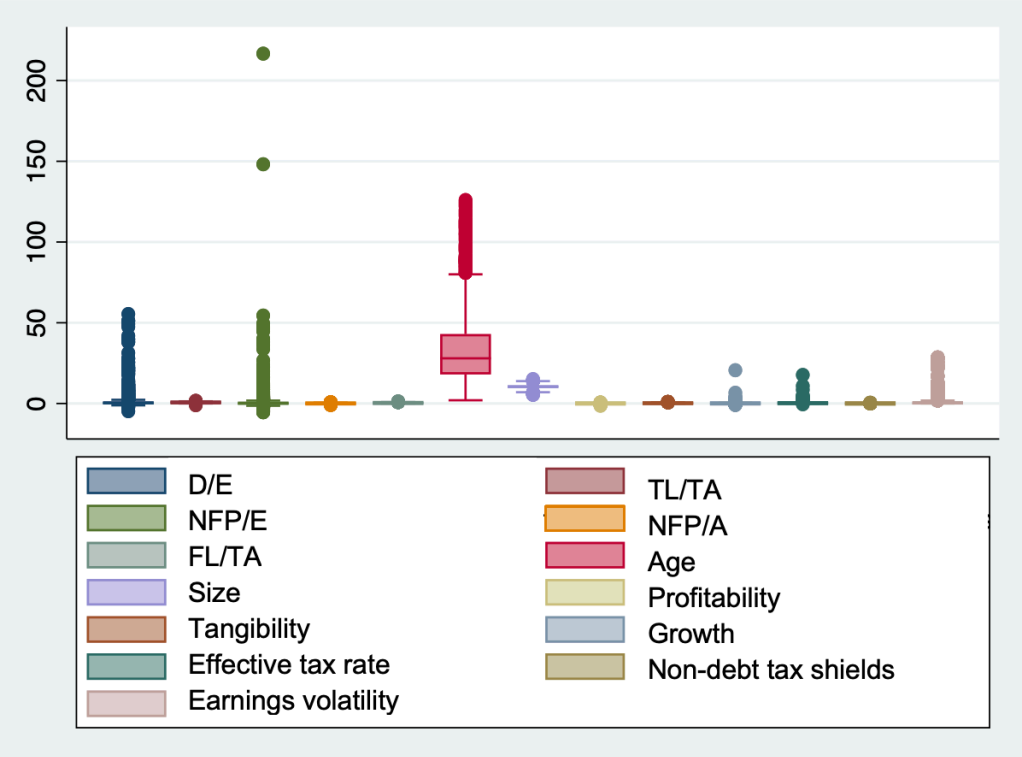
Before outliers removal



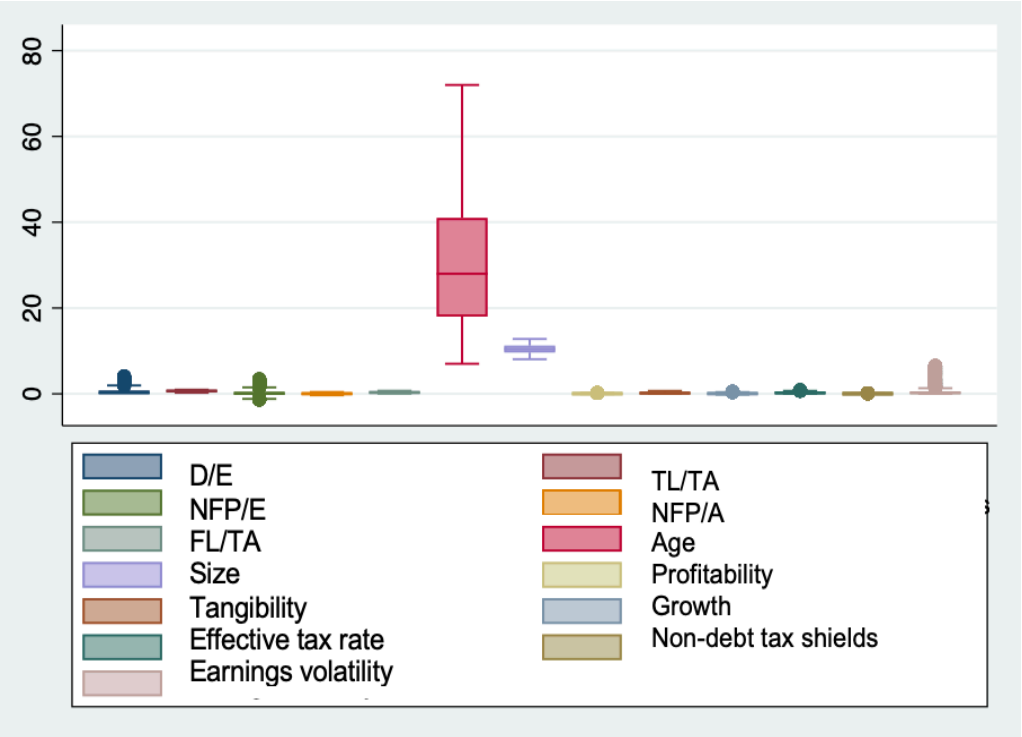
After outliers removal

APPENDIX 6. DESCRIPTIVE STATISTICS and BOX PLOT FOR PRIVATE SAMPLE BEFORE OUTLIERS' REMOVAL

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
D/E	2440	1.11	3.768	-4.75	55.41
TL/TA	2440	.648	.229	-1.049	1.671
NFP/E	2440	.748	6.299	-5.41	216.663
NFP/A	2440	.035	.219	-.887	.748
FL/TA	2440	.332	.202	.014	1.258
Age	2440	32.556	20.935	2	126
Size	2440	10.429	1.391	5.431	15.077
Profitability	2440	.049	.112	-1.363	.584
Tangibility	2440	.214	.22	0	.954
Growth	2440	.115	.528	-.91	20.605
Effective tax rate	2440	.294	.553	-.451	17.681
Non-debt tax shield	2440	.039	.039	0	.489
Earnings volatility	2440	1.338	3.404	.002	28.521

