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Financial leverage and earnings volatility: a cross-regional analysis of corporate financial stability

Supervisor

Ch. Prof. Francesco Scarpa

Graduand

Alyssa Castioni

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Ai miei genitori,
ai sacrifici che hanno fatto per me
e per il sostegno costante che non mi è mai mancato.

A mia nonna Loredana,
la mia roccia in ogni momento, pilastro fondamentale della mia vita.

Alla mia famiglia,
per l'affetto e il bene incondizionato che mi hanno sempre dimostrato.

A Matteo,
colui che crede in me quando io stessa fatico a farlo,
mio faro nelle notti più buie.

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con cui hanno accompagnato il mio percorso.

A me stessa,
per la forza che ho scoperto dentro di me
nell'affrontare l'ansia e le difficoltà che a volte mi hanno fatto dubitare di farcela,
oggi posso dirlo: ce l'ho fatta.

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Declaration of use of Artificial Intelligence tools

I, Alyssa Castioni, declare that I used generative artificial intelligence tools, specifically ChatGPT by OpenAI, as a support tool during some phases of the preparation of this thesis.

In particular, ChatGPT was used to support the linguistic revision and improvement of the English text. It was also used to support the creation, revision and organization of the R codes employed for the empirical analysis, especially with reference to the procedures related to descriptive statistics, ANOVA, OLS regression analysis and robustness checks.

The use of artificial intelligence was limited to linguistic support and technical assistance in the development of the statistical code. The research design, selection of sources, data interpretation, discussion of the results and final conclusions were independently developed, checked and revised by me.

I further declare that all AI-assisted material was carefully reviewed, verified and integrated into this thesis under my own responsibility. Therefore, I take full responsibility for the accuracy, quality and academic integrity of the final work.

INTRODUCTION

Financial leverage represents one of the most relevant decisions in corporate finance, as it defines the extent to which firms rely on debt to finance their activities. The use of debt can support growth, investment and value creation, but it also introduces fixed financial obligations that companies must satisfy regardless of their operating performance. For this reason, leverage is closely connected to financial risk and to the ability of firms to maintain stable results over time.

In this context, earnings volatility becomes an important dimension of corporate financial stability. Volatile earnings indicate that a firm's performance fluctuates substantially over time, making future profitability less predictable and increasing uncertainty. Therefore, understanding whether financial leverage is associated with earnings volatility is relevant not only from an accounting perspective, but also from a broader corporate finance and risk management perspective.

The relationship between financial leverage and earnings volatility is theoretically complex. Debt may increase instability because it amplifies the effects of negative shocks and increases pressure on firms to meet their financial obligations. For this reason, highly leveraged firms may experience greater earnings volatility, especially when operating performance is uncertain. However, debt may also play a disciplinary role by reducing managerial discretion and encouraging a more efficient use of resources. Therefore, the expected relationship between leverage and earnings volatility is not necessarily unidirectional and may depend on the specific context and on the measure of volatility considered.

Moreover, firms do not operate in identical institutional, economic and financial environments. Capital structure decisions may be influenced by creditor protection, financial market development, legal systems, macroeconomic stability and cultural attitudes toward risk. These factors can differ substantially across geographical areas and may affect both the level of leverage adopted by firms and the consequences of leverage on earnings stability. For this reason, a global perspective is useful to understand whether the relationship between financial leverage and earnings volatility is homogeneous across

firms or whether it changes depending on the geographical context in which companies operate.

Starting from these considerations, this thesis investigates the relationship between financial leverage and earnings volatility through a cross-regional empirical analysis of corporate financial stability. The main objective is to examine whether leverage is significantly associated with earnings volatility and whether this relationship differs across geographical areas. The analysis also aims to verify whether firms located in different regions present different average levels of leverage and earnings volatility.

The empirical analysis is based on an original dataset constructed using firm-level financial data collected from Bloomberg. The initial sample includes companies from different parts of the world and is organized into seven geographical areas: Africa, Asia excluding India, Europe, India, Latin America, North America and Oceania.

The study follows three main steps. First, descriptive statistics are used to provide an overview of the sample, the distribution of firms across geographical areas and sectors and the main characteristics of the financial variables. Second, analysis of variance is applied to test whether average levels of leverage and earnings volatility differ significantly across geographical areas. Third, OLS regression models with moderator analysis are estimated to examine whether financial leverage is associated with earnings volatility after controlling for firm-specific characteristics and whether geographical area moderates this relationship. Robustness checks are then performed using alternative combinations of leverage and volatility measures.

This thesis contributes to the existing literature by focusing on a relationship that has been less explored from a broad international perspective. While previous studies have examined capital structure, leverage, firm performance and earnings volatility in specific countries, sectors or institutional contexts, this study provides a global cross-regional analysis of the leverage-volatility relationship.

The thesis is structured as follows. Chapter 1 reviews the literature on financial leverage, firm performance, earnings volatility and the institutional and cultural factors that influence capital structure decisions. Chapter 2 presents the research gap, the research question and the hypotheses developed for the empirical analysis. Chapter 3 describes

the dataset, the sample selection process, the geographical classification, the cleaning and winsorization procedures and the methodology used. Chapter 4 presents and discusses the empirical results, including descriptive statistics, ANOVA results, OLS regression models and robustness checks. Finally, the conclusion summarizes the main findings, discusses their implications and identifies the limitations of the study.

1. LITERATURE REVIEW

1.1. Financial leverage

Companies can raise capital in two main ways: internally or externally. Internally, they can reinvest profits that would otherwise be paid as dividends to shareholders. Externally, they can raise funds by issuing debt or equity. When a company issues shares, shareholders expect dividends, but the company is not required to pay them, as this is optional. When a company takes on debt, it must make regular interest payments and repay the loan. If profits increase, debt holders receive their fixed interest, and the remaining gains go to shareholders. If profits decrease, shareholders bear the losses. If the company struggles and cannot meet its debt obligations, it may go bankrupt, causing shareholders to lose their investment. Therefore, debt can amplify both returns and losses, which is known as "financial leverage." A company that is "unlevered" uses only equity capital, while a "levered" company uses both equity and debt.

Financial leverage involves borrowing money to increase the capital available for business operations or asset purchases. The goal is to earn a return greater than the cost of borrowing. When used correctly, leverage can increase a company's performance. However, it also carries risks, as companies must meet their debt obligations regardless of their earnings and returns. If a company's performance declines, these obligations can lead to financial distress.

Leverage is important in capital structure because, if managed well, it can lower the company's weighted average cost of capital (WACC), which is the overall return a company needs to pay for financing. Lowering WACC helps increase the company's value. The goal of leverage is to find the right balance of debt and equity that maximizes firm value by minimizing WACC.

The decision on how much leverage to use is complex, as companies must balance the uncertainty of cash flows and the ability to access capital through debt or equity.

Financial leverage is often evaluated using various ratios that compare a company's debt to its equity, assets, or earnings. These ratios provide insights into a company's financial risk.

The debt-to-assets ratio shows the proportion of a company's debt relative to its assets. It is calculated by dividing total liabilities by total assets.

The debt-to-equity ratio shows the relationship between a company's debt and its equity, helping stakeholders understand the company's financial risk. It is calculated by dividing total debt by total equity.

Other commonly used ratios include the debt-to-capital ratio, debt-to-EBITDA ratio, and interest coverage ratio.

A higher debt-to-equity ratio indicates more financial leverage, meaning the company relies more on debt than its own funds. Companies with higher debt levels are seen as riskier because they depend more on borrowed funds than on internal cash flow.[1]

The decision to use financial leverage is central to a company's capital structure and directly influences its financial performance and risk profile. Financial leverage plays a key role in determining a firm's earnings volatility. However, the effect of leverage on earnings volatility is complex and depends on various factors, including the firm's debt levels, its ability to generate stable cash flows and the economic context in which it operates. To better understand this relationship, several theories of capital structure provide valuable frameworks. These theories help explain how financial leverage impacts earnings volatility and why the effects may vary across continents.

For example, the static trade-off theory is particularly relevant, as it emphasizes the trade-off between the benefits of debt, such as the tax deductibility of interest payments, and the costs, particularly the risk of financial distress. When a company increases its debt, it may lower its cost of capital and boost returns. However, if the company becomes over-

[1] LiveFlow. (2022, August 25). Financial leverage ratio. https://liveflow.com/blog/financial-leverage-ratio
Corporate Finance Institute. (n.d.). Financial leverage. Corporate Finance Institute. https://corporatefinanceinstitute.com/resources/commercial-lending/financial-leverage/

leveraged, it faces higher risks of financial distress, which can increase earnings volatility. In regions with higher financial distress costs, for example countries with less favorable bankruptcy laws or more volatile markets, the risk of financial distress is more significant, amplifying earnings fluctuations. Therefore, this theory helps explain why firms in such regions may face greater earnings volatility when they use high leverage compared to firms in countries with more stable financial systems.

Similarly, the asymmetric information signaling theory also plays a critical role in understanding how leverage impacts earnings volatility. It explains why firms might prefer debt over equity, especially when there is an imbalance of information between management and external investors. Companies with better knowledge of their financial situation may opt for debt to signal strength, avoiding the perceived negative signal of issuing equity. This higher debt level can increase earnings volatility, as it amplifies the risk that debt obligations may not be met if the company's performance fluctuates. In regions where information asymmetry is high, such as emerging markets, the effect of leverage on earnings volatility is likely to be more pronounced. Firms in these markets may rely more on debt to signal confidence, leading to greater earnings volatility compared to firms in regions with more transparent financial reporting and better access to equity markets.

The legal environment framework suggests that the strength of a country's legal system influences the degree to which firms use debt. In countries with strong legal protections for creditors and investors, firms are more willing to take on debt because they know their rights are better protected in case of financial distress. This can lead to greater leverage but lower earnings volatility, as the company has better access to capital with fewer risks of severe consequences if it faces financial difficulties. In contrast, in regions with weaker legal protections, firms are less likely to use debt, and those that do might face higher bankruptcy risks, leading to higher earnings volatility.

Lastly, the agency cost models highlight the conflict of interest between managers and shareholders. When a firm has excess free cash flow, managers may be tempted to pursue projects that benefit them personally rather than the shareholders. To mitigate this, firms use debt as a mechanism to reduce available cash flow and limit managerial discretion. This can potentially reduce earnings volatility by forcing managers to focus on projects

that can generate stable cash flows to meet debt obligations. However, the effectiveness of debt in reducing volatility depends heavily on the corporate governance standards in place. In regions with strong corporate governance and oversight, the use of debt is more likely to align managerial and shareholder interests, leading to more stable earnings. In countries with weaker governance frameworks, however, debt may exacerbate agency problems, increasing earnings volatility due to managerial risk-taking.[2]

Financial leverage itself can function as an integral part of a management control system (MCS) within an organization. While traditional MCSs are typically focused on monitoring and evaluating financial performance, financial leverage plays a critical role in helping managers balance risk and return. By adjusting the level of debt in the capital structure, companies can strategically influence their cost of capital, risk exposure, and overall financial stability. Financial leverage, when effectively integrated into a broader management control system, allows managers to make more informed decisions regarding debt usage, thus ensuring the company maintains control over its financial operations. The use of financial leverage as a management tool provides managers with a structured approach to assess and mitigate risks, helping businesses navigate the trade-off between financing growth and controlling financial exposure. As such, financial leverage becomes not only a financial strategy but also a key aspect of operational and strategic control.[3]

[2] Kumar, R. (2007). Determinants of firm's financial leverage: A critical review. Management Development Institute, Gurgaon. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1080883

[3] Graña-Álvarez, et al. (2024). Management control systems, business financial literacy and financial leverage in business-incubated start-ups. The British Accounting Review, 56(6), 101427, https://www.sciencedirect.com/science/article/pii/S0890838924001914

1.2. Financial leverage and its effects on performance

As mentioned before, financial leverage plays a crucial role in determining a firm's financial performance, specifically its return on assets (ROA), return on equity (ROE)[4] and overall firm value. The impact of financial leverage on these performance indicators has been widely debated in the academic literature, with varying findings depending on the firm's debt structure and the economic environment. Several studies have explored the relationship between financial leverage and performance, highlighting both the positive and negative effects of leveraging debt in a company's capital structure.

The study conducted by Haomin Chen (2020) provides a comprehensive empirical analysis of the impact of financial leverage on firm performance in the context of Chinese listed companies over the period 2010–2019. Using a large sample of 10,790 firm-year observations from companies listed on the Shanghai and Shenzhen Stock Exchanges, the study examines how financial leverage, measured as total debt divided by total assets, affects firm performance, proxied by return on assets. The core empirical result shows a statistically significant and negative relationship between financial leverage and ROA. This finding supports the hypothesis that excessive reliance on debt financing increases financial risk and agency costs, which ultimately outweigh the potential benefits of debt, such as tax shields. In particular, the study emphasizes that debt introduces additional financial risk into the firm's operations and may exacerbate agency conflicts between managers and creditors, especially when debtholders impose restrictive covenants that limit managerial flexibility. Chen also situates these findings within the broader theoretical debate on capital structure. While debt is often considered cheaper than equity and can enhance returns under certain conditions, the empirical evidence in the

[4] Return on Equity is a financial metric that measures the profitability of a company in relation to the equity invested by its shareholders. It is calculated by dividing net income by shareholders' equity. ROE reflects how effectively a company uses its equity base to generate profits, with a higher ROE indicating greater efficiency in utilizing shareholder investments.
Return on Assets is a profitability ratio that indicates how well a company uses its assets to generate net income. It is calculated by dividing net income by total assets. ROA provides insight into the efficiency of asset utilization, with a higher ROA showing that the company is effectively using its assets to produce earnings.

Chinese context suggests that, on average, higher leverage undermines performance. The author notes that many Chinese firms adopt relatively conservative financing strategies and, in this environment, the marginal increase in debt tends to intensify financial pressure rather than generate performance gains. This is consistent with the idea that beyond a certain threshold, the costs of financial distress and agency problems exceed the advantages of debt financing. Companies should focus on balancing both financial and operating leverage to optimize their performance and adjust operating leverage to mitigate the adverse effects of debt financing. The research emphasizes that a firm's approach to leveraging debt should be carefully aligned with its overall risk management strategy to ensure long-term sustainability.[5]

Another point of view talking about this relationship can be seen in the article written by Floyd Khoza (2025), where the author explores the effects of financial leverage and liquidity on the financial performance of consumer goods firms listed on the Johannesburg Stock Exchange (JSE) over the period 2015–2024. This study focuses on understanding how leverage influences the profitability of firms in the consumer goods sector, with financial performance measured by return on assets as the dependent variable. The study finds that while an increase in leverage is generally expected to lower ROA due to the associated financial risks, the relationship between financial leverage and ROA is statistically insignificant. This suggests that financial leverage does not always translate into improved performance for consumer goods firms listed on the JSE. The study highlights the complex nature of the leverage-performance relationship, noting that while higher levels of debt might theoretically lead to greater financial flexibility and tax savings, these benefits are not always realized in practice, particularly when the risks associated with debt become pronounced. Khoza's study contributes to the existing literature by focusing on the consumer goods sector, which has been under-researched in relation to leverage and liquidity. The research calls attention to the need for firms to carefully balance their liquidity and leverage ratios to avoid excessive financial risk and

[5] Chen, H. (2020). The impact of financial leverage on firm performance – Based on the moderating role of operating leverage. Atlantis Press, Proceedings of the Fifth International Conference on Economic and Business Management. https://www.researchgate.net/publication/347670441_The_Impact_of_Financial_Leverage_on_Firm_Performance_-_Based_on_the_Moderating_Role_of_Operating_Leverage

to ensure operational stability and long-term profitability. The results emphasize that while leverage may not necessarily lead to poor performance, it underscores the importance of managing debt levels carefully and strategically, particularly in the context of volatile economic conditions.[6]

In Adenugba et al. (2016), the relationship between financial leverage and firm value is explored focusing on 5 selected firms listed on the Nigerian Stock Exchange for the period from 2007 to 2012. The primary objective of the study was to determine how financial leverage affects firms' market value, particularly in the context of long-term investments. The study reveals a significant relationship between financial leverage and firm value. Financial leverage, represented by the debt-to-equity ratio, plays a crucial role in determining the market value of firms. The findings indicate that firms with moderate debt levels experience an increase in firm value, primarily due to the tax benefits associated with debt financing. However, excessive leverage, which leads to financial risk, can negatively affect firm value, especially when the firm faces difficulties in servicing its debt obligations. The research concludes that financial leverage is often a better source of financing for long-term projects than equity. Debt financing provides tax deductions through interest payments, which lower the cost of capital and enhance profitability. The study supports the view that debt can act as a lever, increasing both returns and financial risk. However, when debt levels exceed an optimal threshold, the risk of bankruptcy rises, which can reduce the market value of the firm. The study's empirical results also highlight the non-linear relationship between leverage and firm value. It is observed that some firms see their market value increase as leverage rises, while others experience a decrease in value with higher leverage. This divergence suggests that the impact of leverage on firm value is context-dependent and may vary across different industries or firms with different operational characteristics. High levels of debt in a firm's capital structure are closely associated with financial distress. The study points out that firms with excessive leverage are more likely to experience volatility in earnings and a decline in profitability, especially during periods of economic downturn or operational challenges. The study

[6] Khoza, F. (2025). The impact of liquidity and leverage on the financial performance of the Johannesburg Stock Exchange-listed consumer goods firms. Journal of risk and financial management, 18(9), 510, 21582440231204099, https://www.mdpi.com/1911-8074/18/9/510

recommends that firms should optimize their financial leverage to maximize firm value. This can be achieved by maintaining an optimal mix of debt and equity that balances the benefits of tax shields with the risks of financial distress. It further suggests that companies should carefully monitor their debt levels and avoid over-reliance on debt financing, particularly in sectors prone to financial instability.[7]

Moreover, in 2023 Arhinful and Radmehr also explored the relationship between financial leverage and firm performance focusing on data from 257 firms across the automotive, construction, electronics, metal, and telecommunications sectors listed on the Tokyo Stock Exchange between 2000 and 2021. The primary objective of this research was to analyze how financial leverage, in conjunction with various coverage ratios and debt structures, impacts key financial performance indicators, specifically return on assets, return on equity and Tobin's Q.[8] The study highlights the complex nature of the leverage-performance relationship, stressing the need for firms to maintain a balanced capital structure that optimizes debt use while mitigating associated risks. One of the key findings of the study is the positive and statistically significant effect of interest coverage on ROA, ROE, and Tobin's Q. The results indicate that firms with strong interest coverage are better positioned to meet their debt obligations, which in turn enhances their financial performance. This aligns with prior research suggesting that the ability to service debt through operating income provides firms with the financial flexibility necessary to optimize their performance. Conversely, the study reveals a negative impact of debt service coverage ratio on ROA and ROE, highlighting that excessive reliance on debt can introduce financial strain, particularly when firms are unable to meet their debt service obligations. This finding emphasizes the dual-edged nature of leverage: while moderate debt levels can foster growth, excessive debt can lead to financial distress, ultimately

[7] Adenugba, A. A. (2016). Financial leverage and firms' value: A study of selected firms in Nigeria. European Journal of Research and Reflection in Management Sciences, 6(2), 699-705. https://www.idpublications.org/wp-content/uploads/2016/01/Full-Paper-FINANCIAL-LEVERAGE-AND-FIRMS%E2%80%99-VALUE-A-STUDY-OF-SELECTED-FIRMS-IN-NIGERIA.pdf

[8] Tobin's Q is a financial indicator that compares the market value of a firm with the replacement cost of its assets. It is typically calculated as the ratio between the company's market value (including equity and sometimes debt) and the book value of its total assets. A Tobin's Q greater than one suggests that the market values the firm more highly than the recorded value of its assets, often indicating strong growth expectations or valuable intangible assets, while a value below one may indicate that the firm is undervalued or using its assets less efficiently.

diminishing firm performance. The authors also emphasize the importance of asset coverage ratios and cash coverage ratios in assessing a firm's capacity to meet its debt obligations. The study finds that higher cash coverage ratios have a statistically significant positive impact on ROA, suggesting that firms with sufficient liquidity to meet their interest payments and operational costs are better equipped to achieve higher profitability. On the other hand, the asset coverage ratios' relationship with ROA is negative and statistically insignificant, indicating that a higher reliance on assets for debt coverage does not always translate into improved financial performance. Another crucial aspect of the study is its consideration of external economic factors, including the impact of the COVID-19 pandemic and global economic policy uncertainty on firm performance. The study reveals that the pandemic negatively affected financial performance, consistent with findings in previous research on the adverse effects of global crises on corporate financial outcomes. However, the study also uncovers a positive relationship between global economic policy uncertainty and firm performance, suggesting that greater economic policy certainty at a global level can lead to improved financial performance, possibly by reducing risks associated with unpredictable economic environments.[9]

Lastly, in the research made by Maharani et al. (2024), the authors explore the critical relationship between good corporate governance and leverage, particularly focusing on how these two factors jointly influence corporate financial performance. Their literature review synthesizes the findings of recent studies and posits that an effective combination of governance practices and financial leverage is essential for improving firm profitability, reducing financial risks, and enhancing overall firm value. The study draws on a variety of theoretical perspectives to highlight the dual roles of good corporate governance mechanisms, such as transparency, accountability, and oversight, in shaping financial outcomes, as well as the complex relationship between leverage and financial performance.

[9] Arhinful, R., & Radmehr, M. (2023). The impact of financial leverage on the financial performance of the firms listed on the Tokyo Stock Exchange. SAGE Open, 13(2), https://journals.sagepub.com/doi/10.1177/21582440231204099

The authors discuss how the impact of financial leverage is nuanced and multifaceted. While leverage, when used optimally, can enhance profitability by providing tax advantages and boosting operational capacity, its effects on financial performance are not straightforward. The article cites Margaritis and Psillaki (2021), who argue that leverage has a positive impact on financial performance up to a certain level, after which the risks associated with high levels of debt outweigh the benefits. Excessive leverage can lead to increased financial risk, including higher bankruptcy costs and an elevated weighted average cost of capital, which may ultimately reduce the firm's value.

The article suggests that the relationship between leverage and performance follows a non-linear pattern, where moderate levels of debt may enhance profitability, but as leverage increases beyond an optimal point, the risks of financial distress rise, potentially harming the company's financial health. This aligns also with the trade-off theory, which advocates for a balance between the tax benefits of debt and the potential costs associated with financial distress. Moreover, the authors emphasize that good corporate governance mechanisms can play a crucial moderating role in this relationship. Effective governance practices can help mitigate the risks of excessive leverage by ensuring that debt is used judiciously and aligned with the company's long-term strategic goals.

The review suggests that firms should avoid over-relying on debt and focus on maintaining a balanced capital structure that promotes sustainable growth. By ensuring that the governance practices and leverage policies are aligned, companies can enhance their financial performance and create long-term value for stakeholders.[10]

The studies reviewed present a mixed but insightful picture of the relationship between financial leverage and firm performance. The convergence across these studies lies in the recognition that excessive leverage often increases financial risk and can negatively impact performance, including returns on assets, return on equity and overall firm value. Specifically, the studies by Chen (2020) and Khoza (2025) highlight the risks associated with high leverage, finding negative or insignificant relationships between leverage and

[10] Maharani, A., Kani Putri, Y. S., & Khairany, D. G. (2025). Optimizing corporate financial performance through good corporate governance and leverage: A literature review. DINASTI Accounting Review, 8(1), 1819. https://dinastires.org/DAR/article/view/1819

performance in certain contexts. Conversely, Adenugba et al. (2016) and Maharani et al. (2024) find evidence of an optimal leverage level, suggesting a non-linear relationship where moderate leverage enhances firm value and profitability, but excessive debt increases financial distress. Arhinful and Radmehr (2023) further emphasize that leverage's impact is not solely determined by debt levels but also by a firm's interest coverage, with moderate leverage being beneficial, while excessive debt causes financial strain. Finally, the research conducted by Maharani (2024) contributes to the literature reviewed giving an insight on how also corporate governance, combined financial leverage, can impact a firm's performance.

The studies collectively highlight that firms must carefully balance leverage to optimize performance, minimize risks, and maintain financial stability. Governance and interest coverage play a significant role in moderating these effects, ensuring that debt is used strategically to maximize long-term value.

1.3. Earnings volatility

Earnings volatility refers to the degree of fluctuation in a company's earnings over a specific period, often measured as the standard deviation of earnings. This metric captures how much a company's reported earnings deviate from its average over time, indicating the level of uncertainty or risk associated with its financial performance. A higher standard deviation suggests more significant fluctuations in earnings, signaling greater unpredictability in the company's ability to generate consistent profits. Volatility can stem from both external economic factors and internal accounting practices, making it an important measure of a company's financial health.

As discussed by Dichev and Tang (2009), earnings volatility plays a crucial role in understanding a firm's earnings predictability, with volatile earnings generally leading to

less predictable future earnings. The authors argue that earnings volatility is a significant indicator of how stable or unstable a company's financial performance may be in the future. Their study underscores that firms with more stable earnings, which are characterized by low volatility, tend to exhibit higher earnings persistence. This means that the earnings reported by these firms today are more likely to be reflective of their future performance, providing a reliable indicator of what to expect moving forward. In contrast, companies with high earnings volatility experience substantial reversals in earnings, leading to much lower predictability of future earnings over time. This inverse relationship is particularly important for investors and analysts, as the ability to predict future earnings is fundamental to making informed investment decisions and forecasting a company's long-term financial health.

Dichev and Tang explore the factors behind the negative relationship between earnings volatility and earnings predictability. They suggest that volatility in earnings can arise from multiple sources, including economic shocks that disrupt market conditions, as well as accounting issues such as poor matching between revenues and expenses, which leads to the increased uncertainty of earnings forecasts. For example, high volatility in earnings often reflects a firm's exposure to unpredictable market changes, such as shifts in demand, regulatory changes, or external events like economic recessions, which can cause erratic performance over time. These fluctuations make it more difficult for analysts and investors to rely on past performance as an accurate predictor of future profits. As a result, the forecasting errors associated with high volatility are often larger, and the reliability of earnings predictions decreases. Volatility, in this context, becomes not only an indicator of past financial performance but also a warning sign of the challenges a company may face in maintaining stability in the future.[11]

Thus, earnings volatility is more than just a statistical measure, it serves as a critical indicator of a firm's capacity to maintain steady financial performance, with far-reaching implications for its stability and the reliability of future earnings projections. High

[11] Dichev, I. D., & Tang, V. W. (2009). Earnings volatility and earnings predictability. Journal of Accounting and Economics, 84(1), 215-246. https://www.sciencedirect.com/science/article/pii/S0165410108000578?via%3Dihub

volatility can reflect underlying business risks, poor accounting practices, or financial mismanagement, all of which can signal potential instability for stakeholders.

1.4. The link between financial leverage and earnings volatility

Financial leverage has a significant impact on the stability and predictability of a company's earnings. The relationship between financial leverage and earnings volatility has been explored in various sectors. Generally, financial leverage amplifies the fluctuations in a company's earnings, leading to higher earnings volatility.

In the research by Boll, Müller, and Sidki (2022), the authors investigate the relationship between earnings volatility and earnings management among municipal enterprises in Germany, focusing on how financial leverage impacts the extent of earnings management in these firms. The study shows that firms with higher leverage ratios are more likely to engage in earnings management strategies, especially in the face of volatile earnings. The researchers suggest that leverage amplifies the challenges of maintaining consistent financial performance, as firms with large debt obligations face increased pressure to meet their financial commitments. This pressure becomes particularly acute when earnings are volatile, as firms may struggle to generate predictable cash flows to meet debt service requirements, potentially leading to earnings smoothing through strategic accounting decisions. The authors also emphasize that financial leverage not only magnifies earnings volatility but also heightens the agency costs between managers and stakeholders. The agency theory suggests that managers may use earnings management to align the financial statements with their interests, such as avoiding penalties for missed financial targets or maintaining their reputation within the firm or in the market. This dynamic is especially strong in publicly owned enterprises like the municipal firms studied, where political and social expectations may further influence management's incentives to smooth earnings, often to align with broader political goals or to avoid

political backlash from poor financial results. The study reveals that while debt financing can be a useful tool for leveraging a firm's capacity for growth, it also brings substantial risks, particularly in firms with volatile earnings. The higher the debt, the more exposed the firm becomes to market fluctuations, as the obligation to repay creditors remains fixed, regardless of the firm's performance. Consequently, firms with high debt levels are not only more likely to experience earnings volatility but also to engage in earnings management strategies to mitigate the financial pressure and avoid the appearance of financial instability. Boll, Müller, and Sidki conclude that firms with a high leverage ratio are more likely to face increased earnings volatility, which directly influences their financial reporting behavior.[12]

Additionally, Ujah and Brusa (2014) examine the impact of financial leverage and cash flow volatility on earnings management across multiple industries. The authors explore data from 489 firms between 1990 and 2009, investigating how financial leverage and cash flow volatility contribute to the degree of earnings management. The results reveal that firms with higher financial leverage tend to exhibit increased earnings volatility, which leads them to engage more actively in earnings management. The research highlights that firms with significant debt obligations face immense pressure to meet interest payments, regardless of their earnings performance. This creates a scenario where firms may resort to earnings management techniques to smooth out earnings fluctuations and present a more stable financial picture to stakeholders, such as creditors and investors. Financial leverage, which often stabilizes cash flow in the short term, ultimately amplifies the firm's exposure to financial risk, especially during periods of revenue shortfalls or operational cost fluctuations. As a result, firms with higher leverage are more likely to engage in earnings management as a strategy to avoid missing financial targets, maintain access to capital, and comply with debt covenants. This study shows that while leverage can provide essential capital for business growth, it also magnifies earnings volatility because any deviation in revenue or operational costs directly impacts the ability of firms to meet their fixed debt obligations. The more volatile the earnings, the

[12] Boll, D., Müller, H., & Sidki, M. (2022). Determining the drivers of earnings management among municipal enterprises: Evidence from Germany. Public Money & Management, 42(7), 507–515. https://www.tandfonline.com/doi/full/10.1080/09540962.2022.2076515

greater the tendency for firms to manipulate earnings through operational adjustments, such as deferring expenses or accelerating revenue recognition, to meet debt servicing requirements. This use of earnings management serves as a short-term solution to the challenges posed by earnings volatility but may distort the true financial health of the company. Furthermore, Ujah and Brusa highlight the broader implications of these findings for corporate governance. They suggest that while earnings management can help firms navigate periods of earnings instability, it also raises concerns regarding the integrity of financial reporting. Excessive reliance on earnings management techniques can undermine investor confidence, particularly if the practices employed to smooth earnings become too aggressive or mislead external stakeholders. This reinforces the need for firms to strike a balance between leveraging debt for growth opportunities and maintaining transparent, honest financial reporting practices.[13]

Moreover, in the study conducted by Ahmed (2023), the author explores the link between financial leverage and real earnings management, with a specific focus on how earnings volatility impacts this relationship. Using a sample of non-financial firms listed on the Pakistan Stock Exchange between 2004 and 2018, the study delves into the dynamics of how high leverage levels influence managerial decisions to engage in earnings management, particularly in the context of earnings volatility. The research highlights that firms with higher leverage are more likely to resort to real earning management strategies as a way of stabilizing their financial performance and ensuring they meet the financial expectations of investors and creditors. The study's key finding is that as firms face increased earnings volatility, their managers are under greater pressure to smooth earnings to avoid missing financial targets, such as debt covenants or analyst

[13] Ujah, N. U., & Brusa, J. (2014). Earnings management, financial leverage, and cash flow volatility: An analysis by industry. Journal of Business and Economics,, 14(1), 45-65. https://d1wqtxts1xzle7.cloudfront.net/112278113/201461443054658-libre.pdf?1710072976=&response-content-disposition=inline%3B+filename%3DEarnings_Management_Financial_Leverage_a.pdf&Expires=1763074957&Signature=E-B--AbijIV3aKUfmQrvwDfwQworRPBzfnsQE6Go0tsUvV5v5viQzJ1ed528ZPBp~eGR7IOu1BS-7YfHsZU-urY9v576mJz2KL1BXsBFjfRdrXk-fFKOI-Lj6~HI~b146c90ML54G5DozZvPbBLu1WlXPQ~vFx1xzIyzIX0zLSEgazpxToofq4nDDP0haFRfKsa5NYu7lCu-AXaMf3YuWDOKS8D0JU6TuF4S44qerQ3LDhb-FZFEa95JllW7WEmg5F-YYdYHQ4oKAg~AokhOIXvZXAB84IbKCU0ouka4g2imwwsqFaS8To52JZ~9YGO2ejP~3XL0mg7XNchaif-1Fw__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

expectations. This pressure leads managers to make operational decisions that deviate from standard business practices. Ahmed argues that while financial leverage can offer short-term benefits, such as tax savings and financial flexibility, it also increases the likelihood of earnings volatility in the long run. As firms with high leverage struggle to meet their debt obligations, they may manipulate real activities, such as discretionary expenditures or production costs, to present a more favorable financial picture. This behavior, though legal under generally accepted accounting principles, introduces a risk of misrepresentation, ultimately eroding the reliability of financial reports and misleading stakeholders.[14]

On the other hand, many researchers studied the opposite relationship analyzed before, so the impact of earnings volatility on financial leverage. For example, the study conducted by Mabandla and Marozva (2024) examines this correlation within the banking sector in South Africa. The research analyzes data from South African banks between 2012 and 2021, aiming to understand how fluctuations in earnings impact the capital structure of banks. One of the key findings of the study is that there is a negative relationship between earnings volatility and leverage in the banking sector. Specifically, the research shows that as earnings volatility increases, banks tend to reduce their leverage ratios. This occurs because high earnings volatility increases the financial risk faced by banks, making it more difficult for them to meet their debt obligations, especially during times of financial uncertainty. The study highlights that financial institutions, particularly those operating in oligopolistic markets like the South African banking sector, often adopt a conservative approach to leverage when confronted with higher earnings uncertainty. In such markets, a small number of dominant banks hold significant market

[14] Ahmed, B. (2023). The influence of earnings volatility on the association among leverage and real earnings management. International Journal of Management Research and Emerging Sciences. https://d1wqtxts1xzle7.cloudfront.net/109222982/6. Bilal Ahmed 516 pp 85 101 -libre.pdf?1702969447=&response-content-disposition=inline%3B+filename%3DThe_Influence_of_Earnings_Volatility_on.pdf&Expires=1763074969&Signature=g80elqbYEalFNKer6fJPnVKhg3kIbQ1x246loaJ3JoaY0Q2yWMK7b5hsIYx4k4Uk8b4KivZJtfIAksm-EDGbBr2ccg1YSDJbUk2fkZLb6DGq0bB2TxQW96ZRJVTZB5XhJl7J1cjw4O7oQIEizmOUrWApw0ZZ~IdttLrtkBADph6L6xMuP3wUYM-b9BftB9wIh8U1LlJIornqEhJbNTyBt5VubM225KZ9W68LU0AJAAiAQztw2Z3uqqcBdWcgA26jniQmnUj3~NYpooT~-y1n4MPCTDrGNAr7-UxKHK6Bk~A8SKeci3a0fRif~9idGkLa-C4qh-3~BNIfBfezfvENTw__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

power, which means they are more cautious in their financial strategies to maintain stability and avoid exacerbating risk. The findings indicate that when banks experience volatile earnings, they are less likely to increase their reliance on debt, preferring instead to seek internal financing or lower levels of debt to safeguard against potential financial distress. The negative relationship between earnings volatility and leverage underscores a key finding in corporate finance: that debt increases a firm's exposure to risk, particularly when earnings are unstable. During periods of high earnings volatility, banks with higher leverage face the compounded risk of not being able to meet fixed debt obligations. This could lead to increased financial distress, which is why banks in volatile environments prefer to lower their leverage ratios. Moreover, the study suggests that leveraging debt during periods of earnings volatility can significantly heighten the risk of default, as higher leverage amplifies the adverse effects of fluctuating earnings on a bank's ability to pay its obligations.[15]

The article by Putri (2024) also examines the relationship between earnings volatility and financial leverage, focusing on the Indonesian consumer goods industry. The analysis draws on data from 39 companies listed on the Indonesia Stock Exchange, specifically focusing on how the volatility of earnings affects the capital structure decisions of these firms. The key finding of the research is that there is a negative relationship between earnings volatility and leverage ratios, meaning that firms with higher earnings volatility tend to maintain lower levels of debt in their capital structure. The rationale behind this negative correlation is tied to the challenges that earnings volatility poses in managing debt. When earnings are highly volatile, companies face greater difficulty in predicting their future cash flows, which makes it more challenging to meet fixed debt obligations, such as interest payments and loan repayments. This heightened financial risk increases the likelihood of default, especially during periods of low profitability or financial instability. As a result, firms in the consumer goods sector tend to favor internal financing or opt for lower levels of debt, as they seek to reduce exposure to these risks and maintain

[15] Mabandla, N., & Marozva, G. (2024). The effect of earnings volatility on capital structure: A case of oligopolistic banking sector. Global Business Review. https://www.researchgate.net/publication/387434497_The_Effect_of_Earnings_Volatility_on_Capital_Structure_A_Case_of_Oligopolistic_Banking_Sector

greater financial flexibility. This conservative approach to leverage is particularly evident in industries that experience significant market fluctuations, where the volatility of earnings can be a serious concern for both creditors and shareholders. Putri's study also reveals that companies with more stable earnings are better positioned to secure external financing, as creditors are more willing to lend to firms with predictable and stable cash flows. Conversely, firms experiencing significant earnings volatility may struggle to access external financing at favorable terms, leading them to rely more heavily on internal resources, such as retained earnings or equity financing. This dynamic underscores the importance of earnings stability in influencing capital structure decisions and highlights how volatile earnings can constrain a company's ability to expand its debt capacity. Additionally, the research points to the strategic decisions firms make in response to earnings volatility. While debt can provide financial flexibility and support growth initiatives, the potential for increased financial distress during periods of earnings volatility discourages firms from taking on excessive debt. Instead, they may prioritize maintaining a strong balance sheet with a lower debt ratio, ensuring they have the financial resilience to weather economic downturns or market disruptions. This decision-making process is particularly relevant in the consumer goods sector, where firms face fluctuating demand, price sensitivity, and supply chain disruptions, all of which contribute to earnings instability.[16]

The studies collectively show that the relationship between financial leverage and earnings volatility reveals two key dynamics. Most studies suggest that higher financial leverage amplifies earnings volatility, as firms with greater leverage face increased pressure to meet debt obligations, often resorting to earnings management to stabilize their financial performance. For example, Boll, Müller, and Sidki (2022), Ujah and Brusa (2014), and Ahmed (2023) all demonstrate that firms with high leverage tend to experience more earnings volatility and engage in strategic accounting to manage it. Conversely, other research that explored the opposite relationship, such as those by

[16] Putri, R. L. (2024). Analysis of the effect of asset structure, earnings volatility, and financial flexibility on capital structure in consumer goods industry sector companies on the Indonesia stock exchange. Journal of Management & Research. https://www.emerald.com/lbsjmr/article/22/1/25/1212956/Analysis-of-the-effect-of-assets-structure-earning

Mabandla and Marozva (2024) and Putri (2024), show that higher earnings volatility leads firms to reduce their leverage to avoid financial distress, particularly in sectors with unstable earnings. These contrasting findings highlight the complex relationship between leverage and earnings volatility, suggesting that while leverage can drive growth, it also increases vulnerability to market fluctuations, prompting firms to adjust their debt levels depending on their earnings stability.

1.5. Institutional and cultural differences in financial structure across macro-regions

Institutional and cultural factors play a pivotal role in shaping corporate capital structures across different macro-regions. These factors encompass a variety of legal, financial, and social components that impact how firms decide on their mix of debt and equity financing. The interplay between a country's legal framework, regulatory environment, and its cultural values significantly influences the decisions that firms make regarding their capital structure, with some regions more inclined to use debt financing than others due to these differences.

Research indicates that country-specific institutional characteristics significantly affect the capital structure decisions of firms. For instance, in the article by Gungoraydinoglu and Öztekin (2011), it is evident that institutional characteristics significantly influence the capital structure decisions of firms across different countries. The authors argue that country-specific factors such as bankruptcy laws, creditor rights, and tax systems have a substantial effect on a firm's use of debt financing, shaping leverage choices. For example, in countries with strong creditor rights and efficient bankruptcy systems, firms are more inclined to use debt due to the relatively lower costs of financial distress. The efficiency of bankruptcy processes reduces the financial and legal complexities faced by firms in default situations, making debt a more attractive option compared to equity financing.

This dynamic is particularly pronounced in countries with robust legal frameworks, where creditors have the necessary legal rights and enforcement mechanisms to recover their funds, which in turn reduces the ex-ante costs of borrowing. As a result, firms operating in such environments are more likely to leverage debt, taking advantage of the tax shield benefits associated with interest payments on debt. The lower cost of bankruptcy and financial distress in these institutional environments facilitates higher leverage ratios and allows firms to capitalize on the benefits of debt financing, such as increased financial flexibility and improved profitability. Conversely, in countries where the legal and institutional frameworks are weaker, firms are less inclined to take on debt. In these settings, inefficient bankruptcy procedures, weaker creditor protection, and inadequate enforcement of creditor rights increase the risks associated with debt financing. The cost of financial distress in such countries is higher, leading firms to opt for equity financing instead of debt to avoid the significant risks associated with default and the potential for lengthy and costly bankruptcy proceedings. In these cases, firms are likely to seek equity financing as a safer and less risky alternative to debt. This is particularly true in emerging markets, where institutional weaknesses, such as underdeveloped financial systems, lack of transparency, and political instability, raise the costs of debt and increase uncertainty for creditors. As a result, firms in these regions might prioritize raising capital through equity, as it allows them to maintain greater control over their financial stability while minimizing the risk of default and bankruptcy. The study also emphasizes how institutional arrangements can act as substitute mechanisms for firm-level factors like liquidity, profitability, and size. In countries where institutional quality is high, the importance of firm-specific factors in determining leverage decreases because institutional factors such as strong creditor rights and tax benefits play a more significant role. In contrast, in countries with weaker institutions, firm-specific factors become more prominent as firms are forced to rely on their internal characteristics and capabilities to manage capital structure decisions. This highlights the importance of understanding the interaction between firm-level characteristics and the institutional environment in which the firm operates.[17]

[17] Gungoraydinoglu, A., & Öztekin, Ö. (2011). Firm- and country-level determinants of corporate leverage: Some new international evidence. Journal of Corporate Finance, 17(5), 1077-1099. https://www.sciencedirect.com/science/article/pii/S0929119911000964

Moreover, also de Jong et al. (2008) in their study provide compelling evidence regarding the significant influence of country-specific institutional factors on the capital structure decisions of firms across 42 countries. Their analysis reveals that even within countries that share similar legal systems, the development of local bond markets, the efficiency of legal systems, and the level of creditor rights protection vary significantly, and these variations directly affect firms' choices between debt and equity financing. One of the key findings of the study is that in countries with well-developed bond markets, firms are more inclined to use debt as a primary source of financing. The availability of a liquid and efficient bond market provides firms with greater access to capital at lower costs, as competition among creditors helps reduce borrowing costs. This environment encourages firms to rely more on debt financing, as it provides the flexibility needed to finance expansion and take advantage of new growth opportunities. Stronger creditor protection further enhances this tendency, as firms feel more secure about borrowing in countries where legal frameworks ensure that creditors can effectively enforce their claims in case of default. In contrast, in countries with weaker protection for creditors or less efficient bankruptcy systems, firms tend to avoid debt financing and prefer equity financing instead. In these environments, the higher risks associated with debt, due to the possibility of unfavorable legal outcomes or prolonged bankruptcy proceedings, discourage firms from taking on excessive financial obligations. The study highlights that weaker creditor rights increase the perceived cost of borrowing, making firms more likely to opt for equity to minimize the risk of financial distress and default.

Moreover, the study emphasizes the role of economic development in shaping leverage choices. In countries with higher GDP growth rates, firms are generally more willing to take on debt, as they expect higher future profits and better cash flow stability. In contrast, countries with lower economic growth or economic instability discourage debt usage, as firms in these environments are more cautious about over-leveraging and the risks that come with it. The study's findings underscore the direct impact of macroeconomic conditions on the financing decisions of firms.

Another insight from the research is that the influence of firm-specific factors, such as asset tangibility, firm size, and profitability, is moderated by the country-specific

institutional environment. For example, in countries with well-developed bond markets and strong creditor protections, the impact of asset tangibility as collateral is diminished, as firms can more easily access capital without relying heavily on tangible assets to secure loans. On the other hand, in countries with less developed financial markets, the role of asset tangibility in securing debt becomes more important, as firms have fewer financing alternatives available to them.

The study also highlights the indirect impact of country-specific variables on the relationship between firm-specific factors and capital structure. For instance, better legal enforcement in a country not only directly encourages firms to take on more debt but also indirectly affects how firm-specific determinants, like profitability or liquidity, influence leverage. The study argues that in countries with strong legal systems, the risk of bankruptcy and the consequences of default are less significant, which reduces the importance of firm-specific factors like profitability in determining leverage.[18]

National culture also plays a significant role in shaping corporate capital structure decisions, adding a layer of complexity beyond purely institutional factors. In their study, Chui, Lloyd, and Kwok (2002) emphasize the influence of cultural values on corporate financing decisions, pointing out that national cultural characteristics, such as individualism versus collectivism, affect how firms approach risk and financing.

According to their findings, countries with a high degree of individualism tend to see firms that are more willing to assume risk and take on debt. This inclination stems from a cultural emphasis on self-reliance and individual decision-making. In individualistic societies, personal responsibility and success are highly valued, and these cultural traits extend to how firms perceive the use of debt, often seeing it as an opportunity for growth and leverage. Conversely, in collectivist cultures, where the emphasis is on group stability, firms are generally more conservative in their financing decisions. The cultural preference for social cohesion and risk aversion leads companies in such regions to favor equity financing over debt. This is because the societal norm of ensuring harmony and

[18] de Jong, A., Kabir, R., & Nguyen, T. T. (2008). Capital structure around the world: The roles of firm- and country-specific determinants. Journal of Banking & Finance, 32(3), 595-610. https://www.sciencedirect.com/science/article/pii/S0378426608000113

avoiding high financial risks discourages firms from adopting capital structures that could expose them to the risks associated with debt obligations. The collectivist orientation prioritizes the well-being of the group over individual financial gains, leading companies to minimize reliance on debt, which is perceived as a potential disruptor of group stability.

Additionally, Hofstede's cultural dimensions of uncertainty avoidance and long-term versus short-term orientation (2001) also play a pivotal role in shaping debt financing decisions. Cultures with high uncertainty avoidance (where the society has a strong preference for predictability, structure, and order) tend to favor debt financing, particularly short-term debt. In such cultures, firms seek stability and predictability in their financial obligations. The fixed nature of debt payments, such as interest and principal repayments, offers a sense of stability and control, making it an attractive option despite the risks of financial distress. In contrast, cultures that emphasize long-term orientation focus more on sustainable growth and resilience over time. Firms in these cultures are more likely to engage in financing that minimizes short-term pressures, such as equity financing, rather than relying heavily on debt. These cultural dimensions have profound implications for capital structure decisions. For example, in cultures with high uncertainty avoidance, firms tend to take on more debt, particularly short-term debt, to meet their immediate financing needs. This is often due to a desire for stability and the predictability that debt can provide, even though this comes with the risk of default in periods of earnings volatility. On the other hand, in cultures with low uncertainty avoidance, firms may be more cautious about the potential risks associated with debt and may lean towards equity financing, which provides more flexibility and less exposure to financial risk.

Furthermore, masculinity versus femininity, another of Hofstede's dimensions, can influence whether firms are inclined to take risks in their financing choices. In masculine cultures, where success, achievement, and ambition are prioritized, firms may be more likely to engage in aggressive financing strategies, including higher levels of debt, to achieve rapid growth and competitive advantage. In contrast, feminine cultures, which emphasize quality of life, cooperation, and care for others, tend to prefer more

conservative financial strategies, avoiding debt and prioritizing long-term sustainability and stability.[19]

The articles reviewed offer valuable insights into how cultural and institutional factors shape corporate financing choices.

Gungoraydinoglu and Öztekin (2011) emphasize that in countries with strong legal frameworks and creditor protections, firms are more likely to use debt financing due to lower costs of financial distress. In contrast, in regions with weaker institutional frameworks, firms are more inclined to use equity to avoid the risks of default. Based on this, firms in regions with strong legal systems, such as North America and Western Europe, are likely to rely more on debt financing, while firms in emerging markets will lean towards equity.

De Jong et al. (2008) further highlight that well-developed bond markets and stronger creditor protections promote debt financing, as firms can access capital at lower costs. This study suggests that in countries with robust financial markets, such as the U.S. and the U.K., firms will have a higher tendency to use debt. On the other hand, in countries with less developed financial markets, firms may prefer equity financing. Similar patterns are expected where economic development directly influences leverage decisions.