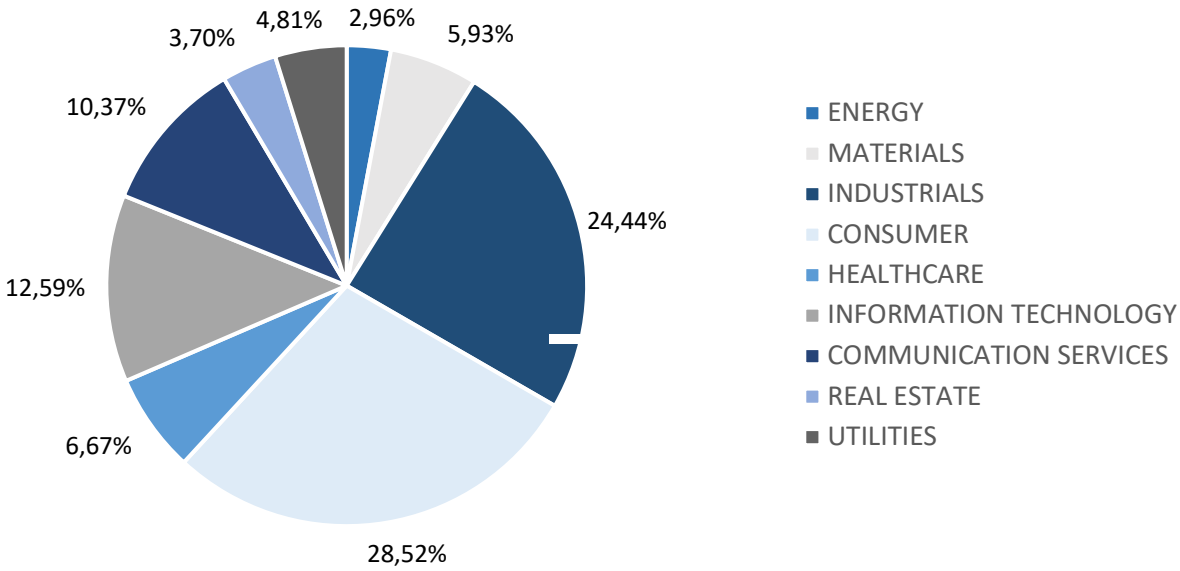


Before outliers removal

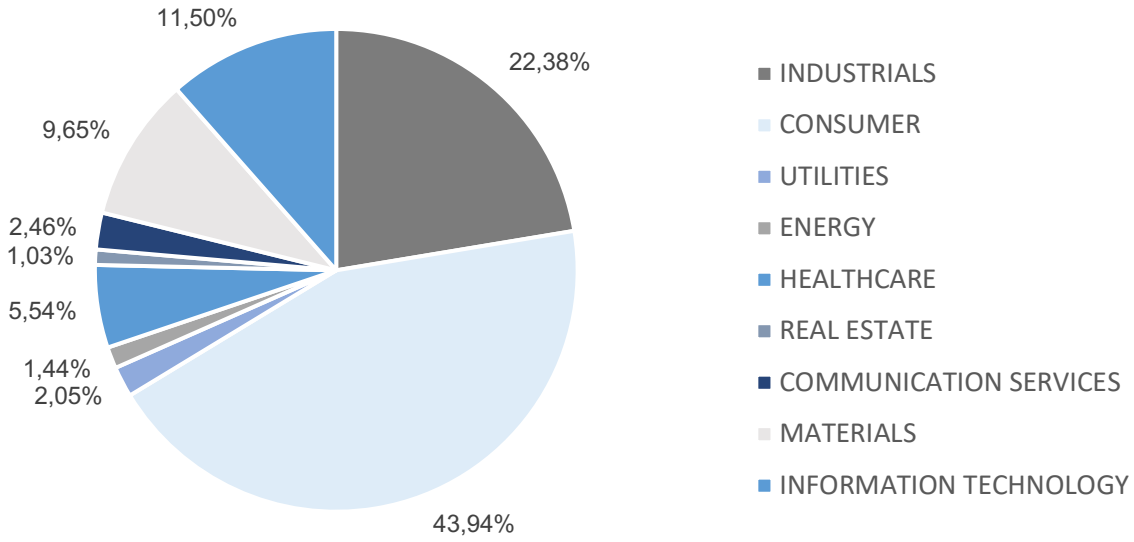


After outliers removal

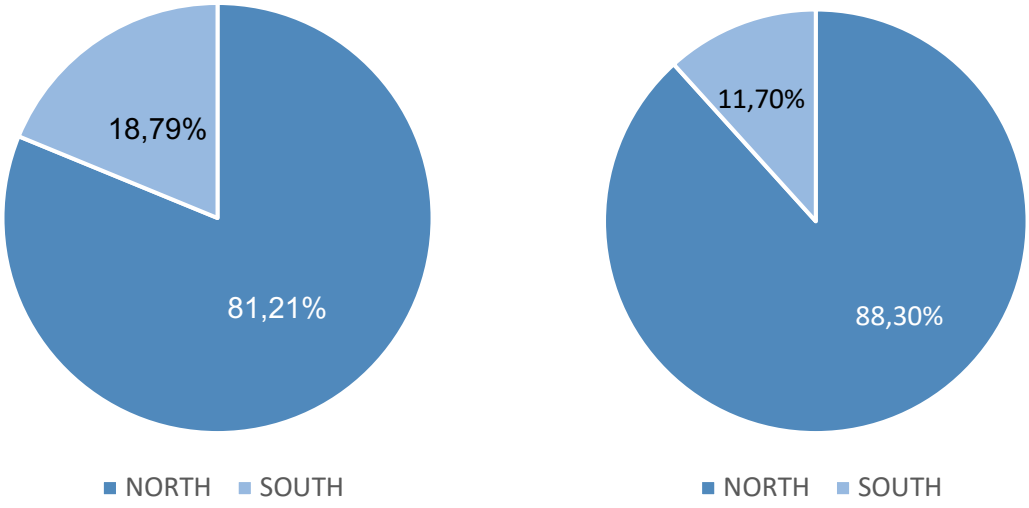
APPENDIX 7. INDUSTRY CLASSIFICATION FOR THE PUBLIC SAMPLE



APPENDIX 8. INDUSTRY CLASSIFICATION FOR THE PRIVATE SAMPLE



APPENDIX 9. GEOGRAPHICAL COMPOSITION OF THE SAMPLES



APPENDIX 10. CORRELATION MATRIX – PUBLIC SAMPLE

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) D/E	1.00												
(2) TL/TA	0.73	1.00											
(3) NFP/E	0.85	0.58	1.00										
(4) NFP/A	0.68	0.43	0.88	1.00									
(5) FL/TA	0.55	0.64	0.55	0.52	1.00								
(6) Age	0.06	0.01	0.09	0.12	0.01	1.00							
(7) Size	-.03	-.01	-.01	0.11	0.23	0.25	1.00						
(8) Profit.	0.04	0.08	-.08	-.15	-.08	-.09	-.17	1.00					
(9) Tang.	0.19	0.15	0.19	0.22	0.04	0.13	-.00	0.16	1.00				
(10) Gr.	-.02	-.02	-.18	-.20	-.11	-.19	-.21	0.27	-.09	1.00			
(11) ETR	0.15	0.19	0.08	0.02	-.03	-.08	-.28	0.35	0.15	0.08	1.00		
(12) NDTS	0.14	0.18	0.08	0.07	-.00	-.07	-.24	0.18	0.29	0.02	0.16	1.00	
(13) Vol.	0.00	0.00	-.07	-.12	-.17	-.11	-.32	0.11	0.11	0.15	0.14	0.10	1.00

APPENDIX 11. CHOSEN OLS REGRESSIONS – PUBLIC SAMPLE

NFP/E	***Coef.***	***St. Err.***	***t-value***	***p-value***	***Sign.***
Age	0.290	.155	1.86	.064	*
Size	0.13	.095	1.55	.67	
Profitability	**-1.096**	**.392**	**-2.80**	**.005**	***
Tangibility	**.879**	**.226**	**3.90**	**0**	***
Growth	-.161	.115	-1.40	.111	
Effective tax rate	**.552**	**.223**	**2.47**	**.002**	***
Non-debt tax shields	1.358	1.116	1.22	.224	
Income variance	**-1.856**	**.592**	**-3.13**	**.002**	***
Constant	.266	.193	1.38	.167	
R-squared		0.341	F-test		88.81
**** p<.01, ** p<.05, * p<.1*			Prob > F		0.000