Cultural factors, discussed by Chui, Lloyd, and Kwok (2002), show that in individualistic cultures, firms are more willing to assume risk and take on debt, while in collectivist cultures, firms prefer equity financing due to a cultural preference for stability. Hofstede's (2001) findings on uncertainty avoidance and masculine versus feminine cultures also support this, with high uncertainty avoidance and masculine cultures favoring debt for its predictability. It is expected that in individualistic cultures, such as those in the U.S. and Western Europe, firms will be more inclined to use debt, while in collectivist cultures, such as parts of Asia, firms will prefer equity. Moreover, it is likely that in societies

[19] Chui, A. C. W., Lloyd, A. E., & Kwok, C. K. (2002). The determination of capital structure: Is national culture a missing piece to the puzzle? Journal of International Business Studies, 33(1), 133-156. https://www.researchgate.net/publication/5222987_The_Determination_of_Capital_Structure_Is_National_Culture_A_Missing_Piece_to_the_Puzzle

characterized by high uncertainty avoidance and a strong emphasis on masculinity, financial leverage will be higher compared to other cultures.

In summary, institutional factors such as legal frameworks, creditor protections, and financial market development are expected to significantly impact the use of debt across different regions. Additionally, cultural dimensions like individualism versus collectivism and uncertainty avoidance will further influence whether firms choose debt or equity financing. These expectations align with the findings from the literature and provide a foundation for understanding regional differences in capital structure decisions.

2. RESEARCH GAP AND HYPOTHESES DEVELOPMENT

2.1. Literature gap and contribution

The existing literature on financial leverage has made substantial contributions to understanding the determinants of capital structure, particularly at the firm and country levels. Numerous studies have examined how institutional and cultural factors influence firms' capital structure choices, revealing that both legal frameworks and cultural values play a critical role in shaping financing decisions.

Additionally, research has shown that earnings volatility is a key dimension of earnings quality and financial stability, with firms facing high volatility typically encountering greater risks in their financial performance. Several studies have explored the link between earnings volatility and capital structure, with some focusing on how volatility affects leverage decisions, while others studied leverage as a driver of earnings volatility. However, these studies are generally limited to specific industries or countries, and their results remain mixed.

Despite these valuable insights, a notable gap in the literature remains: no large-scale, cross-regional empirical study has explicitly analyzed financial leverage as a driver of earnings volatility across firms in different macro-regions. Previous research has primarily focused on the impact of earnings volatility on leverage rather than exploring the reverse relationship, that is, how financial leverage influences earnings volatility across diverse institutional and cultural environments. Furthermore, while there is some evidence regarding the link between capital structure and earnings stability within single countries or specific sectors, cross-regional comparisons that account for differences in institutional frameworks and cultural values have been largely overlooked.

The value added of this thesis therefore lies in its broad comparative perspective. Instead of focusing on a single national market, one specific industry or a limited geographical context, this study considers firms operating across several geographical areas. This allows the analysis to observe whether the leverage-volatility relationship is consistent across regions or whether it changes when firms operate in different institutional, cultural

and financial environments. In this sense, the cross-regional structure of the analysis represents an important contribution, because it extends the discussion on financial leverage and earnings volatility beyond country-specific or sector-specific evidence.

This study aims to fill this gap by providing a comprehensive, cross-regional analysis of how financial leverage is associated with earnings volatility across firms operating in different macro-regions. By examining the relationship between leverage and earnings stability and testing whether this relationship varies across geographical areas with distinct institutional and cultural settings, this research contributes to the understanding of financial risk and corporate performance in a global context.

2.2. Research question

The empirical analysis of this thesis is developed around the relationship between corporate capital structure and financial stability. In particular, the study focuses on financial leverage as a key financing decision that may influence the stability of corporate earnings over time. Since leverage reflects the extent to which firms rely on debt financing, it represents an important indicator of financial risk. Debt can provide firms with additional resources and may support growth, investment and value creation; however, it also introduces fixed financial obligations that firms must meet regardless of their operating performance. For this reason, a higher reliance on debt may affect the stability of earnings and increase the firm's exposure to fluctuations in profitability.

At the same time, the effect of financial leverage on earnings volatility may not be identical for all firms. Firms differ in terms of size, profitability, growth opportunities, industry characteristics and access to financial markets. These firm-specific characteristics may influence both the level of leverage adopted and the degree of volatility experienced. Moreover, companies operate in different geographical, institutional, cultural and economic contexts, which may affect their approach to debt financing and financial risk

management. A given level of leverage may therefore have different implications depending on the continent or geographical area in which a firm operates.

Starting from this perspective, the research question addressed in this thesis is whether financial leverage is associated with corporate earnings volatility and whether this relationship differs across geographical areas. More specifically, the analysis investigates how firms' indebtedness policies are related to earnings stability and whether the leverage-volatility relationship changes across the selected geographical areas. The objective is therefore not only to examine whether leverage is associated with corporate earnings volatility, but also to understand whether this relationship reflects different regional approaches to financial risk.

Earnings volatility is considered as the main indicator of corporate financial stability. In this thesis, it is measured using both ROA volatility and ROE volatility. This distinction is important because the two measures capture different dimensions of firm performance. ROA volatility reflects fluctuations in profitability from an asset-based perspective, as it considers how stable the firm's returns are in relation to its total assets. ROE volatility, instead, reflects fluctuations from an equity-based perspective, as it captures the stability of returns generated for shareholders. Since financial leverage directly affects the relationship between debt and equity, its impact may differ depending on whether volatility is measured through ROA or ROE. For this reason, the analysis uses both measures in order to verify whether the results remain consistent across different definitions of earnings volatility or whether leverage affects asset-based and equity-based volatility differently.

The research question is therefore based on three main themes: financial leverage, earnings volatility and geographical differences. Financial leverage represents the independent variable of interest, as the analysis aims to understand whether firms with higher levels of debt experience different levels of earnings volatility. Earnings volatility represents the dependent variable, as it measures the degree of instability in corporate

performance over time. Geographical area represents both a comparative dimension and a possible moderating factor, since the study examines whether firms located in different regions show different leverage and volatility patterns and whether the relationship between leverage and volatility changes across areas.

To answer this research question, the empirical analysis follows a gradual structure.

First, the study observes the sample of firms selected operating across the chosen geographical areas and uses descriptive statistics to provide an overview of the dataset. This step allows the analysis to identify the general characteristics of the firms included in the sample and to observe preliminary differences in leverage, profitability, size and volatility across regions. Descriptive statistics provide an initial picture of how firms differ across geographical areas.

Second, the study applies an analysis of variance, or ANOVA, to test whether the average levels of financial leverage and earnings volatility differ significantly across geographical areas. In this part of the analysis the focus is placed on leverage measures, ROA volatility and ROE volatility. The purpose of ANOVA is to understand whether there are statistically significant average differences between regions. This step answers the question of whether firms located in different areas present different levels of indebtedness and earnings stability before considering the direct relationship between leverage and volatility.

Third, the study uses OLS regression models with a moderator analysis. In this part of the study, earnings volatility is treated as the dependent variable, while financial leverage is the main independent variable. The regression analysis estimates how earnings volatility changes when financial leverage varies, while keeping other firm-specific factors constant. This allows the study to examine whether leverage explains earnings volatility beyond the influence of other relevant corporate characteristics.

The moderator analysis addresses the geographical component of the research question. By including the interaction between financial leverage and geographical area, the model tests whether the effect of leverage on earnings volatility changes across geographical areas. The analysis investigates whether the slope of the relationship between leverage and volatility is the same across all areas or whether it differs depending on the region in which firms operate.

Overall, the research question combines a comparative and an explanatory perspective. The comparative perspective asks whether firms across geographical areas differ in terms of leverage and earnings volatility. The explanatory perspective asks whether financial leverage affects earnings volatility and whether this relationship changes across geographical areas. By combining these approaches, the study aims to provide a more complete understanding of the relationship between indebtedness policies and corporate financial stability in a cross-regional context.

2.3. Hypotheses development

The hypotheses of this study are developed from the theoretical framework discussed in the literature review and reflect the empirical structure adopted in the analysis. As highlighted in previous research, financial leverage is a central component of corporate capital structure and may influence firms' exposure to financial risk. Debt financing can provide important benefits. However, it also increases the level of fixed financial obligations that firms must meet regardless of their operating performance. When earnings fluctuate, highly leveraged firms may therefore face stronger pressure to meet interest payments and debt repayments, which may contribute to greater instability in corporate performance. For this reason, the literature provided by Boll et al. (2022), Ujah and Brusa (2014) and Ahmed (2023) often associates financial leverage with higher financial risk and with a potential increase in earnings volatility.

At the same time, the theoretical relationship between leverage and earnings volatility is not entirely unambiguous. From the perspective of financial distress and risk amplification, leverage is expected to increase volatility because debt magnifies the consequences of negative earnings shocks, as shown by Chen (2020), Adenugba (2016) and Arhinful and Radmehr (2023). However, other theoretical perspectives by Kumar (2007) and Graña-Álvarez et al. (2024) suggest that debt may also have a disciplinary role. By imposing regular payment obligations, leverage can reduce managerial discretion, limit inefficient investment decisions and force firms to manage resources more carefully. Under this view, debt may contribute to greater financial discipline and, in some cases, may be associated with lower volatility in operating performance. Therefore, the expected relationship between financial leverage and earnings volatility is theoretically relevant, but its direction may depend on how volatility is measured and on the context in which firms operate.

The hypotheses are also grounded in the cross-geographical nature of the study. These assumptions are grounded in the findings of Gungoraydinoglu and Öztekin (2011), de Jong et al. (2008), Chui et al. (2002) and Hofstede (2001). The authors explain that firms do not operate in identical institutional, legal, cultural and financial environments. The literature on capital structure emphasizes that country-level and regional factors, such as creditor protection, bankruptcy laws, financial market development, legal enforcement and cultural attitudes toward risk, can influence firms' financing decisions. For this reason, geographical area is expected to be relevant not only for describing the sample, but also for understanding potential differences in leverage and earnings volatility. These theoretical arguments suggest that firms located in different geographical areas are likely to present different financial profiles in terms of leverage, profitability, size and earnings stability.

Starting from the literature reviewed and from the empirical structure of the thesis, five main hypotheses are formulated.

H1: Firms located in different geographical areas present different financial characteristics in terms of financial leverage and earnings volatility.

The descriptive analysis is expected to show that firms across geographical areas are not homogeneous. Since the sample includes companies operating in different regions, it is reasonable to expect preliminary differences in capital structure and earnings volatility. These differences may emerge in the average values of financial leverage, in the dispersion of leverage ratios and in the volatility of ROA and ROE.

H2: Average levels of financial leverage and earnings volatility differ significantly across geographical areas.

Following this preliminary step, the analysis moves from simple observation to statistical testing through the analysis of variance. Based on the literature on institutional and cultural differences in corporate financing decisions, it is expected that the average level of financial leverage will differ across geographical areas. Firms operating in regions with different financial systems, legal protections and cultural attitudes toward debt are unlikely to adopt identical indebtedness policies. Therefore, the analysis assumes that geographical area may be associated with statistically significant differences in leverage. This expectation applies to both measures of financial leverage used in the study: debt-to-assets and debt-to-equity. The use of both ratios allows the analysis to verify whether regional differences in leverage are observable from an asset-based perspective and from an equity-based perspective.

The same reasoning applies to earnings volatility. If geographical areas differ in terms of institutional stability, financial market development, macroeconomic conditions and exposure to uncertainty, firms located in those areas may also differ in the stability of their earnings. Earnings volatility is closely related to corporate financial stability because it captures the extent to which firms' performance fluctuates over time. Therefore, the thesis expects average levels of earnings volatility to differ across geographical areas. Considering both ROA and ROE measures is important because geographical differences may be more evident in one dimension of volatility than in the other.

H3: Financial leverage is significantly associated with earnings volatility after controlling for firm-specific characteristics.

After testing whether average differences exist across areas, the empirical analysis examines whether financial leverage is associated with earnings volatility through OLS regression models. The underlying hypothesis is that leverage contributes to explaining corporate earnings volatility even after controlling for firm-specific characteristics. Volatility may be influenced by several factors other than leverage. Larger firms may have more stable operations and better access to financial resources, while more profitable firms may be more resilient to earnings fluctuations. Firms with greater growth opportunities may experience higher volatility because they are more exposed to investment risk and market expectations. Industry sector may also influence volatility, since firms operating in different sectors face different levels of operational risk, demand uncertainty and capital intensity. For this reason, the OLS models include size, profitability, growth opportunities and sector as control variables, allowing the analysis to isolate more clearly the relationship between financial leverage and earnings volatility.

H4: The relationship between financial leverage and earnings volatility differs depending on whether earnings volatility is measured through ROA volatility or ROE volatility.

In line with the theoretical discussion, the thesis does not assume that the effect of leverage on earnings volatility must necessarily be positive or negative in every specification. The literature suggests that leverage can amplify risk, but it may also impose financial discipline. Therefore, the main expectation is that financial leverage will be significantly associated with earnings volatility, while the direction of the relationship may depend on the specific measure of volatility considered. This distinction is particularly relevant because ROA volatility and ROE volatility capture different aspects of financial performance, as previously shown. Since leverage directly changes this relationship, its effect may be stronger or different when volatility is measured through ROE rather than ROA.

For this reason, the empirical analysis also expects the leverage-volatility relationship to vary depending on whether earnings volatility is measured through ROA volatility or ROE volatility. If leverage affects the stability of returns on assets and returns on equity differently, this would suggest that financial leverage has different implications depending on the financial perspective adopted. An asset-based perspective may capture the effect of leverage on the stability of the firm's overall operating performance, while an equity-based perspective may capture the extent to which debt amplifies fluctuations in shareholder returns. This theoretical distinction justifies the use of robustness checks, where alternative combinations of leverage and volatility measures are tested in order to verify whether the results are stable or whether they depend on the specific variables used.

H5: Geographical area moderates the relationship between financial leverage and earnings volatility.

Finally, the thesis expects the relationship between financial leverage and earnings volatility to differ across geographical areas. This hypothesis is directly connected to the cross-regional nature of the research question. If firms operate in different institutional, legal, cultural and financial environments, the consequences of leverage may not be identical across regions. Therefore, geographical area may not only explain differences in average leverage and volatility levels, but may also influence the strength or direction of the relationship between the two variables.

This final expectation is tested through the moderator analysis included in the OLS regression models. By interacting financial leverage with geographical area, the empirical model examines whether the slope of the relationship between leverage and earnings volatility changes from one region to another.

3. DATA AND METHODOLOGY

3.1. Sample selection

The empirical analysis is based on an original dataset constructed using firm-level financial data collected from Bloomberg. Bloomberg is a professional financial data platform widely used by financial institutions, analysts, companies and academic researchers to access financial market information, company data, news, analytics and historical financial indicators. The data used in this thesis were collected through the Bloomberg Terminal available at the Ca' Foscari university Bloomberg Lab, which provided access to standardized financial information for listed companies across different geographical areas. This source allowed the collection of comparable accounting and market variables for a large number of firms operating in different regions.[20]

Since the study investigates the relationship between financial leverage and earnings volatility from a geographical perspective, the dataset was initially constructed by collecting companies from the five broad continental groups: America, Asia, Africa, Europe and Oceania. For each of these areas, the objective was to extract up to 3.000 companies from Bloomberg, following the order available at the time of data collection (November 2025). No additional screening criteria were applied at this stage, apart from the geographical classification and the availability of firms in Bloomberg. This approach was adopted in order to obtain a large and diversified initial sample and to allow subsequent comparisons across geographical areas.

However, the number of available firms was not the same for all continental groups. While America, Asia and Europe reached the target of 3.000 firms, Africa and Oceania contained fewer available companies. More specifically, the initial dataset included 3.000 firms from America, 3.000 from Asia, 3.000 from Europe, 2.457 from Oceania and 1.101 from Africa,

[20] Bloomberg Professional Services. (n.d.). Bloomberg Terminal. Bloomberg. https://professional.bloomberg.com/products/bloomberg-terminal/#overview

for a total raw sample of 12.558 firms. This means that the initial dataset was not perfectly balanced across geographical areas. Nevertheless, the sample remained sufficiently large and diversified to support a cross-regional empirical analysis.

The lower number of firms for Africa and Oceania may reflect differences in data availability and Bloomberg coverage across regions. Since the dataset relies on companies for which Bloomberg provides standardized accounting and market information, the final number of firms depends on the availability of publicly covered companies and financial data for each geographical area. Therefore, the smaller sample size for Africa and Oceania may also be related to the lower number of listed or sufficiently covered firms available in Bloomberg for these regions during the data collection period.

For each company, the dataset included a set of financial and accounting variables related to firm characteristics, capital structure, profitability, liquidity and market performance. The variables collected included identifying information, such as company name, ticker, country, continent and GICS sector[21], as well as financial indicators such as market capitalization, total assets, total debt, total equity, total revenues, net income, EBIT, EBITDA, current assets, current liabilities, current ratio, quick ratio, price per share, earnings per share and book value per share. In addition, ROA and ROE values were collected for the years 2022, 2023 and 2024. These yearly profitability indicators were subsequently used to calculate ROA volatility and ROE volatility, which represent the main measures of earnings volatility used in the empirical analysis.

The choice of the 2022–2024 period was mainly driven by data availability and comparability. At the time of data collection, 2024 was the most recent year for which a sufficiently large number of firms had available accounting data in Bloomberg. The three-year period therefore allowed the analysis to use the most recent complete information

[21] GICS: Global Industry Classification Standard. It is an industry classification system developed by MSCI and S&P Dow Jones Indices to classify companies according to their principal business activity and to provide consistent industry definitions across global financial markets.
MSCI. (n.d.). The Global Industry Classification Standard (GICS). MSCI. https://www.msci.com/indexes/index-resources/gics
S&P Dow Jones Indices. (n.d.). GICS: Global Industry Classification Standard. S&P Global. https://www.spglobal.com/spdji/en/landing/topic/gics/

while preserving a large sample size across geographical areas. Moreover, calculating volatility over three consecutive years made it possible to obtain a recent measure of earnings instability. At the same time, this choice should be interpreted as a short-term measure of volatility, and it does not capture longer economic cycles.

Since the study aims to examine whether financial leverage is associated with corporate earnings volatility, the dataset includes both leverage-related variables and profitability-based measures. Financial leverage is measured using accounting information on debt, assets and equity, while earnings volatility is calculated from the variation in ROA and ROE over the three-year period considered.

Additional firm-level variables were also collected because they may influence earnings volatility and therefore need to be considered in the empirical analysis. Firm size, profitability, growth opportunities and industry sector are particularly relevant in this respect. Larger firms may be more diversified and financially stable, while more profitable firms may be more resilient to earnings fluctuations. Firms with stronger growth opportunities may experience higher volatility because they are more exposed to investment risk and market expectations. Similarly, the sector in which a firm operates may affect its level of operational and financial risk. For this reason, these variables were later included as controls in the regression models.

It is important to note that not all financial variables were available for all companies in the initial dataset. Some firms presented missing values for specific accounting or market indicators. This is common in large international datasets, as firms may differ in terms of reporting practices, disclosure quality, data availability and coverage in financial databases. Missing values were therefore not treated as zero and were not considered a reason to remove the entire firm from the raw dataset at the collection stage. Instead, the dataset was kept as comprehensive as possible and missing observations were handled during the statistical analysis according to the requirements of each method.

3.2. Geographical areas

Even though the initial data collection was organized according to the five continents, the empirical analysis adopts a more detailed geographical classification. This choice was made before conducting the statistical analysis in order to obtain a classification that was more suitable for the research objective of the thesis. The aim of the study is not only to compare firms located in different parts of the world, but also to examine whether the relationship between financial leverage and earnings volatility changes across different geographical and economic contexts. For this reason, the geographical variable had to be defined in a way that could capture relevant regional differences without grouping together areas that are too heterogeneous.

America was divided into North America and Latin America, while Asia was divided into India and Asia excluding India. Africa, Europe and Oceania were maintained as separate geographical areas. As a result, the final empirical analysis is based on seven geographical areas: Africa, Europe, Oceania, North America, Latin America, India and Asia excluding India.

The division of America into North America and Latin America was adopted for both empirical and conceptual reasons. From an empirical point of view, the number of firms available for the two areas was very different, with North America representing a much larger portion of the American sample than Latin America. Keeping the whole American continent as a single category would therefore have produced a very broad group dominated by North American firms, reducing the ability of the analysis to identify potential differences related to Latin American companies. From a conceptual point of view, North America and Latin America also differ substantially in terms of financial market development, institutional structure, corporate financing practices, macroeconomic stability and cultural and business environments. North America is generally associated with more developed capital markets, stronger access to external financing and a more consolidated institutional framework. Latin America, instead, may

present different financial conditions, different levels of market development and greater exposure to macroeconomic and institutional uncertainty. For these reasons, separating North from Latin America allows the analysis to capture regional differences more accurately than a single American category would have allowed.

However, it is important to note that Latin America represents the smallest geographical group in the dataset. This does not prevent its inclusion in the empirical analysis, since maintaining Latin America as a separate area is useful for preserving the global and cross-regional structure of the study. Nevertheless, the lower number of observations means that the results related to Latin America should be interpreted with caution, especially in the empirical results section.

A similar reasoning applies to the Asian sample. Asia is a very broad and internally heterogeneous continent, including countries with highly different economic systems, legal frameworks, financial markets, corporate governance practices and cultural characteristics. Within the dataset, India represented a substantial share of the Asian observations. Therefore, keeping India within a general Asian category could have made the interpretation of the results less precise, as the Asian group would have been strongly influenced by Indian firms. For this reason, India was treated as a separate geographical area, while the remaining Asian firms were grouped into Asia excluding India.

The decision to isolate India is also justified by its specific economic and financial characteristics. India represents a large and relevant market, with its own institutional framework, corporate structure, financial system and business environment. Its firms may differ from those located in other Asian countries in terms of capital structure, access to financing, growth opportunities and exposure to financial risk. Therefore, analyzing India separately makes it possible to observe whether Indian firms present different patterns of leverage and earnings volatility compared to other Asian firms. This classification improves the interpretability of the empirical results and reduces the risk of hiding regional differences within an excessively broad Asian category.

Africa, Europe and Oceania were maintained as separate geographical areas. Africa was kept as an independent category because it represents a distinct regional context, characterized by specific institutional, financial and market conditions. Although the number of observations for Africa was lower than for other areas, maintaining it as a separate category was important in order to include firms operating in a different economic environment. Europe was also maintained as a separate category because it represents a broad and relatively developed financial context and provides an important benchmark for comparison with the other geographical areas. Oceania was kept as a separate area because it includes firms operating in a specific regional environment that differs from both Asian and European markets.

It is important to clarify that, even if the original data collection was organized around continents, the final empirical variable should be interpreted as a geographical area variable rather than as a strict continental classification. The term “geographical area” is therefore more appropriate than “continent”, because the final classification does not correspond exactly to the five traditional continents. Instead, it reflects a more refined regional grouping designed to support the empirical objectives of the thesis. This classification aims to capture differences in corporate financing behavior, earnings stability and financial risk across regions.

In broad terms, the geographical classification adopted in this thesis allows the analysis to move beyond a simple five-continent comparison. By separating North America from Latin America and India from the rest of Asia, the study accounts for both numerical imbalances in the dataset and structural differences across regions.

3.3. Cleaning and winsorization

Before conducting the empirical analysis, the dataset was cleaned and prepared in the statistical software used during the study "RStudio"[22], in order to ensure that the variables used in the tests were correctly formatted and suitable for analysis. This step was necessary because large financial datasets often contain missing values, extreme observations, inconsistent formats or values that may strongly distort descriptive statistics and regression estimates.

The first step consisted of importing the dataset into RStudio and checking whether the variables were correctly read by the software. Some numerical variables were initially imported as character variables and therefore had to be converted into numeric format. This was particularly important for the variables used in the empirical analysis, such as leverage ratios, ROA, ROE, market-to-book ratio and earnings volatility measures. The geographical area variable was instead converted into a factor, since it represents a categorical variable and not a numerical one. This allowed R to treat geographical areas as groups in the descriptive analysis and ANOVA and as categorical variables in the regression models.

After checking the format of the variables, the main variables used in the analysis were created. ROA volatility and ROE volatility were calculated for each firm as the standard deviation of ROA and ROE over the years 2022, 2023 and 2024. This procedure allowed the analysis to measure the degree of fluctuation in firm profitability over time. A higher value of ROA or ROE volatility indicates that the firm's profitability changed more strongly across the three-year period, while a lower value indicates more stable profitability. In addition, financial leverage was measured through two ratios: debt-to-assets (leverage D/A) and debt-to-equity (leverage D/E). The debt-to-assets ratio captures the proportion

[22] RStudio or R: open-source programming language and statistical software environment widely used for data analysis, statistical modelling, and graphical representation. https://www.r-studio.com/

of a firm's assets financed through debt, while the debt-to-equity ratio measures the relationship between debt and shareholders' equity. The market-to-book ratio was also calculated as a proxy for growth opportunities.