FL/TA	*Coef.*	*St. Err.*	*t-value*	*p-value*	*Sig*
Age	0.08	0	-1.05	.292	
Size	**.02**	**.004**	**4.43**	**0**	***
Profitability	**-.887**	**.116**	**-2.49**	**.013**	**
Tangibility	**.644**	**.36**	**2.13**	**.032**	**
Growth	-.014	.032	-0.43	.664	
Effective tax rate	.865	.033	1.96	.051	*
Non-debt tax shields	.585	.328	1.78	.075	*
Earnings volatility	**-.915**	**.271**	**-2.64**	**.009**	***
Constant	.149	.057	2.60	.01	***
R-squared		0.298	F-test		20.64
*** p<.01, ** p<.05, * p<.1			Prob > F		0.000

APPENDIX 12. OTHER OLS REGRESSION – PUBLIC SAMPLE

D/E	*Coef.*	*St. Err.*	*t-value*	*p-value*	*Sig*
Age	.001	.002	0.74	.458	
Size	.014	.017	0.82	.411	
Profitability	-.746	.431	-1.73	.084	*
Tangibility	.646	.25	2.59	.01	***
Growth	.234	.121	1.93	.055	*
Effective tax rate	.44	.127	3.48	.001	***
Non-debt tax shields	2.656	1.245	2.13	.033	**
Earnings volatility	-2.128	.998	-2.13	.033	**
Constant	.32	.215	1.49	.137	
R-squared		0.160	F-test		4.954
*** p<.01, ** p<.05, * p<.1			Prob > F		0.000

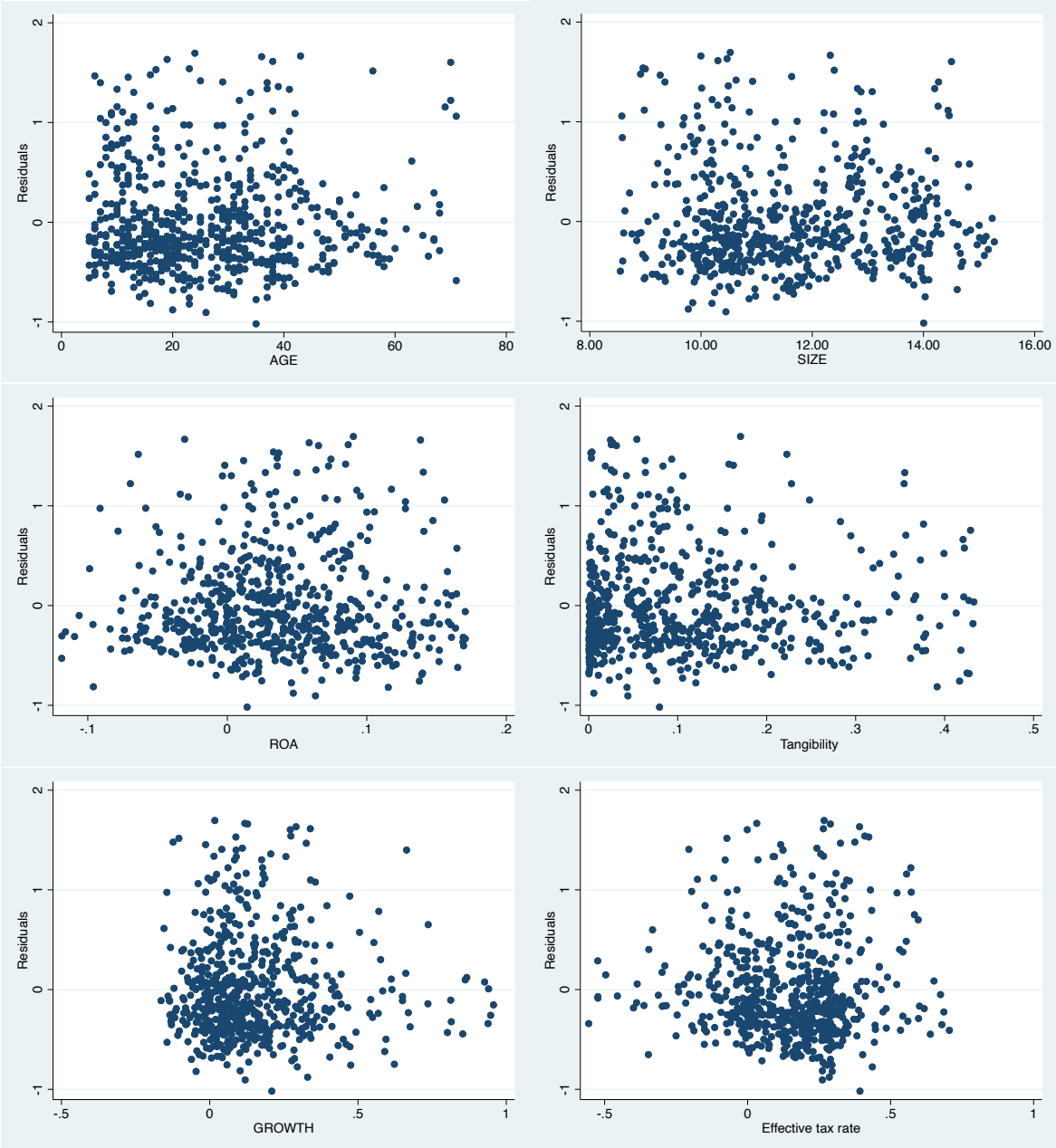
TL/TA	*Coef.*	*St. Err.*	*t-value*	*p-value*	*Sig*
Age	0	.001	0.27	.787	
Size	.008	.005	1.53	.127	
Profitability	-.283	.132	-2.14	.033	**
Tangibility	.109	.077	1.42	.155	
Growth	.023	.038	0.59	.554	
Effective tax rate	.162	.039	4.13	0	***
Non-debt tax shields	1.369	.385	3.56	0	***
Earnings volatility	-.62	.313	-1.98	.048	**
Constant	.406	.068	5.99	0	***
R-squared		0.190	F-test		5.954
*** p<.01, ** p<.05, * p<.1			Prob > F		0.000

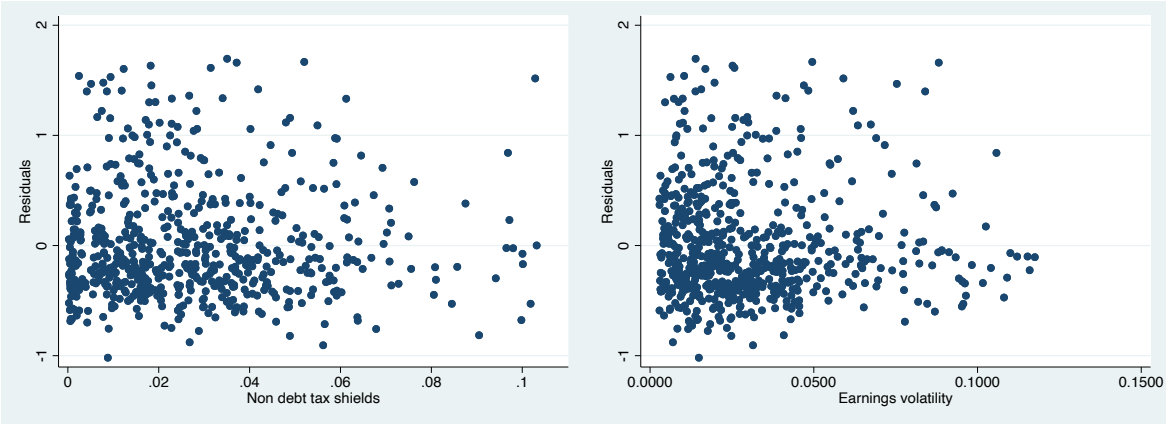
NFP/TA	*Coef.*	*St. Err.*	*t-value*	*p-value*	*Sig*
Age	.001	0	1.38	.169	
Size	.003	.004	0.62	.535	
Profitability	-.478	.112	-4.28	0	***
Tangibility	.346	.064	5.37	0	***
Growth	-.071	.033	-2.15	.032	**
Effective tax rate	.054	.032	1.70	.09	*
Non-debt tax shields	.416	.315	1.32	.188	
Earnings volatility	-.491	.261	-1.88	.06	*
Constant	.049	.055	0.90	.37	
R-squared		0.124	F-test		4.138
*** p<.01, ** p<.05, * p<.1			Prob > F		0.000

APPENDIX 13. TESTING ASSUMPTIONS IN THE PUBLIC SAMPLE

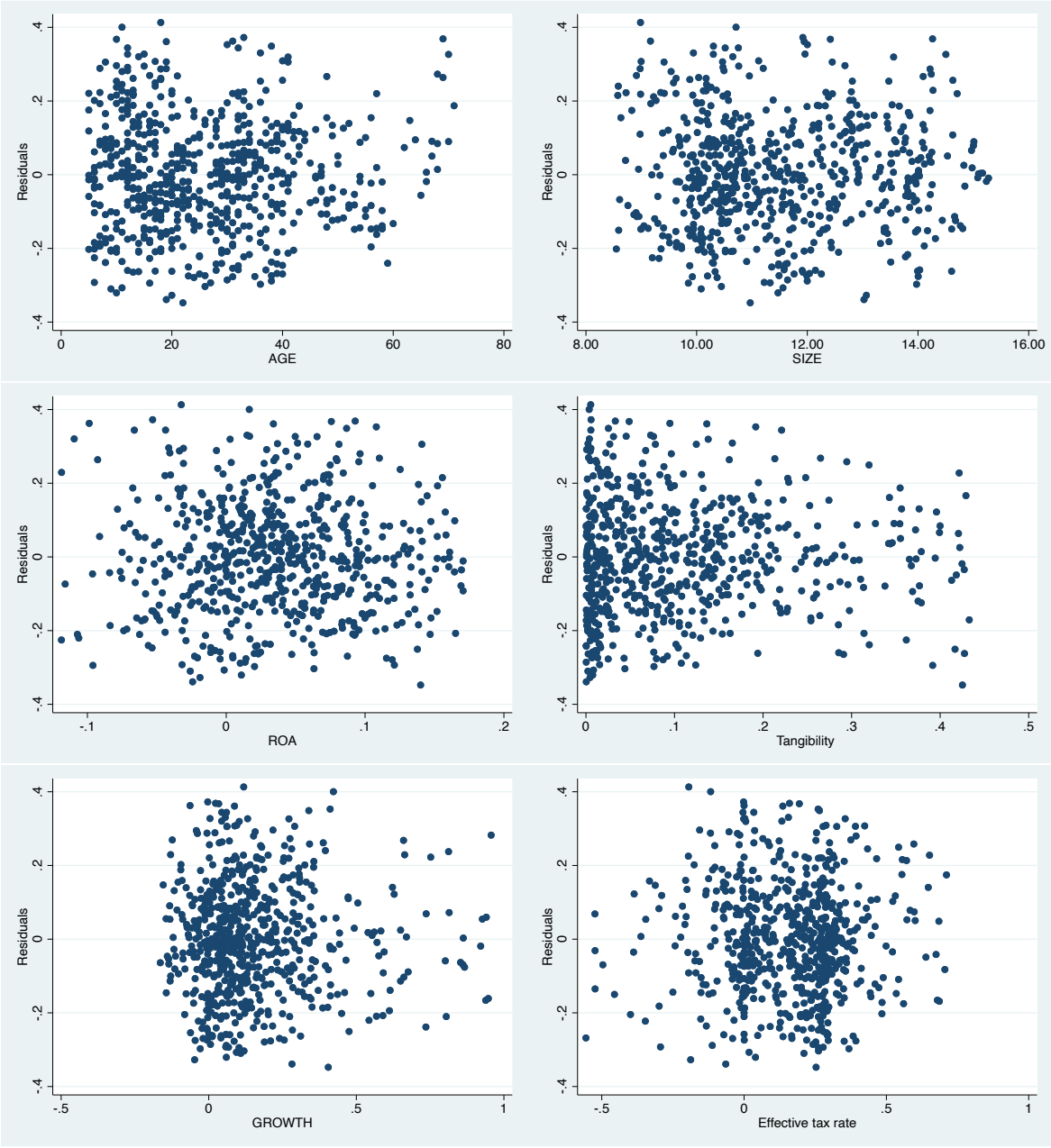
Linearity

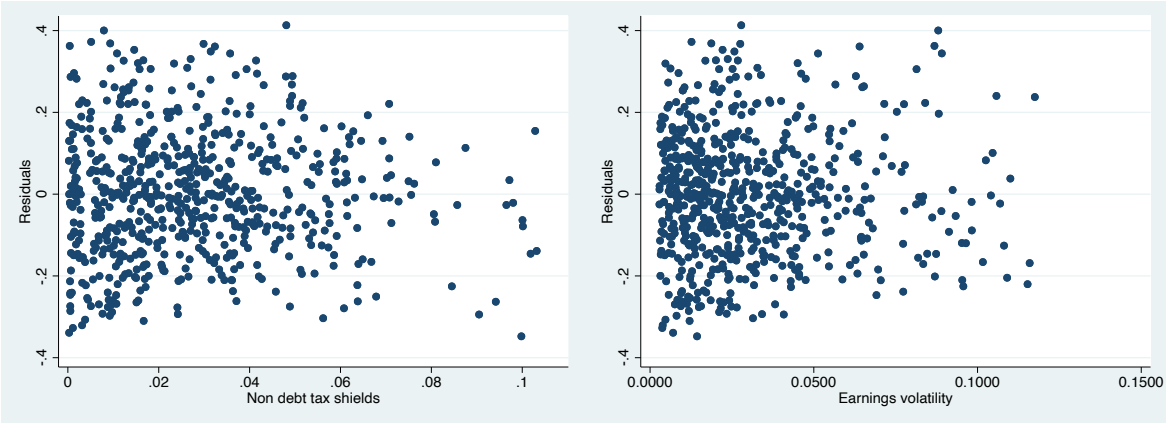
The linearity test is conducted by examining residual plots, where residuals (i.e. the gaps between the observed and the predicted values) are plotted against the variables. The ideal scenario is to have the residuals dispersed around zero on the y-axis without any discernible pattern.





NFP/E regression





FL/TA regression

The figures above show the scatter plots for the two regressions. From the scatter plots, although it is evident that while some variables do not display a perfect linear relationship, it is deductible that the points are generally distributed evenly along the y-axis. Therefore, we can reasonably infer that a linear relationship exists to a considerable extent. Thus, I conclude that our data overall adheres to the linearity assumption.