Once these variables had been created, the dataset was checked for unrealistic or excessively extreme values. This step was particularly important because financial ratios can produce very large or implausible values when the denominator is very small, close to zero, or affected by missing or abnormal accounting data. For example, debt-to-equity can become extremely large when equity is very low, while market-to-book ratios can become distorted when book values are unusually small. Similarly, ROA and ROE volatility may present extreme values when one or more yearly profitability measures are abnormal. If left untreated, these observations could disproportionately affect the mean, standard deviation, ANOVA comparisons and regression coefficients.

For this reason, a first cleaning procedure was applied before winsorization. Extremely abnormal values were transformed into missing values, rather than being retained in the dataset. In particular, values above the following thresholds were replaced with NA[23]: ROA volatility above 50, ROE volatility above 100, market-to-book ratio above 20, debt-to-assets above 2, and debt-to-equity above 10.

These thresholds were selected as plausibility limits after inspecting the distribution of the main variables in R. They were not intended to remove all highly leveraged or highly volatile firms, but only to exclude observations that were excessively extreme and that could disproportionately influence descriptive statistics, ANOVA results and regression estimates.

More specifically, ROA volatility values above 50 were considered abnormally high given that volatility was calculated over a three-year period. ROE volatility was assigned a higher threshold, equal to 100, because ROE is generally more sensitive to capital structure and to variations in equity values than ROA. Therefore, ROE may naturally

[23] NA: not available

present higher fluctuations than ROA, especially when shareholders' equity is low or unstable.

Similarly, market-to-book ratio values above 20 were treated as extreme because they may be driven by very small book values or abnormal market valuations. Debt-to-assets ratios above 2 were also considered excessively high, as they indicate that total debt is more than twice the value of total assets. Finally, debt-to-equity ratios above 10 were treated as extreme because they indicate that total debt is more than ten times shareholders' equity, which may occur when equity is very low and may produce highly distorted leverage ratios.

These values should therefore be interpreted as empirical plausibility cut-offs, defined on the basis of the distribution of the dataset and the economic interpretation of each ratio, rather than as universal accounting rules.

After this preliminary cleaning, winsorization was applied to the variables. Winsorization is a statistical procedure used to reduce the influence of extreme observations without completely deleting them from the dataset. Instead of removing the most extreme values, winsorization replaces them with values corresponding to selected percentiles of the distribution. In other words, observations below a chosen lower percentile are replaced with that lower percentile value, while observations above a chosen upper percentile are replaced with that upper percentile value. This method limits the impact of outliers while maintaining the number of observations in the dataset. The National Institute of Standards and Technology explains that many statistics can be heavily influenced by extreme values and that winsorization addresses this issue by setting tail values equal to specified percentiles of the data; it also clarifies that winsorization is not equivalent to simply discarding observations.[24]

The use of winsorization is particularly important in financial and accounting research because firm-level financial data are often skewed and affected by influential observations. Prior research in accounting and finance highlights that outliers represent

[24] Heckert, N. A. et al. (2012). NIST/SEMATECH e-Handbook of Statistical Methods. National Institute of Standards and Technology. http://www.itl.nist.gov/div898/handbook/

a relevant issue in empirical analysis and that winsorization is one of the most commonly used procedures to reduce their influence. [25]

In this study, winsorization was applied at the 95% level. This means that the central 95% of the distribution was preserved, while the most extreme 2,5% of observations in the lower tail and the most extreme 2,5% of observations in the upper tail were adjusted. More specifically, values below the 2,5th percentile were replaced with the value of the 2,5th percentile, while values above the 97,5th percentile were replaced with the value of the 97,5th percentile. This approach reduced the influence of extreme observations while avoiding the excessive loss of information that would result from deleting them. The procedure was applied by geographical area, meaning that each area was treated separately during the winsorization process. This choice was relevant because the distribution of financial variables may differ across geographical areas. Applying winsorization separately by area allowed the analysis to control extreme values within each regional distribution, rather than imposing the same global cut-off on firms operating in very different contexts.

The choice of 95% winsorization was made after considering the characteristics of the dataset. A less restrictive winsorization level, such as 99%, was considered too mild for this analysis. Under a 99% winsorization rule, only the most extreme 0,5% of observations in each tail would be adjusted. In this dataset, that approach would have left many extreme values still present in the distribution, especially for financial ratios characterized by strong skewness, such as leverage, market-to-book ratio and earnings volatility. As a result, the mean and standard deviation would have remained strongly affected by a limited number of extreme observations.

This decision is also consistent with the objective of the thesis. Since the analysis compares firms across geographical areas, it was important to avoid results being driven by a small number of abnormal values in one specific region. Extreme observations could

[25] Leone, A. J., Minutti-Meza, M., & Wasley, C. E. (2019). Influential observations and inference in accounting research. The Accounting Review, 94(6), 337–364. https://doi.org/10.2308/accr-52396
Adams, J. C., Hayunga, D. K., Mansi, S. A., Reeb, D. M., & Verardi, V. (2019). Identifying and treating outliers in finance. Financial Management, 48(2), 345–384. https://doi.org/10.1111/fima.12269

artificially increase the average level of leverage or volatility in a geographical area and could therefore distort both ANOVA results and regression estimates. At the same time, completely deleting all extreme values would have reduced the sample size and potentially removed observations that, although extreme, still represented real firms. Winsorization therefore offered an intermediate solution, as it limited the influence of extreme observations without excluding firms from the dataset.

It is important to underline that winsorization does not remove all heterogeneity from the data. The objective was not to make firms artificially similar, but to prevent a small number of extreme observations from dominating the empirical analysis. After winsorization, the dataset still retained differences across firms and geographical areas, but these differences were less likely to be driven by implausible or disproportionately influential values.

Finally, after the cleaning and winsorization procedure, the final winsorized dataset was exported and used for the subsequent stages of the empirical analysis. Therefore, the cleaning and winsorization process ensured greater consistency and reliability in the empirical analysis while preserving as much information as possible from the original dataset.

3.4. Descriptive analysis

The first step of the empirical analysis consists of descriptive statistics. The purpose of this section is to provide an initial overview of the sample and of the main financial characteristics of the firms included in the dataset. Before testing formal relationships through ANOVA and regression analysis, it is necessary to understand the structure of the data, the distribution of firms across geographical areas, countries and sectors and the general behavior of the main variables used in the study.

The descriptive analysis was developed using both Excel and RStudio. The initial Excel file contained the financial data exported from Bloomberg and was first used to organize the dataset and to create pivot tables. These pivot tables were constructed in order to describe the composition of the sample from different perspectives. More specifically, pivot tables were used to observe the distribution of firms across geographical areas, countries and GICS sectors. The GICS sectors considered in the analysis include communication services, consumer discretionary, consumer staples, energy, financials, health care, industrials, information technology, materials, real estate and utilities. These sectors refer to the main business activity of each firm and are used to classify companies according to their industry of operation. Consumer staples refers to essential consumer goods, while consumer discretionary refers to non-essential goods and services whose demand depends more strongly on consumers' disposable income.

The geographical distribution was also represented through a pie chart, while the sectoral distribution was represented through a bar chart.

After this preliminary organization in Excel, the data were imported into RStudio. The statistical software was used to compute the descriptive statistics of the main variables included in the empirical analysis.

The descriptive statistics were calculated after the data cleaning and winsorization procedures described in the previous section. This means that the descriptive results are based on the cleaned and winsorized dataset, rather than on the raw data exported directly from Bloomberg. However, missing values were not treated as zero. When a value was not available, it was treated as missing and RStudio computed the descriptive statistics using the available observations for each variable. As a consequence, the number of valid observations may differ across variables.

The analysis focuses on the variables that are most relevant for the research question. These include firm size, capital structure, profitability, liquidity, growth opportunities and

earnings volatility. In particular, financial leverage is observed through debt-to-assets and debt-to-equity ratios, while earnings volatility is measured through ROA volatility and ROE volatility.

For the full sample, the descriptive statistics were computed in RStudio for the main variables used in the empirical analysis. The indicators included the number of available observations, mean, standard deviation, median, trimmed mean, median absolute deviation, minimum, maximum, range, skewness, kurtosis and standard error. The number of available observations indicates how many valid values are present for each variable. The mean represents the average value, while the median identifies the central value of the distribution. The median is particularly useful in financial datasets because it is less affected by extreme values than the mean. The trimmed mean provides an additional measure of central tendency by reducing the influence of the most extreme observations. The standard deviation and the median absolute deviation measure the dispersion of the data, showing how much observations vary around the average or central value. The minimum, maximum and range describe the overall spread of each variable after the cleaning and winsorization process. Skewness indicates whether the distribution is symmetric or whether it has a longer right or left tail, while kurtosis provides information on the concentration of observations and the presence of extreme values in the tails of the distribution. Finally, the standard error measures the precision of the estimated mean. Together, these indicators make it possible to describe not only the average level of each variable, but also its variability, asymmetry, and sensitivity to extreme observations.

In addition to the total descriptive statistics, the same analysis was conducted separately by geographical area. For each geographical area, the descriptive statistics summarize the mean, median, standard deviation, minimum, maximum, and number of available observations for the main financial variables. This makes it possible to compare the financial profiles of firms located in different regions and to identify preliminary differences in leverage, profitability, size, and volatility before conducting formal statistical tests.

3.5. Analysis of variance

The second step of the study consists of the analysis of variance. This method was used to test whether statistically significant differences exist across geographical areas in terms of financial leverage and earnings volatility. More specifically, the analysis examined four variables: leverage calculated as D/A, leverage calculated as D/E, ROA volatility, and ROE volatility. The geographical area variable was used as the grouping variable, since the purpose of the analysis was to verify whether firms located in different regions present different average values for these financial indicators.

The analysis of variance allows the comparison of mean values across more than two groups. The logic of ANOVA is based on the comparison between two sources of variability: the variability between groups and the variability within groups. If the variability between geographical areas is sufficiently large compared to the variability observed within each area, then the analysis indicates that the group means are statistically different. Therefore, ANOVA does not simply observe whether the averages appear different, but tests whether these differences are large enough to be considered statistically significant.

The null hypothesis of ANOVA states that the mean value of the variable considered is equal across all geographical areas. In other words, for each variable tested, the initial assumption is that there are no significant differences between the regions. The alternative hypothesis states that at least one geographical area has a mean value that differs from the others. The result is evaluated through the p-value[26]. In this analysis, a threshold of $p < 0.05$ was adopted to identify statistical significance. Therefore, when the p-value is below 0.05, the null hypothesis is rejected and it can be concluded that statistically significant average differences exist across geographical areas. The conventional significance levels used in the analysis are: $p < 0.001$ for highly significant results, $p < 0.01$ for very significant results, $p < 0.05$ for significant results and $p < 0.10$ for marginally significant results.

[26] The p-value indicates how likely it would be to obtain the observed result if the null hypothesis were true. A low p-value suggests that the observed result is unlikely to be due to random variation alone.

Europe was set as the reference category in R in order to maintain consistency with the subsequent OLS regression analysis, where this kind of category is required for the inclusion of geographical areas as categorical variables. However, in the ANOVA framework, the main objective is not to compare each area with the reference category, but to test whether average differences exist across all groups.

Four separate one-way ANOVA models were estimated. The first model tested whether the average value of leverage D/A differs across geographical areas. The second model repeated the same procedure using leverage D/E. The third model tested differences in ROA volatility, while the fourth model analyzed differences in ROE volatility.

For each model, the ANOVA output reports the associated p-value. A statistically significant p-value indicates that at least one geographical area differs from the others in terms of the average value of the variable analyzed. However, ANOVA alone does not identify which specific areas differ from each other. For this reason, additional post-hoc tests were performed.

After the ANOVA models, eta squared was calculated in order to measure the size of the geographical effect. This step is important because statistical significance does not necessarily imply that the difference is economically or practically large. With a large number of observations, even small differences may become statistically significant. Eta squared measures the proportion of the total variability in the dependent variable that is explained by the grouping variable, in this case geographical area. It is calculated as the ratio between the sum of squares explained by the group and the total sum of squares. As a general guideline, values around 0.01 indicate a small effect, values around 0.06 indicate a medium effect, and values around 0.14 indicate a large effect.

Since ANOVA only indicates whether at least one significant difference exists among groups, Tukey post-hoc tests were then performed to identify which specific pairs of geographical areas differ from each other. The Tukey test compares all possible pairs of geographical areas and calculates, for each comparison, the difference between the two group means, the confidence interval and an adjusted p-value. The adjusted p-value is

used because Tukey performs multiple comparisons simultaneously. When many comparisons are conducted, the probability of finding a significant result by chance increases. The Tukey adjustment corrects for this issue, making the post-hoc results more conservative and reliable. In the interpretation of the Tukey test, an adjusted p-value below 0.05 indicates a statistically significant difference between two geographical areas. Moreover, the confidence interval provides an additional indication of significance: if the interval does not include zero, the difference between the two-group means is considered statistically significant.

The Levene test was then applied to verify whether the assumption of equal variances across groups was satisfied. This test checks whether the dispersion of the data is similar across geographical areas. The null hypothesis of the Levene test states that group variances are equal. If the p-value is high, there is no evidence that variances differ across groups. Conversely, if the p-value is low, the null hypothesis is rejected, indicating that the variances are not equal.

Because unequal variances may affect the reliability of the classical analysis of variance, Welch ANOVA was also performed as a robustness check. Welch ANOVA tests the same general question as standard analysis of variance, namely whether mean differences exist across groups, but it does not require the assumption of equal variances. Therefore, it is more appropriate when the Levene test suggests that group variances are not homogeneous. In this analysis, Welch ANOVA was used to verify whether the evidence of differences across geographical areas remained valid even under a more robust specification.

Finally, boxplots were created for each of the four variables analyzed. The boxplots provide a visual representation of the distribution of leverage and volatility across geographical areas. Each boxplot shows the median, the central dispersion of the data, the presence of outliers and the variability within each geographical area. These graphs complement the statistical tests because they allow a visual inspection of the differences

between regions. While ANOVA, eta squared, Tukey tests, Levene tests and Welch ANOVA provide formal statistical evidence, the boxplots help illustrate the distributional patterns underlying the results.

3.6. Ordinary Least Squares regression analysis with moderator

The third step of the empirical methodology consists of an Ordinary Least Squares regression analysis with moderator. The OLS regression analysis examines whether financial leverage is associated with earnings volatility after controlling for firm-specific characteristics. More specifically, the purpose of this model is to understand whether firms with different levels of financial leverage present different levels of earnings volatility, and whether this relationship changes across geographical areas.

OLS regression is a statistical method used to estimate the relationship between a dependent variable and one or more independent variables. The dependent variable is the variable that the model aims to explain, while the independent variables are the factors expected to influence it. In this study, the main dependent variable is ROA volatility, while the main independent variable is financial leverage D/A. The model estimates the line that best explains the relationship between leverage and volatility by minimizing the squared differences between the observed values and the values predicted by the model. These differences are called residuals.

The main regression analysis is designed to answer if financial leverage explains ROA volatility, after controlling for other firm characteristics. In addition, the model investigates whether this relationship is the same across all geographical areas or whether it changes depending on the region in which firms operate. For this reason, geographical area is included not only as a control dimension, but also as a moderator. A moderator is a variable that can change the strength or direction of the relationship between an independent variable and a dependent variable. In this case, the moderator is geographical area.

The variables describing the geographical area and the GICS sector were converted into factor variables. This conversion is necessary because both variables are categorical. This is important because the regression model does not interpret these variables as numerical values, but as groups. GICS sector was included as a control variable because firms operating in different industries may face different levels of operational risk, capital intensity and demand uncertainty. Therefore, controlling for sector reduces the risk that the estimated relationship between leverage and volatility is actually driven by sectoral differences.

Europe was set as the reference category for the geographical variable. When a categorical variable is included in a regression model, one category must be excluded and used as the benchmark. This is necessary to avoid perfect multicollinearity, because if all categories were included together with the intercept, one category would be automatically determined by the others. In this study, Europe was chosen as the reference area for interpretative reasons, since it represents a broad and relatively stable developed market and provides a useful benchmark for comparison with the other geographical areas. Consequently, all geographical coefficients in the regression are interpreted relative to Europe.

The OLS analysis was structured into three models. This step-by-step structure allows the analysis to progressively test the main relationship, the role of geography and the moderating effect of geography.

The first model is the baseline model. It tests whether leverage D/A is associated with ROA volatility, while controlling for firm size, profitability, growth opportunities and sector. Geographical area is not yet included in this model. The purpose of this model is therefore to estimate the general relationship between financial leverage and ROA volatility across the full sample.

If the coefficient is positive, higher leverage is associated with higher ROA volatility. If the coefficient is negative, higher leverage is associated with lower ROA volatility. The p-value indicates whether the coefficient is statistically significant. The conventional significance thresholds used in the analysis are $p < 0.05$ for significant results, $p < 0.01$ for very significant results and $p < 0.001$ for highly significant results.

The second model adds geographical area to the baseline specification. The purpose of this model is to verify whether firms located in different geographical areas have different average levels of ROA volatility, after controlling for leverage, size, profitability, growth opportunities and sector. In this model, the geographical coefficients indicate whether each area differs from Europe. This model allows the analysis to determine whether geography matters as a level effect.

The third model is the moderator model and represents the main specification of the OLS analysis. In this model, interaction terms between leverage and geographical area are added. The purpose of the interaction terms is to test whether the effect of leverage on volatility changes across geographical areas. Therefore, the third model directly addresses the moderating role of geography in the leverage-volatility relationship. In this model, the coefficient of leverage D/A represents the effect of leverage for the reference category, namely Europe. The interaction terms indicate whether the effect of leverage in each geographical area is statistically different from the effect observed in Europe. If an interaction coefficient is significant, this suggests that the leverage-volatility relationship changes in that specific area compared to Europe. If the interaction terms are not significant, this indicates that geography does not strongly modify the relationship between leverage and ROA volatility.

After estimating the three models, a model comparison ANOVA was performed. This procedure compares nested regression models in order to test whether adding new variables significantly improves the explanatory power of the model.

The regression outputs were interpreted using the estimated coefficients, p-values and adjusted R-squared. The estimated coefficients indicate the direction and magnitude of the relationship between each independent variable and the dependent variable. The p-values indicate whether the coefficients are statistically significant. The adjusted R-squared indicates the proportion of variation in the dependent variable explained by the model, while correcting for the number of variables included.

Several diagnostic tests were then performed to assess the reliability of the regression models. First, multicollinearity was examined using the Variance Inflation Factor, or VIF. Multicollinearity occurs when two or more independent variables are highly correlated with each other. If multicollinearity is too high, the model may have difficulty separating the individual effect of each variable, and the estimated coefficients may become unstable. In general, a VIF close to 1 indicates no multicollinearity, values between 1 and 5 are usually considered acceptable, values between 5 and 10 require caution and values above 10 may indicate a serious problem.

Second, heteroskedasticity was tested using the Breusch-Pagan test. Heteroskedasticity occurs when the variance of the regression residuals is not constant across observations. The null hypothesis of the Breusch-Pagan test is homoskedasticity, meaning that the residuals have constant variance. If the p-value is below 0.05, the null hypothesis is rejected and heteroskedasticity is present. This test is particularly important in firm-level financial data, where firms differ substantially in size, profitability and volatility, making non-constant error variance likely.

Because heteroskedasticity affects the reliability of standard errors, robust standard errors were calculated. Robust standard errors do not change the estimated coefficients, but they adjust the standard errors and p-values. This makes statistical inference more reliable when the assumption of homoskedasticity is violated. Therefore, the final interpretation of the regression results is based on the robust standard errors.

Diagnostic plots were also generated for the main model. Four standard plots were used: residuals vs fitted, Q-Q plot, scale-location and residuals vs leverage. The residuals vs fitted plot checks whether the residuals are randomly distributed around zero and whether the relationship is approximately linear. The Q-Q plot checks whether the residuals follow a normal distribution. The scale-location plot provides an additional visual assessment of heteroskedasticity. The residuals vs leverage plot identifies potentially influential observations, namely firms that may have a disproportionate effect on the estimated coefficients. These plots provide a graphical assessment of the main assumptions of the regression model and support the interpretation of the diagnostic tests.

In addition to the main OLS regression, robustness checks were performed in order to verify whether the results depend on the specific variables used in the main model. The main regression uses ROA volatility as the dependent variable and leverage D/A as the independent variable. However, since the study considers both asset-based and equity-based perspectives, additional specifications were estimated using alternative measures of earnings volatility and financial leverage.

The robustness checks have two main purposes. First, they test whether the leverage-volatility relationship remains stable when ROE volatility is used instead of ROA volatility. Second, they test whether the results remain valid when leverage is measured through debt-to-equity instead of debt-to-assets. This is important because ROA volatility and ROE volatility capture different dimensions of earnings stability. Similarly, leverage D/A and leverage D/E capture two different perspectives on indebtedness. Three robustness models were then estimated.

The first robustness check uses ROE volatility as the dependent variable while keeping leverage D/A as the independent variable. This specification tests whether debt-to-assets also explains equity-based earnings volatility. The purpose is to verify whether the

relationship observed in the main model remains valid when volatility is measured from the shareholders' equity perspective rather than from the asset perspective.

The second robustness check keeps ROA volatility as the dependent variable but replaces leverage D/A with leverage D/E. This is the most direct robustness test for the main model, because it maintains the same dependent variable but changes the leverage measure. The objective is to verify whether the relationship between leverage and ROA volatility remains consistent when indebtedness is measured relative to equity instead of total assets.

The third robustness check changes both the dependent variable and the independent variable. In this specification, ROE volatility is used as the dependent variable and leverage D/E is used as the independent variable. This is the most alternative specification, because it tests the leverage-volatility relationship from a fully equity-based perspective. It allows the analysis to verify whether debt relative to equity is associated with volatility in shareholder returns.

For each robustness check, the same moderator structure was applied. Therefore, geographical area was included both as a categorical variable and through interaction terms with the leverage measure used in the model. This means that each robustness specification tests not only whether leverage is associated with earnings volatility, but also whether this relationship changes across geographical areas.

The same diagnostic procedures used for the main OLS analysis were then repeated for the robustness checks. Multicollinearity was assessed using VIF diagnostics in order to verify whether the explanatory variables were excessively correlated. Heteroskedasticity was tested using the Breusch-Pagan test. Since heteroskedasticity was detected, robust standard errors were computed for all robustness models. As in the main analysis, robust

standard errors were used because they provide more reliable p-values and significance levels when residual variance is not constant.

Diagnostic plots were also generated for each robustness model and were used to check whether the robustness models presented severe violations of regression assumptions or whether any individual observation appeared to dominate the results.

4. EMPIRICAL RESULTS

4.1. Descriptive analysis

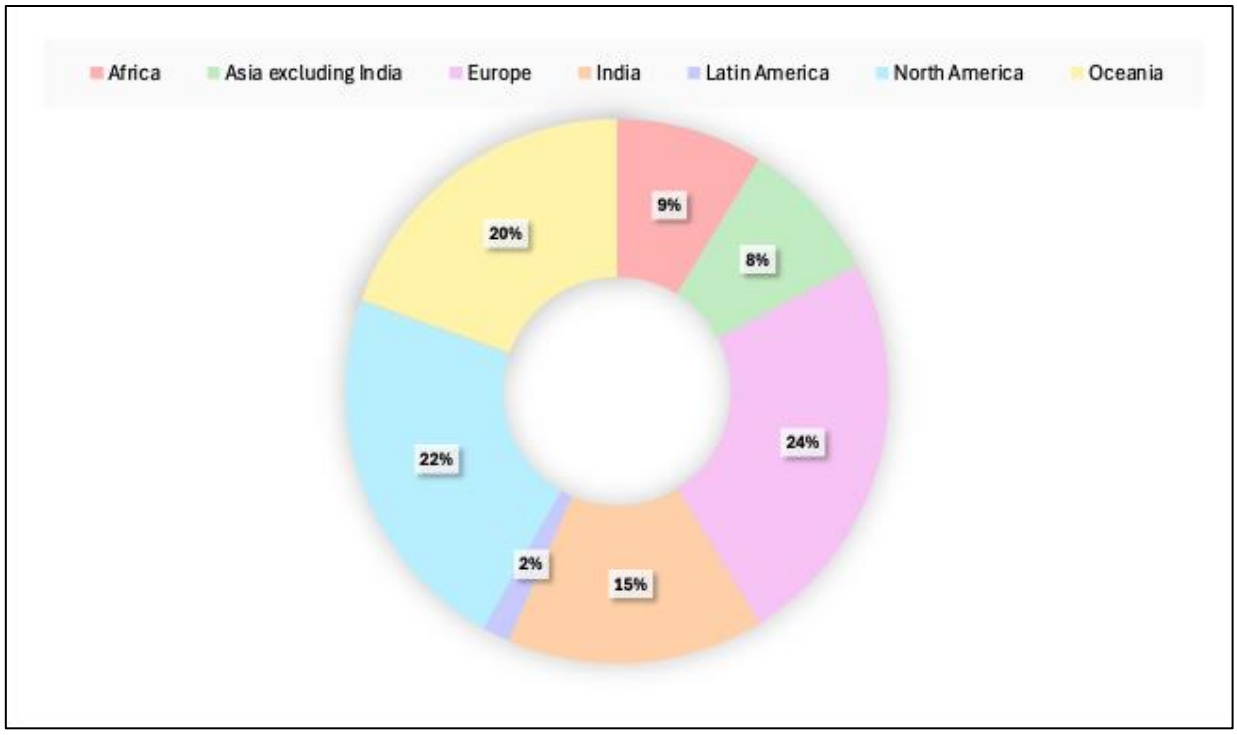
The first part of the descriptive analysis focuses on the composition of the initial sample. As reported in Table 1, the dataset includes a total of 12.558 firms distributed across the seven geographical areas chosen: Africa, Asia excluding India, Europe, India, Latin America, North America and Oceania. The distribution is also represented graphically in Figure 1, which provides a visual overview of the relative weight of each geographical area within the sample. Europe represents the largest geographical group, with 3.000 firms, corresponding to 24% of the total sample. North America follows with 2.794 firms, equal to 22%, while Oceania includes 2.457 firms, representing 20% of the dataset. India accounts for 1.928 firms, corresponding to 15% of the total sample, confirming its significant weight within the broader Asian sample. Africa and Asia excluding India are smaller but still relevant groups, with respectively 1.101 firms and 1.072 firms, each representing approximately 9% of the total dataset. Latin America is the smallest geographical area, with 206 firms, equal to 2% of the total sample. For this reason, the evidence related to Latin America should be interpreted with particular caution in the following analyses. Its inclusion is useful to preserve the global and cross-regional structure of the dataset, but the lower number of observations may make the results for this area more sensitive to individual firms.