Normality

The principal means of testing this hypothesis are the skewness and kurtosis tests. The null hypothesis in these tests posits that there's no significant departure from normality in the examined data. The Pr (skewness) value confirms whether the skewness resembles that of a normal distribution. Similarly, Pr (kurtosis) performs the same function for kurtosis. Meanwhile, Prob > chi2 represents a joint test of both skewness and kurtosis.

			------Joint test------	
Variable	***Pr (Skewness)***	***Pr (Kurtosis)***	***Chi2(2)***	***Prob > chi2***
r	0.677	0.051	5.40	.067

NFP/E regression

			------Joint test------	
Variable	***Pr (Skewness)***	***Pr (Kurtosis)***	***Chi2(2)***	***Prob > chi2***
r	0.8773	0.082	4.46	.108

FL/A regression

In our cases, given that the p-value (Prob > chi2) exceeds 5% in both cases, we can accept the null hypothesis that data does not substantially deviate from normality. Nevertheless, it is important to observe that in the regression of net financial position on total equity, the probability of a difference in kurtosis compared to a normal distribution is just above 5%, and the overall p-value is quite low. This could potentially suggest a discrepancy between our distribution and the normal distribution, albeit not at a 5% significance level.

Heteroscedasticity

A common test for heteroskedasticity in regression models is the Breusch-Pagan-Godfrey test. This test operates under the null hypothesis that errors are homoscedastic, and therefore their variance is constant.

Chi2	0.891
Prob > chi2	0.345

NFP/E regression

Chi2	3.46
Prob > chi2	0.0628

FL/TA regression

The results displayed in Tables 13 and 14 allow to accept the null hypothesis that there is no heteroscedasticity in the model. While the NFP/Total equity model suggests that heteroscedasticity is absent, the Financial Liabilities/Total Assets model indicates the absence of heteroscedasticity only at a 5% significance level. At a 10% significance level, however, heteroscedasticity would be deemed to be present. This prompts me to further scrutinize the situation using the White test. The White test for heteroscedasticity assesses if there is a systematic relationship between the squared residuals and the predictor variables. The null hypothesis for this test is that such a relationship is indeed present, while the alternative hypothesis posits that it isn't.

Chi2	61.319
Prob > chi2	0.043

NFP/E regression

Chi2	74.147
Prob > chi2	0.003

FL/TA regression

Given that the p-values shown in Tables 15 and 16 are less than 5%, we reject the hypothesis that residuals have constant variance. Consequently, we deduce that some degree of heteroscedasticity is present in the sample.

Multicollinearity

Even though the correlation matrix we used earlier rules out the possibility of extreme correlation, it's crucial to conduct an additional test, namely, the calculation of the Variance Inflation Factor (VIF).

The VIF serves as a metric that quantifies the extent to which the variance of the estimated coefficient in the regression is amplified due to multicollinearity. It's determined by the ratio of the variance of the estimated coefficient to its expected variance in the absence of collinearity. VIF values start from 1 and increase, and a common benchmark suggests that a VIF exceeding 5 or 10 could indicate problematic collinearity.

Variable	VIF	1/VIF
Age	1.129	.886
Size	1.361	.735
Profitability	1.268	.789
Tangibility	1.387	.721
Growth	1.154	.867
Effective tax rate	1.24	.806
Non-debt tax shields	1.384	.723
Earnings volatility	1.16	.862
Mean VIF	1.260	.

NFP/E regression

Variable	VIF	1/VIF
Age	1.117	.895
Size	1.379	.725
Profitability	1.252	.798
Tangibility	1.361	.735
Growth	1.151	.869
Effective tax rate	1.242	.805
Non-debt tax shields	1.353	.739
Earnings volatility	1.161	.861
Mean VIF	1.252	.

FL/TA regression

Our reference point for concern is a variance inflation factor (VIF) of 10. However, in our scenario, we have values of 1.260 and 1.252, well below this threshold. This suggests that there is no excess correlation that could distort the outcome of our regression analysis.

APPENDIX 14. LAGRANGE MULTIPLIER TEST – PUBLIC SAMPLE

Chibar2	144.65
Prob > chi2	0.000

NFP/E regression

Chi2	237.73
Prob > chi2	0.000

FL/TA regression

APPENDIX 15. HAUSMAN TEST – PUBLIC SAMPLE

Chi-square	20.225
Prob > chi2	0.01

NFP/E regression

Chi2	49.27
Prob > chi2	0.00

FL/TA regression

APPENDIX 16. RANDOM EFFECTS REGRESSIONS

NFP/E	***Coef.***	***St.Err.***	***t-value***	***p-value***	***Sig***
Age	-.002	.002	-0.76	.446	
Size	-.02	.062	-0.32	.749	
Profitability	-1.2	.395	-3.04	.002	***
Tangibility	1.326	.292	4.54	0	***
Growth	-.019	.03	-0.63	.527	
Effective tax rate	.852	1.075	0.79	.428	
Non-debt tax shields	-2.734	.882	-3.10	.002	***
Earnings volatility	-.04	.024	-1.65	.099	*
Constant	.924	.294	3.14	.002	***
R-squared		0.185	F-test		4.954
*** p<.01, ** p<.05, * p<.1			Prob > F		0.000

NFP/E regression

FL/TA	*Coef.*	*St.Err.*	*t-value*	*p-value*	*Sig*
AGE	0	.001	0.11	.915	
Growth	-.08	.023	-3.42	.001	***
Profitability	-.11	.113	-0.97	.331	
Tangibility	.179	.081	2.21	.027	**
Effective tax rate	.02	.025	0.82	.414	
Non-debt tax shields	.575	.396	1.45	.147	
Earnings volatility	-.454	.276	-1.64	.1	
Size	.009	.007	1.33	.182	
Constant	.25	.081	3.08	.002	***
R-squared		0.191	F-test		0.000
*** p<.01, ** p<.05, * p<.1			Prob > F		

Table 46: Random Effects regression results for the FL/TA regression, public sample

APPENDIX 17. CORRELATION MATRIX – PRIVATE SAMPLE

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) D/E	1.00												
(2) TL/TA	0.29	1.00											
(3) NFP/E	0.67	0.16	1.00										
(4) NFP/A	0.35	0.26	0.28	1.00									
(5) FL/TA	0.27	0.62	0.19	0.51	1.00								
(6) Age	-.06	-.01	-.04	0.08	-.07	1.00							
(7) Size	-.09	-.18	-.04	0.09	-.01	0.16	1.00						
(8) Profit.	-.10	.32	.07	-.21	-.33	-.04	0.01	1.00					
(9) Tang.	0.05	-.19	.06	0.33	0.01	0.26	0.07	-.11	1.00				
(10) Gr.	0.01	0.08	0.01	-.02	0.00	-.06	0.01	-.01	-.07	1.00			
(11) ETR	0.01	0.06	-.01	0.00	0.05	-.06	-.02	-.01	-.09	-.00	1.00		
(12) NDTS	0.02	0.01	0.03	0.02	0.07	0.12	-.03	-.08	-.25	0.16	-.06	1.00	
(13) Vol.	0.00	-.05	0.06	-.03	-.13	0.00	-.03	-.34	-.11	-.09	0.04	0.06	1.00