Table 1. Distribution of firms by geographical area.

Geographical area	Number of firms	Percentage
Africa	1.101	9%
Asia excluding India	1.072	9%
Europe	3.000	24%
India	1.928	15%
Latin America	206	2%
North America	2.794	22%
Oceania	2.457	20%
Total	**12.558**	**100%**

Source: author's own elaboration based on Bloomberg data.

Figure 1. Distribution of data by geographical area



Source: author's own elaboration based on Bloomberg data.

The geographical distribution shown in Table 1 and Figure 1 confirms that the dataset has a broad cross-regional structure, but it is not perfectly balanced across areas. The largest parts of the sample are concentrated in Europe, North America, Oceania and India, while Latin America is considerably less represented. This imbalance is relevant for the interpretation of the following analyses, because areas with a smaller number of observations may produce fewer stable estimates and may be more sensitive to individual firms.

The country-level distribution is presented in Table 2, which provides more detailed information on the internal composition of each geographical area. In Africa, the sample is mainly composed of firms from South Africa, Egypt and Nigeria, which together represent the largest part of the African observations. In Latin America, most firms are from Brazil, followed by Mexico, Chile, Argentina, Colombia, Ecuador, Peru and Venezuela. North America is divided between the United States and Canada, with the US representing the majority of the firms in this area. Within Asia excluding India, the sample includes

firms from countries such as Thailand, Malaysia, Singapore, China, Hong Kong, United Arab Emirates, Japan, South Korea and Taiwan. India, as previously explained, is treated as a separate geographical area. In Europe, the dataset includes firms from several countries, including Spain, United Kingdom, Sweden, Switzerland, Germany, France, Italy, Netherlands, Belgium and Austria. Finally, Oceania is mainly composed of firms from Australia, with a smaller number of firms from New Zealand.

Table 2. Distribution of firms by country

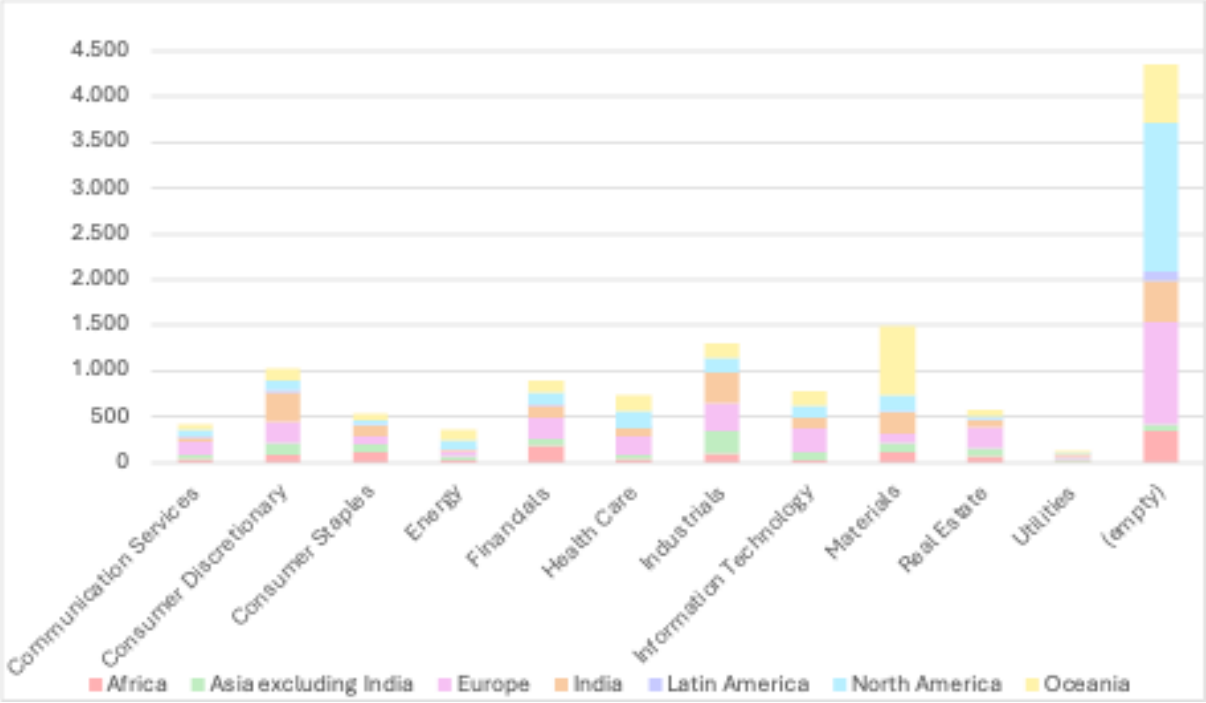
Country	Firms
Africa	**1.101**
Angola	7
Algeria	7
Egypt	258
Ghana	32
Kenya	62
Morocco	77
Nigeria	192
Tanzania	24
Uganda	11
South Africa	431
Latin America	**206**
Argentina	7
Brazil	134
Chile	18
Colombia	8
Ecuador	2
Mexico	29
Peru	7
Venezuela	1
North America	**2.794**
Canada	898
United States	1.896
Asia excluding India	**1.072**
United Arab Emirates	41
China	137
Hong Kong	45
Japan	9
South Korea	2
Malaysia	319
Singapore	179
Thailand	334
Taiwan	6
India	**1.928**
Europe	**3.000**
Austria	32
Belgium	75
Switzerland	393
Germany	347
Spain	635
France	223
United Kingdom	584
Italy	180
Netherlands	97
Sweden	434
Oceania	**2.457**
Australia	2.289
New Zealand	168
Total	**12.558**

Source: author's own elaboration based on Bloomberg data.

As it is possible to notice in Table 2, the fact that some geographical areas are internally more concentrated than others is a relevant aspect, because regional results may partly reflect the characteristics of the main countries represented within each area. Nevertheless, the country-level distribution confirms that the sample includes firms from a wide range of markets and therefore supports the cross-regional nature of the empirical analysis.

The descriptive analysis also considers the distribution of firms across GICS sectors. Table 3 reports the number of firms in each GICS sector by geographical area, while Figure 2 provides a graphical representation of the same distribution. The GICS classification is relevant because sectoral characteristics may influence both financial leverage and earnings volatility. Firms operating in different industries may have different capital needs, asset structures, risk profiles, and profitability patterns. For this reason, sector information is later included as a control variable in the regression analysis.

Figure 2. GICS sector distribution



Source: author's own elaboration based on Bloomberg data.

Table 3. Distribution of firms by GICS sector and geographical area

Geographical area	Financials	Health Care	Industrials	Information Technology
Africa	188	34	94	22
Asia excluding India	74	52	246	92
Europe	219	205	309	251
India	136	84	329	117
Latin America	13	1	11	4
North America	136	191	154	140
Oceania	128	163	162	147
Total	894	730	1.305	773

Geographical area	Materials	Real Estate	Utilities	(empty)
Africa	105	71	10	338
Asia excluding India	104	85	28	79
Europe	107	231	33	1.118
India	228	66	11	451
Latin America	12	14	1	105
North America	175	29	16	1.623
Oceania	758	73	19	642
Total	1.489	569	118	4.356

Geographical area	Total
Africa	1.101
Asia excluding India	1.072
Europe	3.000
India	1.928
Latin America	206
North America	2.794
Oceania	2.457
Total	12.558

Source: author's own elaboration based on Bloomberg data.

As reported in Table 3, the dataset includes firms from several sectors, including communication services, consumer discretionary, consumer staples, energy, financials, health care, industrials, information technology, materials, real estate and utilities. Among the classified firms, the most represented sectors are materials, with 1.489 firms, and industrials, with 1.305 firms. Consumer discretionary is also strongly represented, with 1.019 firms, followed by financials, information technology, health care, real estate, consumer staples, communication services, energy and utilities. The utilities sector is the smallest classified sector, with 118 firms.

A relevant element emerging from Figure 2 and Table 3 is the presence of a large number of observations classified as empty. This indicates that, for several firms, the GICS sector was not available in the exported dataset. This category should not be interpreted as an economic sector, but rather as missing sector information.

As a second step, the descriptive analysis focused on the main financial variables of the full sample. In this part it is possible to observe the total descriptive statistics calculated in RStudio for the variables related to firm size, capital structure, profitability, liquidity, market valuation, and earnings volatility. The tables include the number of available observations, mean, standard deviation, median, trimmed mean, median absolute deviation, minimum, maximum, range, skewness, kurtosis and standard error.

These total descriptive statistics exported from R were divided into four tables in order to improve readability. Table 4 reports the main accounting variables related to firm size, capital structure and operating performance. Table 5 presents market-based and liquidity indicators. Table 6 focuses on profitability measures, namely ROA and ROE for the years 2022, 2023 and 2024. Finally, Table 7 reports the key variables used in the following empirical analysis, that are ROA volatility, ROE volatility, leverage D/A, and leverage D/E.

Table 4. Descriptive statistics of accounting variables

Variable	Total Assets	Total Debt	Total Equity	Total Revenues
Observations	8.868	8.849,00	8.867,00	8.759,00
Mean	2.005.111.166.204.940	242.768.684.484.970,00	374.800.207.839.483,00	533.016.464.013.648,00
Standard deviation	28.522.874.462.270.100	4.304.352.403.861.340,00	6.981.037.557.134.150,00	6.316.339.180.537.710,00
Median	350.689.500	29.813.000,00	144.444.154,00	145.292.000,00
Trimmed	1.963.521.292	364.703.989,34	789.018.623,13	1.018.504.941,30
Median absolute deviation	515.230.632	44.200.753,80	214.962.486,83	215.409.919,20
Minimum	9.446	0,00	-2.279.134.950,00	0,00
Maximum	1.096.785.000.000.000.000	174.143.750.000.000.000,00	288.035.000.000.000.000,00	212.436.599.999.999.000,00
Range	1.096.784.999.999.990.000	174.143.750.000.000.000,00	288.035.002.279.134.000,00	212.436.599.999.999.000,00
Skewness	28	28,41	33,64	21,70
Kurtosis	959	1.003,82	1.294,21	612,85
Standard Error	302.886.870.673.730	45.757.335.061.197,40	74.136.421.678.539,70	67.489.806.026.720,50

Variable	Revenue Growth	Ebitda	Ebit	Net Income
Observations	7.750,00	8.166,00	8.528,00	8.927,00
Mean	16,24	51.225.153.512.332,10	11.855.292.088.689,20	8.129.833.844.688,01
Standard deviation	93,06	2.012.233.755.873.950,00	506.717.663.175.982,00	352.525.773.568.382,00
Median	4,37	9.042.756,50	1.731.000,00	1.408.000,00
Trimmed	5,08	126.849.586,93	75.125.543,96	54.865.182,40
Median absolute deviation	22,89	38.507.784,04	30.405.160,80	29.737.990,80
Minimum	-100,00	-501.584.258,70	-11.837.891.800,00	-9.488.245.248,00
Maximum	704,00	95.177.324.999.999.800,00	24.427.759.999.999.900,00	17.257.725.000.000.000,00
Range	804,00	95.177.325.501.584.100,00	24.427.771.837.891.700,00	17.257.734.488.245.200,00
Skewness	4,34	44,08	44,70	45,12
Kurtosis	25,94	2.004,07	2.054,27	2.093,23
Standard Error	1,06	22.267.616.972.806,90	5.487.094.595.778,07	3.731.110.462.579,26

Source: author's own elaboration based on Bloomberg data.

As shown in Table 4, the accounting variables present a very high degree of dispersion. Total assets, total debt, total equity, total revenues, EBITDA, EBIT and net income show large differences between mean and median values. This indicates that the sample

includes firms of very different sizes, ranging from relatively small companies to very large corporations. In particular, the mean is generally much higher than the median, suggesting that the distribution is influenced by a limited number of very large firms. This is also confirmed by the high standard deviations and by the positive skewness and kurtosis values, which indicate asymmetric and heavy-tailed distributions. Overall, the table shows that the sample is highly heterogeneous in terms of firm size and accounting performance.

Table 5. Descriptive statistics of market and liquidity variables

Variable	Market Cap	Price Per Share	Earnings Per Share	Market to book ratio
Observations	8.206,00	11.414,00	8.731,00	7.074,00
Mean	938.891.924.992.196,00	294,83	3,43	2,25
Standard deviation	11.221.348.265.250.200,00	1.731,35	77,48	2,48
Median	254.734.320,00	12,93	0,02	1,33
Trimmed	1.557.599.895,39	36,99	0,69	1,72
Median absolute deviation	370.839.253,15	19,04	0,47	1,16
Minimum	318.266,42	0,00	-1.903,15	0,03
Maximum	475.406.175.000.000.000,00	25.765,00	3.151,27	12,95
Range	475.406.174.999.682.000,00	25.765,00	5.054,42	12,92
Skewness	30,46	11,29	24,13	2,21
Kurtosis	1.201,13	144,71	1.291,66	5,04
Standard Error	123.873.749.977.417,00	16,21	0,83	0,03

Variable	Book Value Per Share	Current Ratio	Quick Ratio
Observations	8.662,00	8.015,00	7.737,00
Mean	53,46	3,85	2,42
Standard deviation	516,74	9,60	5,14
Median	1,95	1,55	0,86
Trimmed	9,92	2,03	1,22
Median absolute deviation	2,90	1,28	0,89
Minimum	-89,40	0,00	0,00
Maximum	20.746,64	229,86	41,36
Range	20.836,05	229,86	41,36
Skewness	32,78	10,78	4,68
Kurtosis	1.203,66	191,48	25,89
Standard Error	5,55	0,11	0,06

Source: author's own elaboration based on Bloomberg data.

Table 5 reports the descriptive statistics for market capitalization, price per share, earnings per share, market-to-book ratio, book value per share, current ratio and quick ratio. Also in this case, the variables show substantial dispersion. Market capitalization, in particular, presents a very large difference between mean and median, confirming that the sample includes a small number of firms with very high market values. The market-to-book ratio has a mean higher than the median, suggesting that some firms are valued by the market substantially above their book value. Liquidity indicators, measured through the current ratio and quick ratio, also show variability across firms, although their distributions are less extreme than those of size-related variables. These results

confirm that firms in the sample differ not only in size, but also in market valuation and liquidity position.

Table 6. Descriptive statistics of profitability variables

Variable	Roa 2022	Roa 2023	Roa 2024
Observations	7.553,00	7.740,00	7.771,00
Mean	-12,37	-13,67	-13,23
Standard deviation	54,78	56,80	56,43
Median	1,10	0,81	1,12
Trimmed	-2,73	-3,30	-2,77
Median absolute deviation	10,26	10,01	9,95
Minimum	-634,40	-677,61	-625,87
Maximum	32,03	34,01	33,87
Range	666,43	711,61	659,74
Skewness	-7,24	-7,28	-6,71
Kurtosis	70,22	72,38	60,01
Standard Error	0,63	0,65	0,64

Variable	Roe 2022	Roe 2023	Roe 2024
Observations	6.913,00	7.060,00	7.041,00
Mean	-6,78	-8,07	-6,74
Standard deviation	44,18	45,86	44,84
Median	4,34	3,25	4,02
Trimmed	0,40	-0,49	0,60
Median absolute deviation	18,73	18,65	17,69
Minimum	-262,44	-294,42	-226,05
Maximum	63,93	73,80	76,69
Range	326,37	368,22	302,75
Skewness	-2,44	-2,59	-2,37
Kurtosis	8,04	9,26	7,23
Standard Error	0,53	0,55	0,53

Source: author's own elaboration based on Bloomberg data.

Profitability measures are presented in Table 6, which reports ROA and ROE for 2022, 2023 and 2024. The results show that both ROA and ROE are characterized by considerable variability across firms and across years. The presence of negative minimum values indicates that some firms experienced losses during the period considered. At the same time, the median values are generally positive, suggesting that at least half of the firms in the sample reported positive profitability. The difference between mean and median values shows that profitability distributions are affected by extreme negative observations, especially for ROA. This confirms the importance of considering not only average profitability, but also the dispersion and volatility of profitability over time.

Table 7. Descriptive statistics of volatility and leverage variables

Variable	Roa Volatility	Roe Volatility
Observations	7.250,00	6.816,00
Mean	7,27	13,74
Standard deviation	9,03	16,77
Median	3,68	7,09
Trimmed	5,31	10,05
Median absolute deviation	4,18	7,74
Minimum	0,09	0,21
Maximum	43,13	78,33
Range	43,03	78,12
Skewness	1,98	1,95
Kurtosis	3,61	3,31

Variable	Leverage D/A	Leverage D/E
Observations	8.647,00	7.870,00
Mean	0,20	0,57
Standard deviation	0,23	0,87
Median	0,12	0,22
Trimmed	0,16	0,37
Median absolute deviation	0,18	0,33
Minimum	0,00	0,00
Maximum	1,25	4,41
Range	1,25	4,41
Skewness	1,44	2,40
Kurtosis	2,26	6,06

Source: author's own elaboration based on Bloomberg data.

The most relevant variables for the research question are reported in Table 7. ROA volatility has a mean of 7,27 and a median of 3,68, while ROE volatility has a mean of 13,74 and a median of 7,09. This indicates that ROE volatility is generally higher than ROA volatility, which is consistent with the fact that ROE is more directly affected by the firm's equity structure and by financial leverage. The higher standard deviation of ROE volatility also confirms that returns to shareholders fluctuate more strongly than returns on assets.

The leverage variables show that firms differ in their reliance on debt financing. Leverage D/A has a mean of 0,20 and a median of 0,12, while leverage D/E has a mean of 0,57 and a median of 0,22. In both cases, the mean is higher than the median, indicating that the distribution is positively skewed and that some firms present much higher leverage than the majority of the sample. This is also confirmed by the skewness and kurtosis values reported in the table.

The descriptive analysis was also conducted separately by geographical area in order to identify preliminary differences across regions. The results are reported in four tables. Table 8 presents the accounting variables by geographical area, Table 9 reports market and liquidity indicators, Table 10 focuses on profitability measures, and Table 11 presents the main variables used in the following empirical analysis.

Table 8. Descriptive statistics of accounting variables by geographical area

Geographical area	Total Assets Mean	Total Assets Median	Total Assets Standard Deviation	Total Assets Min	Total Assets Max	Total Assets Observations
Latin America	58.344.658.206.249.800	5.225.537.784	213.285.936.902.676.000	52.009.581	1.096.785.000.000.000.000	111
North America	3.132.773.965	53.740.119	8.997.242.231	9.446	47.273.495.000	1.332
Asia excluding India	7.337.152.903	798.155.414	19.156.839.809	2.584.798	96.948.048.403	1.024
India	781.936.071.888.026	1.310.133.000	3.789.534.393.660.920	13.143.400	21.054.974.999.999.900	1.707
Europe	5.549.726.628	172.538.000	17.484.333.605	631.789	95.226.690.300	2.053
Oceania	945.877.967	31.814.708	2.851.286.899	645.469	15.029.647.500	1.822
Africa	12.173.722.934.335.600	7.052.148.114	45.864.007.292.690.900	19.942.241	259.698.449.999.999.000	819
Geographical area	**Total Debt Mean**	**Total Debt Median**	**Total Debt Standard Deviation**	**Total Debt Min**	**Total Debt Max**	**Total Debt Observations**
Latin America	7.909.904.470.167.740	600.977.000	31.961.588.205.991.900	0	174.143.750.000.000.000	111
North America	845.436.302	4.262.687	2.545.627.355	0	13.526.581.300	1.328
Asia excluding India	2.087.002.999	60.414.595	6.514.602.870	0	35.172.521.685	1.024
India	3.437.708.877	211.055.000	9.903.678.908	0	53.224.550.000	1.706
Europe	1.191.545.684	23.423.650	3.578.678.894	0	18.682.275.000	2.040
Oceania	249.129.732	967.500	812.200.053	0	4.439.000.000	1.821
Africa	1.550.975.193.942.130	612.263.000	7.264.446.500.862.170	0	41.530.669.999.999.800	819
Geographical area	**Total Equity Mean**	**Total Equity Median**	**Total Equity Standard Deviation**	**Total Equity Min**	**Total Equity Max**	**Total Equity Observations**
Latin America	15.933.992.946.667.200	2.376.754.000	56.868.910.067.271.200	-191.137.500	288.035.000.000.000.000	111
North America	957.436.873	16.840.488	2.578.917.540	-31.465.770	12.848.372.500	1.332
Asia excluding India	3.393.427.274	420.607.982	8.449.535.086	-4.892.278	42.067.645.700	1.024
India	27.395.892.816.723	601.826.000	168.449.017.673.669	-1.349.108.650	1.063.859.999.999.980	1.707
Europe	1.699.978.692	79.446.500	5.019.146.048	-9.916.975	26.840.925.000	2.052
Oceania	365.072.129	20.095.335	987.045.126	-4.370.348	4.959.551.400	1.822
Africa	1.841.155.718.072.440	2.295.623.000	7.545.546.979.732.370	-2.279.134.950	41.082.794.999.999.800	819
Geographical area	**Total Revenues Mean**	**Total Revenues Median**	**Total Revenues Standard Deviation**	**Total Revenues Min**	**Total Revenues Max**	**Total Revenues Observations**
Latin America	13.193.967.645.860.500	2.115.968.000	43.079.208.117.405.400	0	212.436.599.999.999.000	112
North America	1.250.155.105	13.969.000	3.267.897.135	0	16.306.355.000	1.295
Asia excluding India	3.173.149.470	386.016.405	7.792.392.035	22.970	39.480.364.409	1.019
India	316.294.004.202.031	917.511.000	1.772.160.828.409.760	0	10.600.249.999.999.900	1.717
Europe	2.148.317.068	77.814.679	6.370.195.681	0	34.175.100.000	2.007
Oceania	407.375.894	3.366.041	1.207.199.951	0	6.335.317.500	1.788
Africa	3.225.188.957.726.650	3.225.080.961	11.702.884.153.356.600	0	62.742.950.000.000.000	821
Geographical area	**Revenue Growth Mean**	**Revenue Growth Median**	**Revenue Growth Standard Deviation**	**Revenue Growth Min**	**Revenue Growth Max**	**Revenue Growth Observations**
Latin America	20	8	89	-100	435	109
North America	8	3	72	-100	307	977
Asia excluding India	7	2	42	-71	165	998
India	26	8	119	-100	628	1.625
Europe	8	3	54	-100	227	1.857
Oceania	24	3	143	-100	704	1.384
Africa	24	12	51	-88	210	800
Geographical area	**Ebitda Mean**	**Ebitda Median**	**Ebitda Standard Deviation**	**Ebitda Min**	**Ebitda Max**	**Ebitda Observations**
Latin America	4.203.722.778.311.330	528.035.000	17.880.693.049.083.300	-368.758.600	95.177.324.999.999.800	99
North America	229.906.622	-346.154	673.169.606	-126.397.750	3.376.132.750	1.151
Asia excluding India	451.400.213	30.216.000	1.259.442.832	-254.993.189	6.649.368.399	975
India	1.273.523.920	75.408.500	3.549.260.525	-215.754.725	18.676.055.000	1.684
Europe	311.633.194	7.151.347	933.757.601	-82.254.625	4.907.625.000	1.846
Oceania	61.642.752	-1.194.021	188.961.057	-36.316.769	918.850.000	1.734
Africa	3.149.951.275.430	351.225.000	19.619.975.337.311	-501.584.259	125.308.797.303.028	677
Geographical area	**Ebit Mean**	**Ebit Median**	**Ebit Standard Deviation**	**Ebit Min**	**Ebit Max**	**Ebit Observations**
Latin America	927.493.900.109.315	212.674.000	4.406.275.203.999.680	-11.837.891.800	24.427.759.999.999.900	109
North America	124.227.044	-839.433	426.212.126	-152.217.700	2.170.850.000	1.237
Asia excluding India	259.659.955	14.704.815	765.861.578	-482.171.657	3.862.150.125	996
India	858.467.494	44.044.000	2.394.557.501	-488.145.550	12.293.362.500	1.702
Europe	169.009.623	1.529.951	548.418.423	-179.891.250	2.855.800.000	1.983
Oceania	36.765.629	-1.630.676	128.264.811	-50.882.000	649.400.000	1.801
Africa	4.030.082.284	265.196.351	12.210.583.816	-1.199.952.525	66.082.405.250	700
Geographical area	**Net Income Mean**	**Net Income Median**	**Net Income Standard Deviation**	**Net Income Min**	**Net Income Max**	**Net Income Observations**
Latin America	653.774.657.189.401	146.796.000	3.107.790.416.802.120	-9.488.245.248	17.257.725.000.000.000	111
North America	96.522.186	-710.883	361.405.788	-181.488.756	1.875.262.448	1.366
Asia excluding India	226.821.605	9.236.719	756.002.972	-543.448.386	3.947.753.050	1.018
India	698.985.331	32.913.777	2.243.377.374	-929.626.872	12.060.859.392	1.726
Europe	126.693.187	792.500	466.979.567	-241.240.650	2.489.350.106	2.048
Oceania	19.275.847	-1.845.513	83.023.886	-73.547.000	411.340.000	1.833
Africa	5.061.552.545	221.172.000	15.633.094.481	-2.414.228.992	82.519.891.968	825

Source: author's own elaboration based on Bloomberg data.