Table 24: correlation matrix for the private sample

APPENDIX 18. CHOSEN OLS REGRESSIONS – PRIVATE SAMPLE

NFP/E	Coef.	St.Err.	t-value	p-value	Sign.
Age	-.030	.017	-1.72	.086	*
Size	-.096	.036	-2.67	.008	***
Profitability	-2.66	.667	-3.99	0	***
Tangibility	.789	.151	5.21	0	***
Growth	.209	.184	1.14	.256	
Effective tax rate	.373	.703	0.53	.597	
Non-debt tax shields	1.086	1.28	0.85	.396	
Earnings volatility	-.036	.018	-2.00	.046	**
Constant	1.006	.278	3.62	0	***
R-squared		0.341	F-test		25.660
			Prob > F		0.000

FL/TA	*Coef.*	*St.Err.*	*t-value*	*p-value*	*Sig*
Age	-.090	0.068	-1.33	.183	
Size	.022	.065	0.34	.732	
Profitability	-.684	.156	-4.56	0	***
Tangibility	.022	.008	2.61	.009	**
Growth	.073	.037	1.98	.048	**
Effective tax rate	.071	.065	1.09	0.291	
Non-debt tax shields	.595	.232	2.56	.008	**
Earnings volatility	-.016	.008	-1.98	.048	**
Constant	.314	.089	3.51	0	***
R-squared		0.224	F-test		13.804
**** p<.01, ** p<.05, * p<.1*			Prob > F		0.000

APPENDIX 19. OTHER OLS REGRESSIONS – PRIVATE SAMPLE

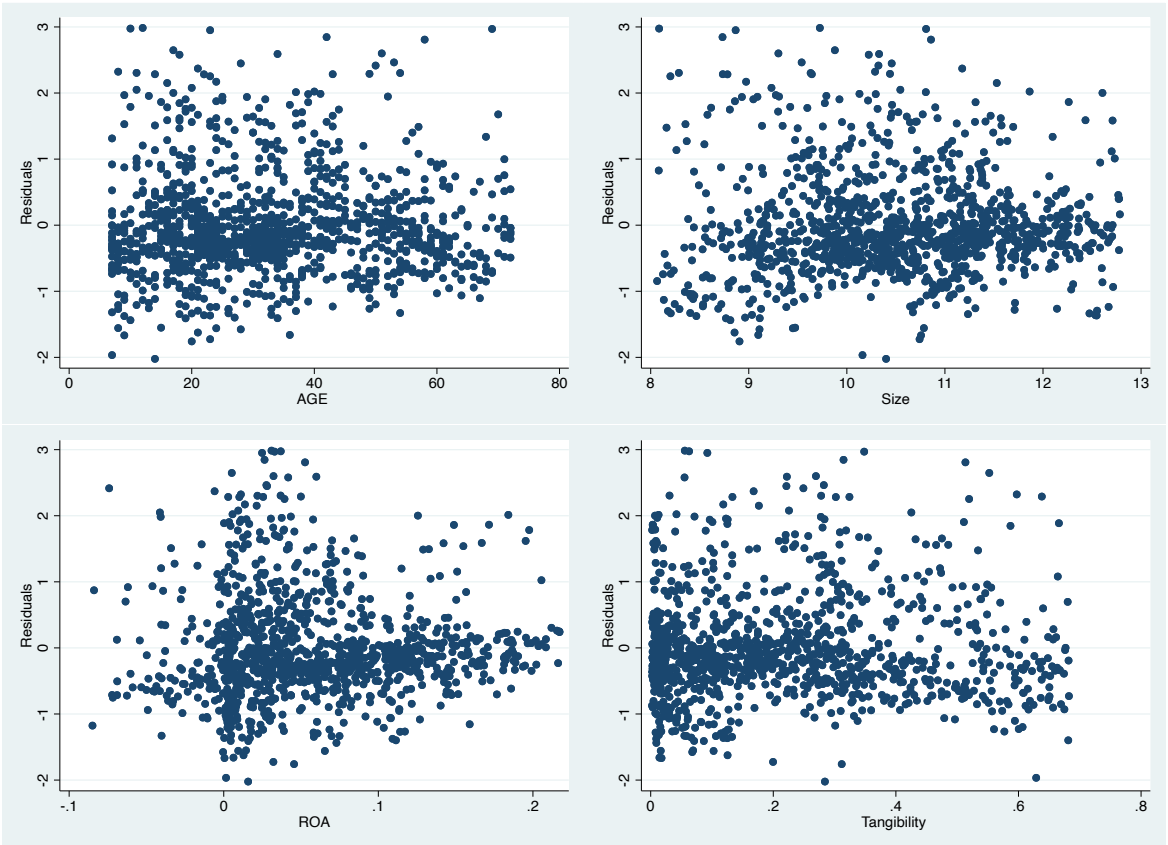
D/E	*Coef.*	*St.Err.*	*t-value*	*p-value*	*Sig*
Age	-.004	.001	-2.68	.007	***
Size	-.097	.024	-4.00	0	***
Profitability	-3.524	.422	-8.34	0	***
Tangibility	.473	.15	3.16	.002	***
Growth	.437	.18	2.42	.016	**
Effective tax rate	.249	.135	1.85	.065	*
Non-debt tax shields	1.941	1.258	1.54	.123	
Earnings volatility	-.031	.018	-1.74	.081	*
Constant	-.004	.001	-2.68	.007	***
R-squared		0.102	F-test		4.954
*** p<.01, ** p<.05, * p<.1			Prob > F		0.000

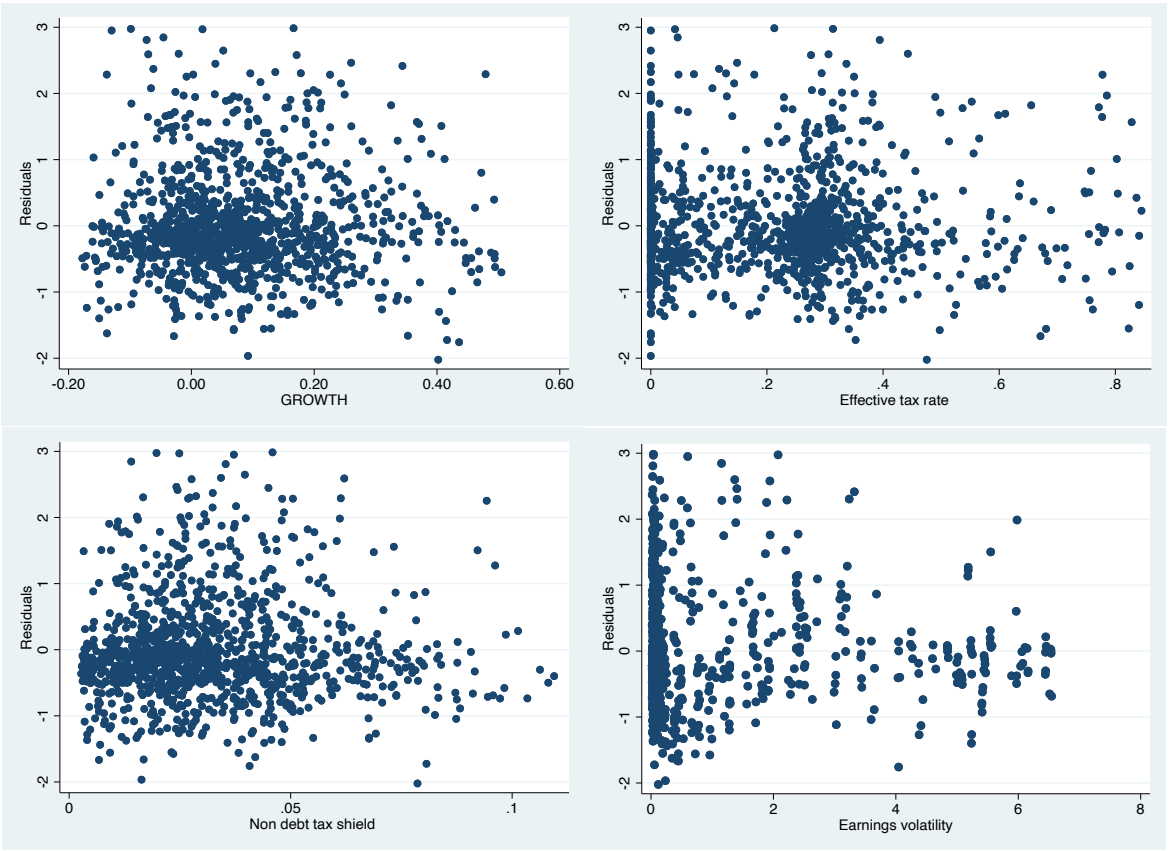
TL/TA	*Coef.*	*St.Err.*	*t-value*	*p-value*	*Sig*
Age	-.001	0	-3.84	0	***
Size	-.024	.005	-4.60	0	***
Profitability	-1.01	.093	-10.85	0	***
Tangibility	-.168	.033	-5.16	0	***
Growth	.137	.039	3.53	0	***
Effective tax rate	.067	.029	2.29	.022	**
Non-debt tax shields	-.183	.283	-0.65	.518	
Earnings volatility	-.008	.004	-2.09	.036	**
Constant	1.021	.058	17.64	0	***
R-squared		0.155	F-test		4.954
*** p<.01, ** p<.05, * p<.1			Prob > F		0.000

NFP/TA	*Coef.*	*St.Err.*	*t-value*	*p-value*	*Sig*
Age	0	0	-1.35	.177	
Size	.005	.005	1.02	.309	
Profitability	-.56	.087	-6.43	0	***
Tangibility	.194	.031	6.30	0	***
Growth	.062	.037	1.66	.097	*
Effective tax rate	.005	.028	0.17	.864	
Non-debt tax shields	.235	.259	0.91	.363	
Earnings volatility	-.002	.004	-0.60	.546	
Constant	-.012	.056	-0.21	.831	
R-squared		0.106	F-test		16.332
*** p<.01, ** p<.05, * p<.1			Prob > F		0.000

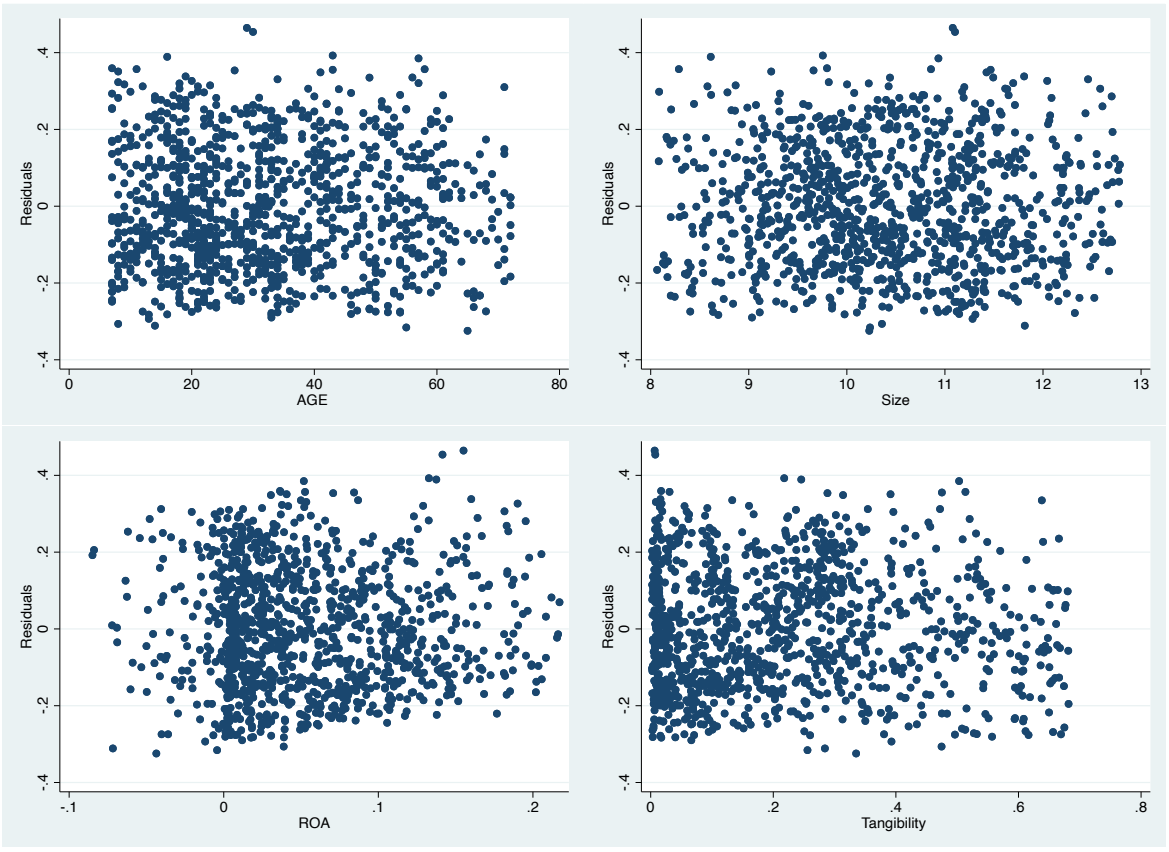
APPENDIX 20. TESTING OLS ASSUMPTIONS – PRIVATE SAMPLE