As shown in Table 8, the accounting variables differ substantially across geographical areas. Variables such as total assets, total debt, total equity, total revenues, EBITDA, EBIT and net income present high dispersion within all regions, as shown by the differences between mean and median values and by the high standard deviations. In several cases, the mean is considerably higher than the median, indicating that the average values are influenced by a limited number of very large firms. This confirms that firm size and accounting performance are highly heterogeneous not only in the total sample, but also within each geographical area.

The table also suggests that some regions include firms with particularly large accounting values. For example, India and Latin America show high average values for several size and performance indicators, while other areas present lower median values. However, these results should be interpreted with caution, because the presence of large differences between mean and median indicates that the distributions are strongly asymmetric. Therefore, the median is particularly useful in this table because it provides a more stable indication of the typical firm within each geographical area.

Table 9. Descriptive statistics of market and liquidity variables by geographical area

Geographical area	Market Cap Mean	Market Cap Median	Market Cap Standard Deviation	Market Cap Min	Market Cap Max	Market Cap Observations
Latin America	25.762.396.727.641.900	3.620.729.472	91.818.717.880.070.800	13.665.233	475.406.175.000.000.000	88
North America	3.187.151.526	53.713.288	9.063.511.209	318.266	45.524.248.986	1.265
Asia excluding India	4.721.755.827	494.400.000	12.299.189.564	4.872.766	63.035.936.358	925
India	2.050.297.773.870.860	1.273.249.536	8.677.773.273.725.700	17.635.545	48.112.029.999.999.900	1.499
Europe	3.377.810.074	142.569.528	10.279.822.575	1.147.057	56.083.736.064	1.926
Oceania	840.957.792	39.799.376	2.445.123.137	1.913.894	12.849.243.443	1.703
Africa	2.955.054.405.296.070	3.140.173.184	12.378.544.132.559.800	29.147.030	69.456.457.499.999.900	800
Geographical area	**Price Per Share Mean**	**Price Per Share Median**	**Price Per Share Standard Deviation**	**Price Per Share Min**	**Price Per Share Max**	**Price Per Share Observations**
Latin America	856	33	3.109	1	15.967	167
North America	36	24	48	0	226	2.447
Asia excluding India	4	1	6	0	31	984
India	301	80	581	1	2.959	1.694
Europe	117	15	285	0	1.463	2.840
Oceania	9	1	18	0	86	2.291
Africa	2.290	190	5.249	0	25.765	991
Geographical area	**Earnings Per Share Mean**	**Earnings Per Share Medi**	**Earnings Per Share Standard Deviation**	**Earnings Per Share M**	**Earnings Per Share Max**	**Earnings Per Share Observations**
Latin America	80	1	673	-1.903	3.151	111
North America	-3	0	15	-85	11	1.351
Asia excluding India	0	0	2	-13	4	1.002
India	8	2	21	-27	100	1.632
Europe	2	0	6	-8	32	1.999
Oceania	0	0	0	0	1	1.817
Africa	10	1	27	-11	143	819
Geographical area	**Book Value Per Share Mea**	**Book Value Per Share Me**	**Book Value Per Share Standard Deviation**	**Book Value Per Shar**	**Book Value Per Share Max**	**Book Value Per Share Observations**
Latin America	1.366	11	4.263	-89	20.747	111
North America	9	1	20	-19	87	1.354
Asia excluding India	7	1	20	0	105	1.002
India	108	36	203	-64	1.018	1.567
Europe	30	3	88	0	501	2.011
Oceania	1	0	2	0	9	1.799
Africa	73	8	176	-8	860	818
Geographical area	**Current Ratio Mean**	**Current Ratio Median**	**Current Ratio Standard Deviation**	**Current Ratio Min**	**Current Ratio Max**	**Current Ratio Observations**
Latin America	15	2	51	0	230	103
North America	4	1	7	0	37	1.194
Asia excluding India	3	2	3	0	15	955
India	6	2	13	0	72	1.520
Europe	3	1	5	0	27	1.875
Oceania	4	2	7	0	32	1.727
Africa	2	1	2	0	8	641
Geographical area	**Quick Ratio Mean**	**Quick Ratio Median**	**Quick Ratio Standard Deviation**	**Quick Ratio Min**	**Quick Ratio Max**	**Quick Ratio Observations**
Latin America	1	1	1	0	4	90
North America	3	1	6	0	33	1.195
Asia excluding India	2	1	2	0	11	943
India	3	1	7	0	41	1.520
Europe	2	1	3	0	16	1.725
Oceania	3	1	5	0	25	1.677
Africa	1	1	1	0	5	587
Geographical area	**Mtbr Mean**	**Mtbr Median**	**Mtbr Standard Deviation**	**Mtbr Min**	**Mtbr Max**	**Mtbr Observations**
Latin America	2	1	2	0	11	81
North America	3	2	3	0	13	873
Asia excluding India	1	1	2	0	8	875
India	3	2	3	0	13	1.251
Europe	2	1	2	0	10	1.739
Oceania	2	1	3	0	12	1.537
Africa	2	1	2	0	9	718

Source: author's own elaboration based on Bloomberg data.

Table 9 reports the descriptive statistics for market capitalization, price per share, earnings per share, book value per share, current ratio, quick ratio and market-to-book ratio. The results confirm that market-based variables also differ across geographical areas and are characterized by high variability. Market capitalization, in particular, shows large differences between mean and median values, suggesting that in each area there are a few firms with very high market values compared to the majority of the sample.

Liquidity indicators, measured through the current ratio and quick ratio, also vary across regions. However, their median values are generally more stable than their means, which suggests that some high values influence the averages. The market-to-book ratio presents moderate differences across areas and provides a preliminary indication of differences in growth opportunities and market valuation. In general, Table 9 shows that firms differ not only in accounting size, but also in market valuation and liquidity position across geographical areas.

Table 10. Descriptive statistics of profitability variables by geographical area

Geographical area	Roa 2022 Mean	Roa 2022 Median	Roa 2022 Standard Deviation	Roa 2022 Min	Roa 2022 Max	Roa 2022 Observations
Latin America	1	4	17	-68	21	102
North America	-49	-4	124	-634	23	990
Asia excluding India	1	3	14	-49	26	890
India	3	2	13	-44	32	1.399
Europe	-6	2	24	-93	23	1.751
Oceania	-25	-10	46	-205	24	1.680
Africa	4	4	9	-26	26	741
Geographical area	**Roa 2023 Mean**	**Roa 2023 Median**	**Roa 2023 Standard Deviation**	**Roa 2023 Min**	**Roa 2023 Max**	**Roa 2023 Observations**
Latin America	2	3	11	-38	19	105
North America	-54	-6	130	-678	22	995
Asia excluding India	1	3	13	-40	26	922
India	3	3	13	-45	34	1.453
Europe	-8	1	27	-113	20	1.775
Oceania	-26	-10	45	-189	22	1.738
Africa	4	4	10	-25	32	752
Geographical area	**Roa 2024 Mean**	**Roa 2024 Median**	**Roa 2024 Standard Deviation**	**Roa 2024 Min**	**Roa 2024 Max**	**Roa 2024 Observations**
Latin America	3	5	11	-32	22	103
North America	-52	-4	129	-626	22	976
Asia excluding India	1	2	12	-41	22	931
India	4	3	13	-44	34	1.511
Europe	-8	1	28	-114	22	1.762
Oceania	-28	-10	47	-199	20	1.735
Africa	5	4	11	-23	34	753
Geographical area	**Roe 2022 Mean**	**Roe 2022 Median**	**Roe 2022 Standard Deviation**	**Roe 2022 Min**	**Roe 2022 Max**	**Roe 2022 Observations**
Latin America	6	10	22	-60	48	93
North America	-26	-2	67	-262	61	838
Asia excluding India	5	6	20	-58	47	850
India	9	7	20	-48	64	1.224
Europe	-5	5	38	-134	54	1.651
Oceania	-27	-11	55	-201	54	1.561
Africa	12	11	19	-40	59	696
Geographical area	**Roe 2023 Mean**	**Roe 2023 Median**	**Roe 2023 Standard Deviation**	**Roe 2023 Min**	**Roe 2023 Max**	**Roe 2023 Observations**
Latin America	4	7	20	-59	34	97
North America	-29	-3	73	-294	58	817
Asia excluding India	4	5	21	-59	52	881
India	10	7	21	-45	74	1.278
Europe	-8	4	43	-165	47	1.672
Oceania	-28	-12	52	-199	43	1.611
Africa	12	12	22	-57	63	704
Geographical area	**Roe 2024 Mean**	**Roe 2024 Median**	**Roe 2024 Standard Deviation**	**Roe 2024 Min**	**Roe 2024 Max**	**Roe 2024 Observations**
Latin America	8	10	22	-61	40	96
North America	-21	-1	60	-226	63	769
Asia excluding India	3	5	21	-77	44	895
India	11	8	21	-42	77	1.339
Europe	-9	4	44	-168	52	1.648
Oceania	-29	-11	56	-221	44	1.582
Africa	15	14	23	-43	75	712

Source: author's own elaboration based on Bloomberg data.

Profitability measures are reported in Table 10, which includes ROA and ROE for 2022, 2023 and 2024. The table shows that profitability varies considerably across geographical areas and across years. Some regions report positive median values, while others present negative average values, suggesting that the sample includes firms with very different profitability profiles. The presence of negative minimum values in all profitability measures confirms that several firms experienced losses during the period considered.

A relevant aspect emerging from Table 10 is that mean values are often lower than median values, especially for ROA. This suggests that profitability distributions are affected by negative extreme observations. In other words, a number of firms with particularly negative profitability reduce the average values, while the median remains more representative of the central tendency of the sample. This pattern confirms the importance of considering both mean and median when interpreting profitability data.

Table 11. Descriptive statistics of volatility and leverage variables by geographical area

Geographical area	Roa Volatility Mean	Roa Volatility Median	Roa Volatility Standard Deviation	Roa Volatility Min	Roa Volatility Max	Roa Volatility Observations
Latin America	6	3	8	0	37	103
North America	9	5	11	0	42	837
Asia excluding India	5	3	6	0	28	904
India	5	3	7	0	30	1.398
Europe	6	3	8	0	35	1.698
Oceania	11	7	11	0	43	1.565
Africa	5	3	6	0	25	745
Geographical area	**Roe Volatility Mean**	**Roe Volatility Median**	**Roe Volatility Standard Deviation**	**Roe Volatility Min**	**Roe Volatility Max**	**Roe Volatility Observations**
Latin America	10	5	11	1	45	95
North America	18	10	20	1	78	758
Asia excluding India	10	5	13	0	61	867
India	11	6	14	0	64	1.264
Europe	13	7	17	0	70	1.610
Oceania	18	11	19	1	75	1.525
Africa	11	6	13	1	61	697
Geographical area	**Leverage D/A Mean**	**Leverage D/A Median**	**Leverage D/A Standard Deviation**	**Leverage D/A Min**	**Leverage D/A Max**	**Leverage D/A Observations**
Latin America	0	0	0	0	1	111
North America	0	0	0	0	1	1.246
Asia excluding India	0	0	0	0	1	1.011
India	0	0	0	0	1	1.648
Europe	0	0	0	0	1	2.020
Oceania	0	0	0	0	1	1.799
Africa	0	0	0	0	1	812
Geographical area	**Leverage D/E Mean**	**Leverage D/E Median**	**Leverage D/E Standard Deviation**	**Leverage D/E Min**	**Leverage D/E Max**	**Leverage D/E Observations**
Latin America	1	0	1	0	4	104
North America	1	0	1	0	4	989
Asia excluding India	0	0	1	0	3	971
India	1	0	1	0	4	1.519
Europe	1	0	1	0	4	1.882
Oceania	0	0	1	0	3	1.650
Africa	1	0	1	0	4	755

Source: author's own elaboration based on Bloomberg data.

The variables most directly connected to the research question are presented in Table 11. ROA volatility and ROE volatility show relevant differences across geographical areas. In

general, ROE volatility is higher than ROA volatility in all areas, confirming that returns to shareholders are more volatile than returns on assets.

The table also shows that North America and Oceania present relatively higher levels of volatility compared to most other areas, especially in terms of ROE volatility. This suggests that firms in these regions experienced stronger fluctuations in profitability during the period considered. By contrast, areas such as Asia excluding India, India, Africa, and Latin America generally show lower median volatility values, although dispersion remains present within each group.

Overall, the preliminary descriptive results show that the dataset is broad and geographically diversified, although not perfectly balanced across areas. Europe, North America, Oceania and India represent the largest parts of the sample, while Latin America is comparatively underrepresented. This imbalance is particularly relevant for the interpretation of the empirical results, because the smaller size of the Latin American subsample may reduce the stability of the estimates related to this area. Moreover, some geographical areas are dominated by specific countries, such as the United States in North America and Australia in Oceania. The sample also includes firms from different industries, although GICS sector information is missing for a significant number of observations.

At the same time, the descriptive statistics show strong heterogeneity across firms in terms of size, market value, profitability, liquidity, leverage and earnings volatility. The main financial variables are not normally distributed and often present high dispersion, asymmetry and heavy tails, as indicated by the differences between mean and median values and by the skewness and kurtosis indicators.

The descriptive statistics by geographical area show that the sample is characterized by substantial regional heterogeneity. Firms differ across areas in terms of size, market valuation, liquidity, profitability, leverage and earnings volatility. However, these descriptive results only provide preliminary evidence of possible differences. For this reason, the next stage of the empirical analysis applies ANOVA to verify whether average differences in leverage and volatility across geographical areas are significant.

4.2. Analysis of variance

The analysis of variance was conducted in order to verify whether the differences observed in the descriptive statistics were statistically significant across geographical areas. The final ANOVA sample includes 6.513 complete observations, after removing observations with missing values in the variables included in the test. The analysis focuses on four main variables: leverage D/A, leverage D/E, ROA volatility and ROE volatility.

The results reported in Table 12 show that all four ANOVA models are statistically significant, with p-values below 0.001. This means that the null hypothesis of equal means across geographical areas can be rejected for each variable. Therefore, the results indicate that firms located in different geographical areas present significantly different average levels of leverage and earnings volatility. More specifically, the average values of leverage D/A, leverage D/E, ROA volatility and ROE volatility are not homogeneous across regions.

Table 12. Analysis of variance results

ANOVA 1 - Leverage Debt/Assets					
	Df	**Sum sq**	**Mean sq**	**F value**	**P value**
Geographical area	6	4,11	1	21,07	<0,0000000000000002 ***
Residuals	6.506	211,51	0		
ANOVA 2 - Leverage Debt/Equity					
	Df	**Sum sq**	**Mean sq**	**F value**	**P value**
Geographical area	6	94	16	24,17	<0,0000000000000002 ***
Residuals	6.506	42222	1		
ANOVA 3 - ROA volatility					
	Df	**Sum sq**	**Mean sq**	**F value**	**P value**
Geographical area	6	33174	5.529	89,45	<0,0000000000000002 ***
Residuals	6.506	402138	62		
ANOVA 4 - ROE volatility					
	Df	**Sum sq**	**Mean sq**	**F value**	**P value**
Geographical area	6	43179	7.196	32,47	<0,0000000000000002 ***
Residuals	6.506	1441846	222		

Source: author's own elaboration based on Bloomberg data.

The significance of the analysis of variance results suggests that geographical area is associated with differences in firms' financial characteristics. However, these results

should not be interpreted as meaning that geography explains most of the variation in leverage and volatility. The ANOVA only shows that at least one geographical area differs from the others in terms of average values. For this reason, eta squared was used to assess the magnitude of the geographical effect as reported in Appendix Table 1. The eta squared results show that the effect of geographical area is small for leverage D/A and leverage D/E, with a value of 0,02. This means that, although leverage differs significantly across regions, geographical area explains only a limited share of the overall variability in leverage. Firms' indebtedness policies are not identical across regions, but the differences are not large enough to suggest that geography is the dominant factor explaining leverage.

This result shows that geographical area matters for leverage, but only to a limited extent. Capital structure decisions are likely influenced by many additional firm-specific factors, such as size, profitability, sector, access to credit, internal financing capacity and market conditions. Therefore, the significant ANOVA results for leverage indicate the presence of regional differences, but the small eta squared values suggest that these differences should be interpreted as statistically significant rather than strongly explanatory. This distinction is particularly relevant because the sample is large, and with many observations even relatively small differences can become statistically significant.

The results are more meaningful for ROA volatility. Among the four variables analyzed, ROA volatility presents the strongest geographical effect, with an eta squared of 0,08. The eta squared value indicates that geographical area explains approximately 8% of the variability in ROA volatility, which represents a more relevant effect compared to the leverage variables and ROE volatility. This suggests that differences across regions are more clearly reflected in the stability of returns on assets than in firms' leverage ratios. From an economic perspective, this may indicate that firms' asset-based performance is more sensitive to the geographical context in which they operate. Differences in market stability, macroeconomic conditions, institutional environments, industry composition and exposure to uncertainty may affect the stability of firms' operating performance, and these effects appear more visible when volatility is measured through ROA.

By contrast, the geographical effect on ROE volatility is more limited, with an eta squared of 0,03. Although the analysis of variance result is statistically significant, eta squared suggests that the explanatory power of geographical area is weaker than for ROA

volatility. This distinction is relevant because ROE volatility is more directly affected by the firm's equity structure and by the relationship between debt and shareholders' returns. Therefore, while ROE volatility differs across regions, its variation may depend more strongly on firm-level capital structure and profitability conditions than on geographical area alone. This supports the idea that ROA volatility and ROE volatility capture different dimensions of earnings instability: ROA volatility reflects the stability of performance generated by the firm's assets, while ROE volatility is more directly influenced by the financial structure of the firm.

The Tukey post-hoc tests, reported in Appendix Table 4, provide a more detailed interpretation of the results of the analysis of variance. Since the ANOVA only indicates that at least one difference exists across geographical areas, the Tukey test identifies which specific regional pairs differ significantly. The results show that significant differences are not uniformly distributed across all geographical areas. Instead, they are concentrated in specific pairs of regions. This means that the geographical heterogeneity detected by ANOVA does not imply that every area is significantly different from all the others. Some areas present similar average values, while others differ more clearly. Therefore, the regional effect should be interpreted as selective rather than universal. In addition, comparisons involving Latin America should be interpreted with caution because this area includes a much smaller number of observations than the other regions.

The main pattern emerging from the Tukey tests and which it is visible also in the boxplots is that Oceania tends to present lower leverage compared to several other geographical areas. This is relevant in both leverage D/A and leverage D/E. As shown in Figure 3, the boxplots show that Oceania has a lower central position in the leverage distributions, suggesting that firms in this area rely less on debt financing relative to assets or equity compared to many other regions. This result is important because it indicates that Oceania may have a more conservative financial structure in the sample, at least on average. However, this interpretation should remain cautious, because the ANOVA and Tukey tests identify differences in average values but do not explain the underlying causes of those differences.

The volatility results show a different pattern. Oceania and North America appear to be the areas with higher levels of earnings volatility, especially when volatility is measured through ROA and ROE. This is visible in the volatility boxplots reported in Figure 4, where these two areas present higher central values and wider dispersion compared to several other regions. The result suggests that firms in Oceania and North America experienced stronger fluctuations in profitability during the period considered. This finding is particularly relevant because it shows that lower leverage does not necessarily correspond to lower earnings volatility. In the case of Oceania, the analysis suggests a combination of relatively lower leverage and relatively higher volatility. This indicates that earnings instability may be driven by factors other than leverage alone, such as sectoral composition, firm size, exposure to market shocks or regional economic conditions.

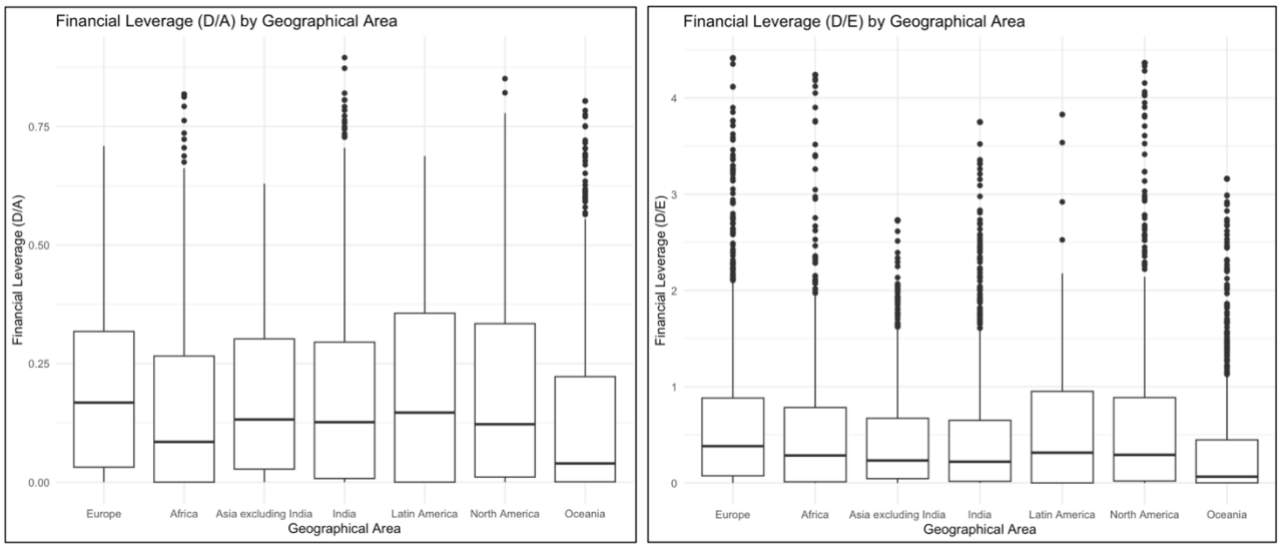
The fact that ROA volatility shows the clearest regional differences is one of the most important findings of the ANOVA section. Compared to leverage and ROE volatility, ROA volatility appears to be the variable for which geographical area has the strongest explanatory relevance. This supports the idea that the stability of asset-based performance may vary substantially across geographical contexts. In practical terms, firms located in different regions do not only differ in how much debt they use, but also in how stable their operating profitability is. This finding suggests that volatility is not randomly distributed across the sample but has a relevant regional component.