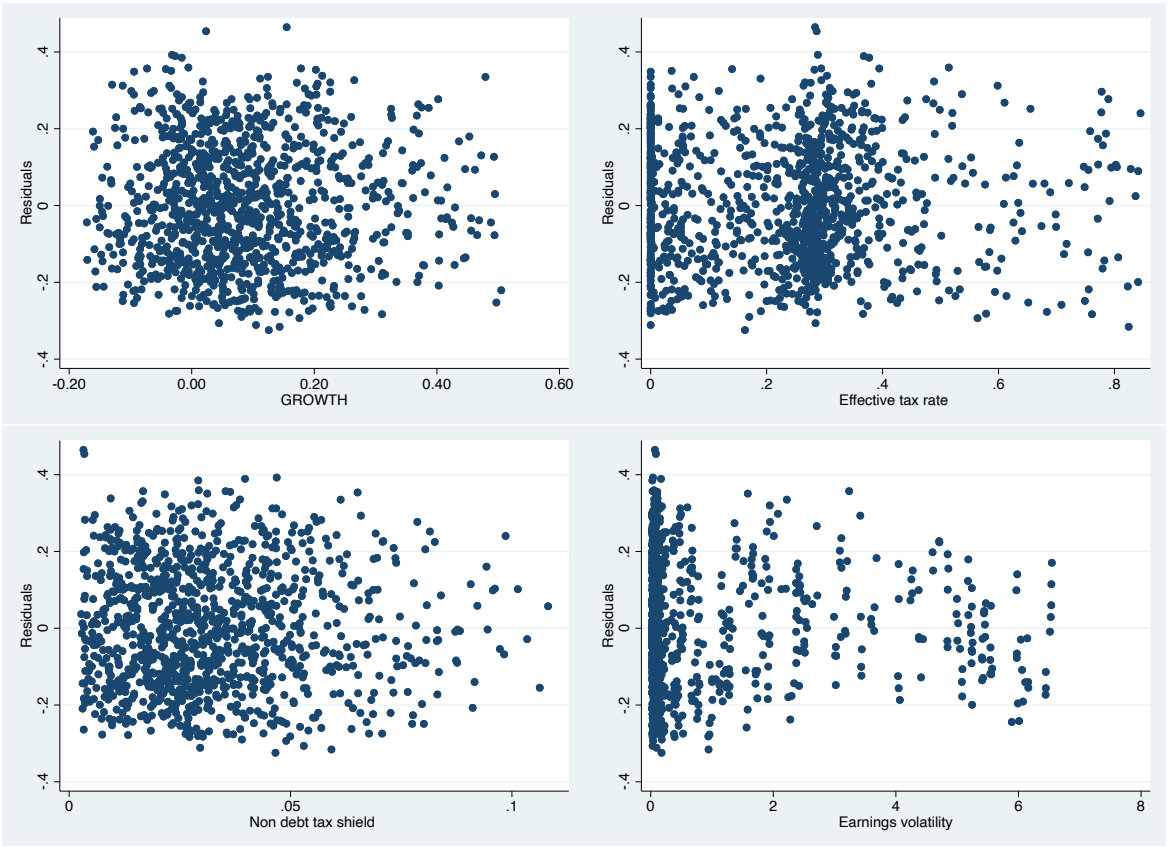
Linearity





NFP/E regression





FL/TA regression

The figures above demonstrate that, on the whole, the linear condition is met, despite the presence of a few outliers. Upon examining the graphs, we observe no discernible pattern or trend in the residuals, and there is no indication of them being more concentrated towards one side of the y-axis. As a result, we can accept the linearity condition.

Normality

			------Joint test------	
Variable	Pr (Skewness)	Pr (Kurtosis)	Chi2(2)	Prob > chi2
r	0.778	0.102	4.113	.128

NFP/E regression

			------Joint test------	
Variable	Pr (Skewness)	Pr (Kurtosis)	Chi2(2)	Prob > chi2
r	0.433	0.098	4.934	.0889

FL/A regression

Both tests indicate that we can't reject the null hypothesis of the distribution being comparable to a normal distribution. In fact, all three sets of probabilities exceed the 5% threshold, suggesting that we never reject the null hypotheses. Therefore, we can assume that the residuals are normally distributed, and thus, the normality condition is satisfied.

Heteroscedasticity

Chi2	2.887
Prob > chi2	0.0893

NFP/E regression

Chi2	4.219
Prob > chi2	0.03995

FL/TA regression

Following the previous chapter's structure, we assessed the data's heteroscedasticity using the Breusch Pagan test. The test for NFP/E yielded a 9% p-value, exceeding the 5% threshold, indicating that we don't reject the null hypothesis of homoscedastic residuals. However, the test for FL/TA resulted in a 3% p-value, leading to a rejection of the null hypothesis of homoscedasticity. This finding indicates that the residuals of the second regression are not homoscedastic. We can analyze this further through the White test.

Chi2	61.96
Prob > chi2	0.038

NFP/E regression

Chi2	87.65
Prob > chi2	0.003

FL/TA regression

As anticipated, the White test verifies that the residuals of the FL/TA regression are not homoscedastic. However, it also contradicts the results of the previous regression for NFP/E, as the p-value of 4% suggests rejecting the null hypothesis of homoscedasticity. Consequently, we can conclude that the homoscedasticity condition is not met.

Multicollinearity

Variable	VIF	1/VIF
Age	1.156	.865
Size	1.289	.776
Profitability	1.149	.87
Tangibility	1.435	.697
Growth	1.027	.974
Effective tax rate	1.133	.883
Non-debt tax shields	1.221	.819
Earnings volatility	1.275	.785
Mean VIF	1.260	.

NFP/E regression

Variable	VIF	1/VIF
Age	1.167	.857
Size	1.283	.779
Profitability	1.124	.889
Tangibility	1.405	.712
Growth	1.026	.974
Effective tax rate	1.105	.905
Non-debt tax shields	1.212	.825
Earnings volatility	1.267	.789
Mean VIF	1.199	.

FL/TA regression

With variance inflation factors (VIF) of 1.26 and 1.199 respectively, which are below the threshold of 5, we can confidently conclude that multicollinearity is not a concern in the two samples. Therefore, the no multicollinearity condition is satisfied.

APPENDIX 21. LAGRANGE MULTIPLIER TEST

Chibar2	243.84
Prob > chi2	0.000

NFP/E regression

Chibar2	301.03
Prob > chi2	0.000

FL/TA regression

APPENDIX 22. HAUSMAN TEST

Chi-square	34.913
Prob > chi2	0.00

NFP/E regression

Chi2	67.47
Prob > chi2	0.00

FL/TA regression

APPENDIX 23. RANDOM EFFECTS REGRESSIONS

NFP/E	*Coef.*	*St.Err.*	*t-value*	*p-value*	*Sig*
Age	-.004	.003	-1.33	.183	-.009
Size	-.083	.04	-2.07	.039	-.162
Profitability	-2.137	.37	-5.78	0	-2.862
Tangibility	.427	.213	2.00	.045	.009
Growth	-.05	.107	-0.46	.644	-.26
Effective tax rate	-.043	.098	-0.44	.661	-.236
Non-debt tax shields	.444	1.327	0.33	.738	-2.158
Earnings volatility	-.004	.029	-0.12	.903	-.061
Constant	1.315	.432	3.04	.002	.468
R-squared		0.146	F-test		16.332
**** p<.01, ** p<.05, * p<.1*			Prob > F		0.000

FL/TA	*Coef.*	*St.Err.*	*t-value*	*p-value*	*Sig*
Age	-.001	.001	-2.23	.025	**
Size	.013	.008	1.71	.087	*
Profitability	-.485	.072	-6.77	0	***
Tangibility	.102	.041	2.49	.013	**
Growth	-.004	.02	-0.19	.848	
Effective tax rate	.021	.018	1.16	.245	
Non-debt tax shields	.041	.265	0.15	.878	
Earnings volatility	.001	.005	0.19	.849	
Constant	.221	.082	2.71	.007	***
R-squared		0.101	F-test		16.332
**** p<.01, ** p<.05, * p<.1*			Prob > F		0.000

APPENDIX 24. COMPARISON BETWEEN INITIAL HYPOTHESES AND FINDINGS

Variable	Hypothesized Relationship	Results – Public sample	Results – Private sample
Age	+	+	-
Profitability	-	-	-
Size	+	-	+
Growth	-	- (Not significant)	-
Tangibility	+	+	+
Effective tax rate	+	+	+ Not significant
Non debt tax shields	-	- (Not significant)	+- (Not significant)
Income variance	-	-	+