The Levene test adds another important element to the interpretation. The test is significant for all variables, with p-values below 0.001, as reported in Appendix Table 2, indicating that variances are not equal across geographical areas. This means that regions differ not only in terms of their average values, but also in terms of dispersion. This means that some geographical areas contain firms with more heterogeneous leverage and volatility profiles than others. This result is consistent with the descriptive statistics, which showed strong dispersion, asymmetry and heavy tails in the main financial variables. It also confirms that the sample is not only geographically diversified, but also internally heterogeneous within each region.

The unequal variances are particularly relevant for interpreting the results because they suggest that the financial characteristics of firms are not equally dispersed across regions. For example, one geographical area may contain firms with relatively similar leverage levels, while another may include firms with very different degrees of indebtedness. Similarly, volatility may be concentrated within a narrower range in some regions and much more dispersed in others. This strengthens the idea that geographical area is associated with heterogeneous financial profiles, but it also confirms the need for caution when comparing regions with different levels of dispersion.

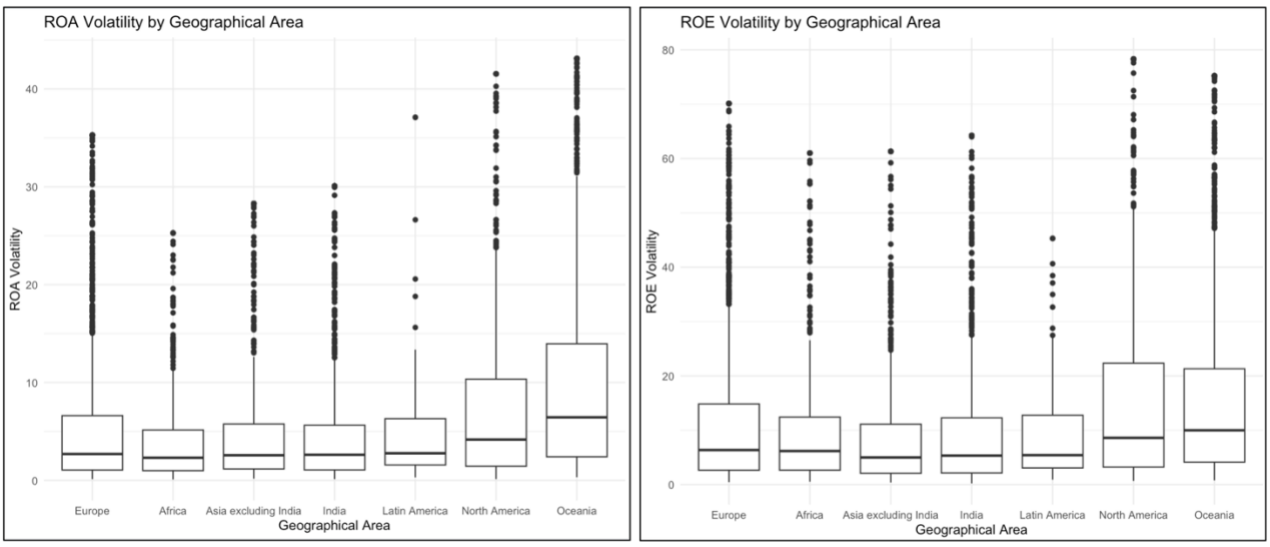
For this reason, Welch ANOVA was used as a robustness check. The Welch results, reported in Appendix Table 3, confirm the standard analysis of variance findings, with p-values below 0.001 for all variables. This outcome shows that the significant differences across geographical areas remain valid even after accounting for the violation of the equal variance assumption. Therefore, the ANOVA results do not depend on a problematic statistical assumption. The evidence of regional differences is robust to the use of a more appropriate test for unequal variances.

Figure 3. Financial leverage boxplots by geographical area



Source: author's own elaboration based on Bloomberg data.

Figure 4. Earnings volatility boxplots by geographical area



Source: author's own elaboration based on Bloomberg data.

The graphical evidence from the boxplots supports the statistical results. The leverage boxplots reported in Figure 3 show that Oceania tends to have lower leverage levels, while the volatility boxplots reported in Figure 4 show higher volatility for Oceania and North America. The boxplots also highlight the presence of outliers and wide dispersion within several regions, confirming that financial variables are highly heterogeneous across firms. This visual evidence is coherent with the Levene test, which indicates unequal variances, and with the descriptive statistics, which showed that the financial variables are not normally distributed. In particular, the ROA volatility boxplot provides the clearest visual confirmation of regional differences, as the distribution of ROA volatility varies visibly across geographical areas.

Taken together, the results of the analysis of variance support the hypothesis that firms across geographical areas differ in terms of leverage and earnings volatility. The evidence is statistically strong, since all four ANOVA models are significant at the 0.001 level. However, the strength of the geographical effect differs across variables. For leverage D/A and leverage D/E, the differences are statistically significant but relatively small. For ROE volatility, the geographical effect is also limited. For ROA volatility, instead, the

geographical effect is more relevant, suggesting that regional differences are especially important for explaining asset-based earnings instability.

ANOVA confirms that average differences exist across geographical areas, but it does not explain whether leverage itself contributes to earnings volatility after controlling for firm-specific characteristics. Moreover, ANOVA does not test whether the relationship between leverage and volatility changes across regions. Therefore, the next step of the empirical analysis uses OLS regression with moderator in order to examine whether financial leverage is significantly associated with earnings volatility and whether geographical area modifies this relationship.

4.3. OLS regression analysis with moderator

The OLS regression analysis allows the study to verify whether leverage remains associated with volatility after controlling for firm-level characteristics. The main model uses ROA volatility as the dependent variable and leverage D/A as the main explanatory variable.

The main OLS regression is presented through three progressively specified models, reported in Table 13, 14 and 15. Model 1 represents the baseline specification and examines the relationship between leverage D/A and ROA volatility while including the firm-level controls. Model 2 extends the baseline specification by adding geographical area. Model 3 further extends the analysis by adding the interaction terms between leverage D/A and geographical area. This specification makes it possible to observe whether the leverage-volatility relationship differs across regions, rather than only whether regions differ in their average level of volatility.

The three models should therefore be interpreted together. Model 1 identifies the general association between leverage and ROA volatility. Model 2 verifies whether this association remains stable after controlling for geographical differences and whether geography has an independent effect on average volatility levels. Model 3 tests whether geography changes the slope of the leverage-volatility relationship. This progressive structure is important because it allows the analysis to distinguish between two different roles of geography: geography may explain differences in average ROA volatility, or it may moderate the effect of leverage on ROA volatility.

Model 1, as shown in Table 13, provides evidence of a negative and statistically significant relationship between leverage D/A and ROA volatility. This means that, after controlling for firm size, profitability, growth opportunities and sector, firms with higher debt relative to assets tend to present lower volatility in ROA. The negative coefficient suggests that, within this sample, more leveraged firms tend to have more stable returns on assets.

This result is particularly relevant because it is partly counterintuitive compared to the part of the literature that associates debt financing with higher financial risk and greater earnings instability. Studies discussed in the literature review often emphasize that leverage may amplify earnings fluctuations because debt creates fixed financial obligations that firms must meet even when performance declines. However, the negative coefficient found in this model suggests that this relationship is not necessarily uniform.

Table 13. Model 1 - OLS regression analysis

MODEL 1				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	11,1914	0,6310	17,7346	0,0000
Leverage D/A	-3,2427	0,4608	-7,0370	0,0000
Log Total Assets	-0,2246	0,0203	-11,0889	0,0000
Average ROA	-0,1992	0,0081	-24,6336	0,0000
MTBR	0,1874	0,0411	4,5608	0,0000
GICS sector - Consumer Discretionary	-1,0081	0,4560	-2,2108	0,0271
GICS sector - Consumer Staples	-0,7075	0,5000	-1,4149	0,1572
GICS sector - Energy	1,3656	0,6687	2,0423	0,0412
GICS sector - Financials	-1,2544	0,4773	-2,6282	0,0086
GICS sector - Health Care	-0,4404	0,5569	-0,7907	0,4291
GICS sector - Industrials	-1,1271	0,4508	-2,5001	0,0124
GICS sector - Information Technology	-0,0115	0,5336	-0,0216	0,9827
GICS sector - Materials	0,3202	0,4827	0,6632	0,5072
GICS sector - Real Estate	-1,3684	0,4734	-2,8905	0,0039
GICS sector - Utilities	-0,0789	0,7920	-0,0997	0,9206

Source: author's own elaboration based on Bloomberg data.

This result should not be interpreted as implying that debt always reduces volatility. Rather, it suggests that the firms with higher debt-to-assets ratios in the sample may be firms with more predictable operating performance, more stable assets, or stronger capacity to sustain debt. From this perspective, the negative coefficient may indicate that firms able to access and maintain higher levels of debt are also firms whose asset-based profitability is relatively more stable. In other words, the relationship may reflect not only

the mechanical effect of debt, but also the characteristics of firms that are able to use debt financing. Since ROA measures profitability relative to total assets, the result suggests that leverage D/A is associated with lower fluctuations in operating performance, rather than higher instability.

One possible economic explanation is related to the disciplinary role of debt. Firms with higher leverage may face stronger pressure to manage resources efficiently, maintain stable cash flows and avoid excessive fluctuations in operating performance. Debt obligations may therefore encourage more controlled investment and operating decisions, which can be associated with lower ROA volatility. Another possible explanation is that firms with higher debt-to-assets ratios may be more mature, larger or more stable firms, which are able to obtain and sustain debt financing precisely because their operating performance is less volatile. Therefore, the negative relationship should be interpreted as an association between leverage and asset-based stability, rather than as evidence that debt directly causes lower volatility.

The control variables in Model 1 also provide important information. Firm size, measured through log total assets, is negative and highly significant. This indicates that larger firms tend to have lower ROA volatility. The result is consistent with the idea that larger firms may be more diversified, more established and less exposed to extreme fluctuations in profitability. Larger firms may also have better access to financial resources and more stable market positions, which can reduce the variability of returns generated by their assets.

Average ROA is also negative and highly significant. This means that firms with higher average profitability over the period tend to present lower ROA volatility. This suggests that profitability and stability are connected: firms that are more profitable on average also tend to be less volatile.

By contrast, the market-to-book ratio is positive and highly significant. This suggests that firms with higher growth opportunities tend to show higher ROA volatility. Firms with higher market-to-book ratios are often firms whose valuation depends more strongly on future expectations, expansion opportunities and investment prospects. These firms may be more exposed to uncertainty and may therefore present more volatile profitability. The

positive coefficient of market-to-book ratio indicates that growth potential is associated with greater instability in ROA.

The sector controls are generally not strongly significant. This suggests that, once size, profitability, growth opportunities and leverage are included in the model, industry differences do not dominate the explanation of ROA volatility.

Overall, Model 1 provides a solid baseline specification. The adjusted R-squared is 0.3507, indicating that the model explains approximately 35% of the variation in ROA volatility. Given the high heterogeneity of the sample and the firm-level nature of the data, this represents a meaningful explanatory power. It suggests that leverage, size, profitability, growth opportunities and sector capture an important part of the variation in asset-based earnings volatility, although other unobserved factors may still contribute to explaining the remaining volatility.

In Model 2 the geographical area variable is added. The most important result, represented in Table 14, is that the coefficient of leverage D/A remains negative and statistically significant. This confirms that the negative relationship between leverage and ROA volatility is not eliminated when geographical differences are controlled for.

The geographical coefficients in Model 2 provide additional insight. Since Europe is the reference category, the coefficients of the other areas indicate whether firms located in those regions have higher or lower ROA volatility compared to European firms, holding leverage and the other controls constant. The results show that Africa, India, Latin America and Oceania have positive and statistically significant coefficients. This means that firms located in these areas show higher average levels of ROA volatility than European firms. This may reflect differences in market structure, macroeconomic stability, institutional environment, industry composition or firm characteristics that are not fully captured by the controls included in the model. However, the interpretation must remain cautious because the regression identifies associations, not causal mechanisms.

This caution is relevant also for Latin America, because this geographical area has a much smaller number of observations than the other regions. Therefore, although the positive

coefficient suggests higher average ROA volatility compared to Europe, the result should not be generalized too strongly.

Table 14. Model 2 - OLS regression analysis

MODEL 2				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	11,2961	0,6539	17,2757	0,0000
Leverage D/A	-3,0666	0,4622	-6,6342	0,0000
Africa	1,3630	0,2806	4,8571	0,0000
Asia excluding India	0,2829	0,2524	1,1210	0,2623
India	1,1611	0,2693	4,3113	0,0000
Latin America	1,8158	0,7779	2,3342	0,0196
North America	0,3781	0,3362	1,1246	0,2608
Oceania	0,8598	0,2889	2,9759	0,0029
Log Total Assets	-0,2527	0,0211	-11,9533	0,0000
Average ROA	-0,1997	0,0082	-24,2158	0,0000
MTBR	0,1718	0,0422	4,0713	0,0000
GICS sector - Consumer Discretionary	-1,2324	0,4581	-2,6900	0,0072
GICS sector - Consumer Staples	-0,9578	0,4967	-1,9285	0,0538
GICS sector - Energy	1,2453	0,6744	1,8465	0,0649
GICS sector - Financials	-1,3889	0,4824	-2,8791	0,0040
GICS sector - Health Care	-0,5068	0,5570	-0,9098	0,3629
GICS sector - Industrials	-1,2135	0,4512	-2,6898	0,0072
GICS sector - Information Technology	-0,0056	0,5341	-0,0104	0,9917
GICS sector - Materials	-0,0244	0,4871	-0,0500	0,9601
GICS sector - Real Estate	-1,3981	0,4726	-2,9586	0,0031
GICS sector - Utilities	0,0012	0,7838	0,0015	0,9988

Source: author's own elaboration based on Bloomberg data.

The results for Asia excluding India and North America are not statistically significant in Model 2. This means that, once firm-level characteristics are controlled for, these areas do not show a statistically significant difference in average ROA volatility compared to Europe. The result for North America is particularly interesting because the descriptive analysis and boxplots suggested relatively high volatility in North America. However, in the regression, this difference is no longer statistically significant after controlling for size,

profitability, growth opportunities, leverage and sector. This suggests that the higher volatility observed descriptively for North America may be partly explained by firm-level characteristics rather than by geographical location alone.

The adjusted R-squared increases to 0.3533 in Model 2. The increase is small, but it indicates that geographical area adds some explanatory power to the model. Therefore, geography contributes to explaining ROA volatility, but it does not radically change the model.

Table 15 shows the main results of Model 3. This model introduces the interaction between leverage D/A and geographical area. This model is especially important because it tests whether the effect of leverage on ROA volatility differs across regions. In this specification, the main coefficient of leverage D/A represents the effect of leverage for European firms, because this geographical area is the reference category. The coefficient is negative and highly significant, indicating that in Europe higher leverage D/A is associated with lower ROA volatility.

The geographical coefficients in Model 3 show that Africa and India remain positive and statistically significant. This indicates that, compared to Europe, these regions show higher average ROA volatility when leverage is equal to zero. However, the most relevant part of Model 3 is the set of interaction terms. These interaction coefficients indicate whether the relationship between leverage and ROA volatility in each geographical area is significantly different from the relationship observed in Europe.

The interaction results show that almost all interaction terms are not statistically significant. It means that the effect of leverage on ROA volatility does not appear to change substantially across geographical areas. While geographical areas differ in their average level of volatility, they do not strongly differ in the way leverage D/A is related to ROA volatility. The only partial exception is Oceania, which is marginally significant at the 10% level, but this evidence is weak and not sufficient to conclude that Oceania presents a clearly different leverage-volatility relationship.

Table 15. Model 3 - OLS regression analysis

MODEL 3				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	11,5124	0,7019	16,4010	0,0000
Leverage D/A	-3,9068	0,9292	-4,2046	0,0000
Africa	1,1702	0,4375	2,6745	0,0075
Asia excluding India	0,1781	0,4105	0,4338	0,6645
India	1,3458	0,4312	3,1208	0,0018
Latin America	1,9283	1,4060	1,3714	0,1703
North America	-0,0711	0,5468	-0,1301	0,8965
Oceania	0,3962	0,4513	0,8780	0,3800
Log Total Assets	-0,2557	0,0218	-11,7307	0,0000
Average ROA	-0,2010	0,0083	-24,1461	0,0000
MTBR	0,1711	0,0422	4,0539	0,0001
GICS sector - Consumer Discretionary	-1,2286	0,4592	-2,6758	0,0075
GICS sector - Consumer Staples	-0,9555	0,4971	-1,9219	0,0547
GICS sector - Energy	1,3309	0,6788	1,9607	0,0500
GICS sector - Financials	-1,3992	0,4824	-2,9006	0,0037
GICS sector - Health Care	-0,5182	0,5591	-0,9268	0,3541
GICS sector - Industrials	-1,2151	0,4535	-2,6796	0,0074
GICS sector - Information Technology	-0,0175	0,5352	-0,0326	0,9740
GICS sector - Materials	0,0860	0,4913	0,1750	0,8611
GICS sector - Real Estate	-1,3631	0,4731	-2,8811	0,0040
GICS sector - Utilities	0,0476	0,7912	0,0602	0,9520
Leverage D/A - Africa	1,0827	1,5016	0,7211	0,4709
Leverage D/A - Asia excluding India	0,4968	1,4086	0,3527	0,7243
Leverage D/A - India	-1,0027	1,4301	-0,7011	0,4833
Leverage D/A - Latin America	-0,2695	4,4822	-0,0601	0,9521
Leverage D/A - North America	2,0973	1,6680	1,2574	0,2087
Leverage D/A - Oceania	2,5171	1,4776	1,7035	0,0885

Source: author's own elaboration based on Bloomberg data.

This result provides an important distinction. Geography matters, but mainly as a level effect, not as a strong moderating effect. The regression suggests that some regions have higher average ROA volatility than Europe, but the negative relationship between leverage D/A and ROA volatility is broadly similar across areas. Therefore, the evidence does not strongly support the idea that geographical area systematically changes the direction or strength of the leverage-volatility relationship in the main ROA-based model.

In other words, regional differences emerge more clearly in the average level of volatility than in the intensity of the relationship between leverage and volatility. This means that the geographical context helps explain which areas are characterized by higher or lower ROA volatility, but it does not strongly change how leverage D/A is associated with ROA volatility.

Table 16. Comparison of OLS Models

COMPARISON OF MODELS							
Model comparison	**Model specification / change**	**Residual Degrees of freedom**	**Residual sum of squares**	**Added Degrees of freedom**	**Sum of Sq**	**F-statistic**	**p-value**
Model 1	Baseline model: leverage D/A + controls + sector	5948	270811	—	—	—	—
Model 1 vs Model 2	Addition of geographical area	5942	269470	6	1340.34	49265	0.000049 ***
Model 2 vs Model 3	Addition of leverage × geographical area interactions	5936	269164	6	306.63	11271	0.3435

Source: author's own elaboration based on Bloomberg data.

The model comparison represented in Table 16 confirms this interpretation. The comparison between Model 1 and Model 2 shows that adding geographical area significantly improves the model, with a p-value of 0.000049. This means that geographical area provides additional explanatory information for ROA volatility. However, the comparison between Model 2 and Model 3 shows that adding the interaction between leverage and geographical area does not significantly improve the model. This confirms that the interaction terms do not add meaningful explanatory power. Therefore, the results indicate that geography helps explain differences in average volatility levels, but it does not strongly modify the relationship between leverage and ROA volatility.

The robust standard errors confirm the same conclusions. The complete robust standard error results are reported in Appendix Table 7. After correcting for heteroskedasticity, leverage D/A remains negative and statistically significant. This is important because the Breusch-Pagan test, reported in Appendix Table 6, indicates the presence of heteroskedasticity, meaning that standard errors from the basic OLS output could be unreliable. The fact that the main coefficient remains significant after using robust

standard errors strengthens the reliability of the result. The controls also remain consistent: firm size and average ROA are negatively associated with ROA volatility, while the market-to-book ratio is positively associated with ROA volatility.

The robust standard errors also confirm the interpretation of the geographical variables. In the model including geography, Africa, India, Latin America and Oceania remain associated with higher average ROA volatility compared to Europe. However, the evidence for Latin America should be read with caution because of the limited number of firms in this area. In the interaction model, however, the interaction terms remain mostly insignificant. Therefore, the robust results support the same overall message: leverage D/A is negatively associated with ROA volatility, geographical area matters for average volatility levels, but geography does not strongly moderate the leverage-volatility relationship.

The diagnostic results support an acceptable interpretation of the model. The VIF diagnostics, shown in Appendix Table 5, do not indicate problematic multicollinearity, suggesting that the independent variables are not excessively correlated and that the estimated coefficients are stable. The diagnostic plots, reported in Appendix Figure 1, show some deviations from ideal regression assumptions, especially heteroskedasticity and non-normal residuals. This is consistent with the descriptive analysis, which showed that the dataset contains strong heterogeneity, skewness and heavy tails. However, the large sample size and the use of robust standard errors reduce the risk that these issues undermine the main interpretation. The residuals vs leverage plot does not indicate that the results are driven by a single influential observation, which further supports the stability of the regression findings.

4.4. Robustness checks results

The robustness checks provide a broader interpretation of the leverage-volatility relationship by using alternative measures of both volatility and leverage. They are particularly relevant because they allow the analysis to verify whether the main OLS result depends on the specific use of ROA volatility and leverage D/A, or whether it remains stable when the relationship is observed from an equity-based perspective.

Table 17. Robustness check 1

ROBUSTNESS CHECK 1 - Leverage D/A and ROE volatility				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	14,971186	1,426029	10,498518	0,000000
Leverage D/A	3,525248	1,961431	1,797284	0,072343
Africa	3,005744	0,883696	3,401331	0,000675
Asia excluding India	-1,493630	0,758687	-1,968705	0,049035
India	1,366211	0,867330	1,575192	0,115268
Latin America	0,140301	1,962186	0,071502	0,943001
North America	-1,092153	0,903170	-1,209244	0,226619
Oceania	-1,673527	0,774110	-2,161874	0,030669
Log Total Assets	-0,188821	0,048616	-3,883954	0,000104
Average ROE	-0,228052	0,009964	-22,887990	0,000000
MTBR	0,686521	0,091916	7,469006	0,000000
GICS sector - Consumer Discretionary	-1,318976	0,950834	-1,387179	0,165441
GICS sector - Consumer Staples	-1,913842	1,017062	-1,881736	0,059923
GICS sector - Energy	1,004002	1,294682	0,775481	0,438087
GICS sector - Financials	-2,295420	0,915407	-2,507540	0,012185
GICS sector - Health Care	-2,030011	1,062981	-1,909735	0,056217
GICS sector - Industrials	-1,194234	0,919480	-1,298815	0,194060
GICS sector - Information Technology	-0,618566	1,011333	-0,611634	0,540804
GICS sector - Materials	-1,813986	0,909469	-1,994556	0,046139
GICS sector - Real Estate	-4,788574	0,938134	-5,104363	0,000000
GICS sector - Utilities	-1,398768	1,619532	-0,863687	0,387796
Leverage D/A - Africa	-0,698769	3,423981	-0,204081	0,838298
Leverage D/A - Asia excluding India	2,953457	3,158137	0,935190	0,349730
Leverage D/A - India	-3,061585	3,178253	-0,963292	0,335442
Leverage D/A - Latin America	1,637788	6,857731	0,238824	0,811251
Leverage D/A - North America	8,794132	3,441173	2,555562	0,010627
Leverage D/A - Oceania	7,024682	3,106615	2,261202	0,023784

Source: author's own elaboration based on Bloomberg data.

Table 17 reports the results of the first robustness check, which uses ROE volatility as the dependent variable while keeping leverage D/A as the leverage measure. In this model, the coefficient of leverage D/A becomes positive. With robust standard errors, the coefficient is 3.525 and the p-value is 0.072, meaning that the relationship is positive but only marginally significant. Therefore, the evidence is weaker than in the main ROA model, but the direction of the relationship changes. While leverage D/A is negatively associated with ROA volatility, it is weakly positively associated with ROE volatility. This change in sign is important because it suggests that leverage may affect asset-based and equity-based volatility differently.

This difference suggests that leverage may have different implications depending on the performance measure used to calculate volatility. ROA volatility captures the stability of returns generated by the firm's assets, whereas ROE volatility captures the stability of returns to shareholders. Since ROE is directly affected by the firm's equity base and financial structure, it is more sensitive to leverage. Therefore, the positive coefficient in the ROE volatility model suggests that debt may amplify fluctuations in shareholder returns, even if it is associated with lower volatility from an asset-based perspective.

From an economic point of view, this result is coherent with the different construction of ROA and ROE. ROA relates profitability to total assets, which include both debt-financed and equity-financed resources. ROE, instead, relates profitability to shareholders' equity. When leverage increases, the equity base becomes relatively more sensitive to changes in net income. As a result, the same fluctuation in profitability may produce a stronger fluctuation in ROE than in ROA. This helps explain why leverage D/A may be negatively associated with ROA volatility but positively associated with ROE volatility.

The geographical coefficients in the first robustness check also differ from the main model. Africa shows higher ROE volatility than Europe, while Oceania shows lower ROE volatility after controlling for the other variables. Asia excluding India and India are only marginally significant, while Latin America and North America are not significant. This indicates that the regional patterns observed for ROA volatility do not perfectly replicate when volatility is measured through ROE. Therefore, the regional distribution of volatility depends partly on whether the analysis focuses on asset-based or equity-based

performance. Again, the result for Latin America should be interpreted cautiously, given the smaller size of this geographical group.

The interaction terms in the first robustness check provide stronger evidence of geographical moderation than the main ROA model. The interactions between leverage D/A and North America and between leverage D/A and Oceania are statistically significant. This indicates that, compared to Europe, the positive relationship between leverage D/A and ROE volatility is stronger in North America and Oceania. This is an important result because it suggests that geography becomes more relevant when volatility is measured from the shareholders' perspective. In other words, the effect of leverage on equity-based volatility appears to vary more across regions than the effect of leverage on asset-based volatility. The adjusted R-squared of this model is 0.2582, meaning that it explains approximately 25.8% of the variation in ROE volatility.

The second robustness check uses ROA volatility as the dependent variable but replaces leverage D/A with leverage D/E. This model keeps the same volatility measure as the main model but changes the leverage measure. The coefficient of leverage D/E is negative and highly significant. With robust standard errors, the p-value is 0.000014, confirming a strong negative relationship between leverage D/E and ROA volatility. The results are reported in Table 18.

This result reinforces the main finding. The negative relationship between leverage and ROA volatility is not dependent on the specific use of D/A as the leverage proxy. Even when leverage is measured through D/E, higher leverage is associated with lower ROA volatility. Therefore, the ROA-based result appears robust across alternative leverage measures. This strengthens the conclusion that, in this sample, leverage is negatively associated with asset-based earnings volatility.

This is important because it suggests that the negative association between leverage and ROA volatility is not simply driven by the debt-to-assets ratio. Instead, the result remains visible even when debt is measured relative to equity.

Table 18. Robustness check 2

ROBUSTNESS CHECK 2 - Leverage D/E and ROA volatility				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	10,130915	0,641926	15,782053	0,000000
Leverage D/E	-0,684348	0,157355	-4,349060	0,000014
Africa	1,196394	0,358824	3,334203	0,000861
Asia excluding India	0,277224	0,332203	0,834503	0,404033
India	1,151855	0,335575	3,432477	0,000602
Latin America	1,672027	1,011458	1,653085	0,098369
North America	0,357294	0,445984	0,801135	0,423087
Oceania	0,707511	0,365272	1,936944	0,052801
Log Total Assets	-0,217439	0,020997	-10,355971	0,000000
Average ROE	-0,208380	0,008506	-24,498008	0,000000
MTBR	0,167519	0,041510	4,035672	0,000055
GICS sector - Consumer Discretionary	-0,998768	0,436354	-2,288894	0,022122
GICS sector - Consumer Staples	-0,879837	0,473121	-1,859645	0,062987
GICS sector - Energy	1,317636	0,665067	1,981207	0,047616
GICS sector - Financials	-1,096036	0,454093	-2,413680	0,015824
GICS sector - Health Care	-0,212518	0,542739	-0,391565	0,695394
GICS sector - Industrials	-1,138389	0,429134	-2,652761	0,008006
GICS sector - Information Technology	-0,014074	0,511275	-0,027526	0,978041
GICS sector - Materials	0,143956	0,467141	0,308165	0,757968
GICS sector - Real Estate	-1,407888	0,448685	-3,137807	0,001711
GICS sector - Utilities	-0,504380	0,675812	-0,746332	0,455498
Leverage D/E - Africa	0,028834	0,286331	0,100702	0,919790
Leverage D/E - Asia excluding India	-0,003345	0,372620	-0,008977	0,992838
Leverage D/E - India	-0,583999	0,253796	-2,301055	0,021424
Leverage D/E - Latin America	-0,585043	0,655385	-0,892671	0,372071
Leverage D/E - North America	0,077938	0,319448	0,243977	0,807258
Leverage D/E - Oceania	0,154418	0,341686	0,451928	0,651338

Source: author's own elaboration based on Bloomberg data.

The geographical coefficients in the second robustness check are also consistent with the main OLS model. Africa, India and Oceania show higher average ROA volatility than Europe, holding the other variables constant. This confirms that these regions are characterized by higher asset-based volatility relative to Europe. Asia excluding India, Latin America and North America are not statistically significant in this specification. The fact that Africa, India and Oceania remain significant across specifications suggests that their higher ROA volatility is a relatively stable result.

The control variables again show coherent signs. Firm size is negative and significant, confirming that larger firms tend to have lower ROA volatility. Average ROA is negative and highly significant, confirming that more profitable firms tend to be more stable. Market-to-book ratio is positive and significant, indicating that firms with higher growth opportunities tend to experience higher volatility.

The interaction terms in the second robustness check are mostly not significant. This means that the effect of leverage D/E on ROA volatility is generally similar across geographical areas. The main exception is the interaction between leverage D/E and India, which becomes significant with robust standard errors. This suggests that the negative relationship between leverage D/E and ROA volatility is stronger in India than in Europe. However, because the other interaction terms are not significant, the overall evidence of geographical moderation remains limited.

The adjusted R-squared is 0.361, which is slightly higher than in the main model, indicating that this specification performs well.

The third robustness check uses ROE volatility as the dependent variable and leverage D/E as the leverage measure. This is the specification in which both the volatility measure and the leverage measure are equity-based. According to Table 19, the result is very different from the ROA models. Leverage D/E is positive and highly significant, with a robust p-value of 0.000009. This means that firms with higher debt relative to equity tend to have higher ROE volatility. This is one of the most relevant findings of the robustness analysis, because it confirms that the positive relationship between leverage and volatility becomes much stronger when both variables are observed from an equity-based perspective.

Debt-to-equity directly captures the extent to which debt financing is used relative to shareholders' equity. Since ROE measures returns relative to equity, higher debt relative to equity can amplify changes in returns to shareholders. Therefore, the positive coefficient indicates that leverage increases the instability of equity-based performance. This is consistent with the idea that financial leverage can magnify returns to shareholders, both positively and negatively, making ROE more volatile.

Table 19. Robustness check 3

ROBUSTNESS CHECK 3 - Leverage D/E and ROE volatility				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	15,375918	1,360473	11,301891	0,000000
Leverage D/E	2,043907	0,458954	4,453407	0,000009
Africa	3,083857	0,780762	3,949805	0,000079
Asia excluding India	-1,172098	0,655990	-1,786763	0,074029
India	1,897170	0,722333	2,626449	0,008651
Latin America	0,671681	1,577342	0,425831	0,670247
North America	-0,235274	0,796237	-0,295482	0,767637
Oceania	-0,962142	0,638985	-1,505735	0,132191
Log Total Assets	-0,240239	0,048340	-4,969778	0,000001
Average ROE	-0,223105	0,009812	-22,738147	0,000000
MTBR	0,622403	0,090002	6,915447	0,000000
GICS sector - Consumer Discretionary	-1,294609	0,940166	-1,377000	0,168566
GICS sector - Consumer Staples	-1,728825	1,005369	-1,719592	0,085561
GICS sector - Energy	1,156954	1,287688	0,898474	0,368971
GICS sector - Financials	-2,708455	0,912396	-2,968507	0,003005
GICS sector - Health Care	-1,487261	1,057472	-1,406431	0,159651
GICS sector - Industrials	-1,123373	0,911301	-1,232713	0,217734
GICS sector - Information Technology	-0,315585	1,003261	-0,314560	0,753108
GICS sector - Materials	-1,663094	0,897687	-1,852642	0,063985
GICS sector - Real Estate	-4,417871	0,921816	-4,792573	0,000002
GICS sector - Utilities	-1,582581	1,616178	-0,979212	0,327517
Leverage D/E - Africa	-0,001323	0,850173	-0,001556	0,998759
Leverage D/E - Asia excluding India	1,157430	0,999932	1,157508	0,247113
Leverage D/E - India	-1,360778	0,737874	-1,844187	0,065208
Leverage D/E - Latin America	0,137806	1,725987	0,079842	0,936366
Leverage D/E - North America	1,346892	0,855055	1,575212	0,115263
Leverage D/E - Oceania	1,588987	0,823895	1,928628	0,053827

Source: author's own elaboration based on Bloomberg data.

This result also helps explain why the main ROA model and the ROE robustness checks lead to different conclusions. ROA volatility reflects the stability of profitability generated by total assets, while ROE volatility reflects the stability of profitability available to shareholders. Since shareholders' equity is directly affected by the firm's financing structure, ROE volatility is more exposed to changes in leverage. For this reason, the positive and significant coefficient of leverage D/E in the third robustness check suggests

that debt may amplify volatility for shareholders even when leverage is associated with lower volatility from an asset-based perspective.

The geographical coefficients in this model show that Africa and India have significantly higher ROE volatility than Europe. This suggests that these regions are characterized by higher shareholder-return volatility even after controlling for leverage, firm size, profitability, growth opportunities and sector. Other areas are not statistically significant, indicating that their ROE volatility is not significantly different from Europe once the controls are included.

The interaction terms in the third robustness check suggest that geographical moderation is more visible than in the ROA models, although the evidence is not uniformly strong. This means that the relationship between leverage and ROE volatility may vary more across regions than the relationship between leverage and ROA volatility. However, the evidence remains less systematic than the evidence on average regional differences. Therefore, even in the robustness checks, geographical area appears to matter more clearly for volatility levels than for the intensity of the leverage-volatility relationship.

The adjusted R-squared of the third robustness check is 0.2688, meaning that the model explains approximately 26.9% of the variation in ROE volatility. This is lower than the ROA volatility models, but it remains acceptable for firm-level financial data. The lower explanatory power may reflect the fact that ROE volatility is more sensitive to financial structure, equity fluctuations and firm-specific shocks, which may be harder to capture fully with the available controls.

The diagnostic tests for the robustness checks confirm the patterns observed in the main OLS analysis. The VIF diagnostics, reported in Appendix Table 8, do not indicate problematic multicollinearity, suggesting that the coefficients are not made unstable by excessive correlation among independent variables. However, the Breusch-Pagan tests, summarized in Appendix Table 9, are significant in all three robustness models, confirming the presence of heteroskedasticity. For this reason, robust standard errors are necessary for interpretation. The robust standard error results are provided in Appendix Table 10 and represent the most reliable basis for assessing coefficient significance.

Finally, the diagnostic plots, included in Appendix Figure 2, show non-normal residuals, heavy tails and heteroskedasticity, which is consistent with the nature of firm-level financial data. However, they do not suggest that the results are dominated by a single observation.

Taken together, the OLS analysis provides a more complete interpretation of the relationship between financial leverage and earnings volatility. In the main model, where ROA volatility is used as the dependent variable and leverage D/A as the main leverage measure, the results consistently show a negative and statistically significant relationship. In this model, higher leverage D/A is associated with lower ROA volatility after controlling for firm size, profitability, growth opportunities and sector. This result is relevant because it is partly counterintuitive compared to the literature that associates leverage with higher financial risk and greater instability. However, it may be explained by the fact that firms with higher debt-to-assets ratios are also firms with more stable asset-based profitability, stronger capacity to sustain debt, or greater financial discipline imposed by debt obligations. In Model 2, the leverage coefficient remains negative and significant after adding geographical area, confirming the stability of the main result. At the same time, some geographical areas, particularly Africa, India, Latin America and Oceania, show higher average ROA volatility compared to Europe. This indicates that geography contributes to explaining differences in average volatility levels, although the improvement in explanatory power is limited. The result for Latin America, however, must be interpreted with particular caution because this area has a much smaller number of observations than the other geographical groups. Model 3 further clarifies the role of geographical area. The interaction terms between leverage D/A and geographical area are mostly not statistically significant, suggesting that geography does not strongly moderate the relationship between leverage and ROA volatility. Therefore, the main OLS results indicate that geographical area matters mainly because firms in some regions present higher average volatility levels, rather than because the effect of leverage on ROA volatility changes substantially across regions. In this sense, regional differences are more visible in the level of volatility than in the strength of the leverage-volatility relationship.

The robustness checks refine this interpretation by showing that the direction of the leverage-volatility relationship depends on how earnings volatility is measured. When volatility is measured through ROA, leverage tends to show a negative relationship, both when leverage is measured as D/A and when it is measured as D/E. By contrast, when volatility is measured through ROE, leverage tends to show a positive relationship, especially when leverage is measured as D/E. This suggests that financial leverage may be associated with lower asset-based volatility, while amplifying equity-based volatility. In other words, leverage appears to have different implications depending on whether earnings instability is observed from the perspective of the firm's assets or from the perspective of shareholders' equity. This distinction represents one of the central findings of the empirical analysis, because it shows that the interpretation of financial leverage changes depending on the measure of earnings volatility adopted.

CONCLUSION

This thesis examined the relationship between financial leverage and earnings volatility through a global cross-regional analysis of corporate financial stability. The main objective was to understand whether firms with different levels of indebtedness present different levels of earnings volatility and whether this relationship changes across geographical areas.

The descriptive analysis showed that the sample is characterized by strong heterogeneity. The distribution of firms is broad and global, although not perfectly balanced across areas. Europe, North America, Oceania and India represent the largest portions of the sample, while Latin America is considerably less represented. This aspect is important for the interpretation of the results, because estimates related to Latin America may be less stable and more sensitive to individual observations.

The descriptive statistics also showed that firm-level financial data are highly dispersed and often strongly skewed. Variables such as total assets, total debt, total equity, revenues and market capitalization present large differences between mean and median values, confirming that the sample includes firms of very different sizes. The key variables of the analysis also revealed important patterns. ROE volatility was higher than ROA volatility, both in terms of mean and standard deviation, suggesting that returns to shareholders fluctuate more strongly than returns on assets. This result is coherent with the nature of ROE, which is more directly affected by the firm's equity structure and by financial leverage. Leverage D/A and leverage D/E were also positively skewed, indicating that most firms present relatively moderate debt levels, while a smaller group of firms is characterized by much higher indebtedness.

The analysis of variance confirmed that statistically significant differences exist across geographical areas. All ANOVA models were significant, showing that leverage D/A, leverage D/E, ROA volatility and ROE volatility differ across regions. Therefore, the hypothesis that firms located in different geographical areas present different financial profiles is supported. However, the eta squared results showed that the strength of the geographical effect is not the same for all variables. For leverage D/A and leverage D/E,

the effect of geographical area is statistically significant but relatively small. For ROE volatility, the geographical effect is also limited. For ROA volatility, instead, the effect is more relevant, suggesting that regional differences are especially important in explaining asset-based earnings instability.

The robustness of the ANOVA results was confirmed by the Welch ANOVA, which remained significant for all variables even after considering the unequal variances detected by the Levene tests. The Tukey post-hoc tests showed that not all geographical areas differ from each other, but that significant differences are concentrated in specific pairs of regions. The boxplots confirmed these patterns visually, especially because Oceania showed lower leverage levels, while North America and Oceania indicated higher volatility levels. Overall, the ANOVA results support the idea that geographical area matters in explaining differences in leverage and earnings volatility, although the magnitude of this effect varies across variables.

The OLS regression analysis provided a more direct test of the relationship between financial leverage and earnings volatility. In the main model, ROA volatility was used as the dependent variable and leverage D/A as the main independent variable. The results showed that leverage D/A is negatively and significantly associated with ROA volatility after controlling for firm size, profitability, market-to-book ratio and sector. This means that, in the main specification, higher leverage is associated with lower asset-based earnings volatility. This finding suggests that, when volatility is measured through ROA, more leveraged firms may be associated with more stable asset-based profitability.

This result can be interpreted in light of the disciplinary role of debt discussed in the literature. While several studies associate leverage with higher financial risk and greater pressure to meet debt obligations, other theoretical perspectives suggest that debt can reduce managerial discretion and encourage firms to use resources more efficiently. From this point of view, leverage may contribute to financial discipline and may be associated with more stable operating performance. Moreover, more leveraged firms may also be larger, more mature or more structured firms, with better access to financial markets and more stable operations. Therefore, the negative relationship between leverage and ROA volatility is consistent with the idea that leverage does not necessarily increase instability in every context. This interpretation is particularly relevant because the negative sign of

the coefficient is partly counterintuitive compared to the part of the literature that associates debt with higher earnings instability. However, the result may reflect the fact that firms able to sustain higher leverage are also firms with more stable asset-based performance.

When geographical area was added to the OLS model, the leverage coefficient remained negative and significant, confirming the stability of the main result. At the same time, some geographical areas showed higher average ROA volatility compared to Europe, especially Africa, India, Latin America and Oceania. This confirms that geography matters for average levels of earnings volatility. However, when interaction terms between leverage and geographical area were introduced, most of them were not statistically significant. Therefore, the hypothesis that geographical area moderates the relationship between leverage and ROA volatility is not strongly supported in the main model. Geography appears to matter more as a level effect than as a moderator of the leverage-volatility relationship. In other words, regional differences emerge more clearly in the average level of volatility than in the intensity of the relationship between leverage and volatility.

The robustness checks provided one of the most important findings of the thesis. When alternative combinations of leverage and volatility measures were used, the relationship between leverage and earnings volatility changed depending on the measure of volatility considered. When ROA volatility was used as the dependent variable, leverage was negatively associated with volatility both when measured through D/A and when measured through D/E. This confirms that the negative relationship between leverage and asset-based earnings volatility is robust to the use of an alternative leverage measure.

However, when ROE volatility was used as the dependent variable, the relationship changed. Leverage D/A became positively associated with ROE volatility, although only weakly when robust standard errors were considered. More importantly, leverage D/E was positively and significantly associated with ROE volatility. This means that higher debt relative to equity is associated with higher volatility in shareholder returns. Therefore, the robustness checks show that the effect of leverage is not uniform, leverage is negatively associated with ROA volatility, but positively associated with ROE volatility, especially when leverage is measured through debt-to-equity.

The different results obtained for ROA volatility and ROE volatility suggest that leverage does not affect all dimensions of earnings volatility in the same way. ROA volatility captures the stability of returns generated by the firm's assets, while ROE volatility captures the stability of returns available to shareholders. Therefore, leverage may be associated with lower asset-based volatility, while at the same time amplifying the volatility of shareholder returns. This distinction is one of the central findings of the thesis, because it shows that the interpretation of financial leverage depends strongly on the volatility measure adopted.

These findings can also be connected to the literature reviewed in Chapter 1. Studies such as Boll et al. (2022), Ujah and Brusa (2014), and Ahmed (2023) emphasize that financial leverage can increase financial pressure and may be associated with greater earnings instability or earnings management incentives. However, other studies, such as Chen (2020), Arhinful and Radmehr (2023), Adenugba et al. (2016), and Maharani et al. (2024), show that the effect of leverage is complex and depends on the level of debt, the firm's ability to service its obligations, governance mechanisms and the broader institutional context. The results of this thesis are consistent with this second interpretation. They show that leverage cannot be interpreted as having a single positive or negative effect on earnings volatility. Its association with earnings volatility depends on whether financial stability is observed from an asset-based or equity-based perspective.

In relation to the hypotheses developed at the beginning of the thesis, the results provide mixed but meaningful evidence.

With respect to H1, the descriptive analysis supports the expectation that firms located in different geographical areas present different financial characteristics in terms of leverage, profitability, size and earnings volatility. H2 is also supported, since the ANOVA results confirm statistically significant average differences across geographical areas for both leverage and volatility measures. H3 is supported as well, because the OLS models show that financial leverage is significantly associated with earnings volatility after controlling for firm-specific characteristics. However, the direction of this association depends on the measure of volatility used. H4 is therefore supported, as the robustness checks show that the leverage-volatility relationship differs between ROA volatility and

ROE volatility. Finally, H5 is only partially supported. Geographical area matters for average volatility levels, but the interaction terms provide limited evidence that geography strongly moderates the relationship between leverage and ROA volatility.

This study presents some limitations that should be considered when interpreting the results. First, the analysis is based on a three-year period, from 2022 to 2024. Although this period allows the calculation of ROA and ROE volatility, a longer time horizon could provide a more complete measure of earnings instability and reduce the influence of temporary shocks affecting specific years. Second, the dataset is not perfectly balanced across geographical areas. Latin America is represented by a much smaller number of firms compared to Europe, North America, Oceania and India, and its results should therefore be interpreted with caution. Third, the analysis relies on Bloomberg data availability, and missing values reduced the number of valid observations for some variables and models. Fourth, although cleaning and winsorization procedures were applied, the data remain highly heterogeneous, skewed and characterized by heavy tails. Finally, the OLS models identify statistical associations rather than causal relationships. Therefore, the results should not be interpreted as proof that leverage directly causes changes in earnings volatility.

Future research could extend this analysis by using a longer panel dataset, including more years and different economic cycles. It could also include country-level institutional variables, such as creditor protection, bankruptcy laws, legal enforcement, financial market development and macroeconomic stability, in order to better explain regional differences. Moreover, sector-specific analyses could help determine whether the leverage-volatility relationship changes across industries. Finally, future studies could further investigate the distinction between ROA volatility and ROE volatility, since the results of this thesis suggest that the choice of volatility measure has a substantial impact on the interpretation of financial leverage.

In conclusion, this thesis shows that financial leverage is significantly associated with earnings volatility, but its effect is not uniform. The main evidence indicates that leverage is negatively related to ROA volatility, while the robustness checks show that leverage is positively related to ROE volatility. This means that leverage may be associated with greater stability in asset-based profitability but greater instability in shareholder returns. Geographical area also plays an important role in explaining differences in average volatility levels, although it does not strongly moderate the leverage-volatility relationship in the main ROA model. Overall, the results highlight the importance of considering both the measure of leverage and the measure of earnings volatility when evaluating corporate financial stability. The relationship between debt and earnings volatility depends not only on how leverage is measured, but also on whether volatility is observed from the perspective of assets or shareholders' equity.

APPENDIX

Appendix Table 1. Eta squared results

ETA SQUARED - Leverage Debt/Assets		
Parameter	**Eta squared (η^2)**	**95% CI**
Geographical area	0,02	[0,01-1,00]
ETA SQUARED - Leverage Debt/Equity		
Parameter	**Eta squared (η^2)**	**95% CI**
Geographical area	0,02	[0,02-1,00]
ETA SQUARED - ROA volatility		
Parameter	**Eta squared (η^2)**	**95% CI**
Geographical area	0,08	[0,07-1,00]
ETA SQUARED - ROE volatility		
Parameter	**Eta squared (η^2)**	**95% CI**
Geographical area	0,03	[0,02-1,00]

Source: author's own elaboration based on Bloomberg data.

Appendix Table 2. Levene Test results

LEVENE TEST - Leverage Debt/Assets			
	Df	**F value**	**P value**
Group	6	9,5156	0,0000000001949 ***
	6.506		
LEVENE TEST - Leverage Debt/Equity			
	Df	**F value**	**P value**
Group	6	17,446	<0,00000000000000022 ***
	6.506		
LEVENE TEST - ROA volatility			
	Df	**F value**	**P value**
Group	6	66,375	<0,00000000000000022 ***
	6.506		
LEVENE TEST - ROE volatility			
	Df	**F value**	**P value**
Group	6	22,229	<0,00000000000000022 ***
	6.506		

Source: author's own elaboration based on Bloomberg data.

Appendix Table 3. Welch ANOVA results

Leverage Debt/Assets	**Leverage Debt/Equity**
F = 22,339	F = 71,508
num df = 6,0	num df = 6,0
denominator df = 1063,2	denominator df = 1076,2
p-value <0,00000000000000022	**p-value <0,00000000000000022**
ROA volatility	**ROE volatility**
F = 25,66	F = 30,804
num df = 6,0	num df = 6,0
denominator df = 1060,3	denominator df = 1083,5
p-value <0,00000000000000022	**p-value <0,00000000000000022**

Source: author's own elaboration based on Bloomberg data.

Appendix Table 4. Tukey test results

TUKEY - Leverage Debt/Assets				
Geographical area	**Difference**	**Lower**	**Upper**	**Adjusted p-value**
Africa-Europe	-0,03954458	-0,06405242	-0,01503673	0,00004090
Asia excluding India	-0,01620561	-0,03887350	0,00646227	0,34760545
India-Europe	-0,01726445	-0,03761409	0,00308519	0,15852528
Latin America-Europ	-0,01059249	-0,06707804	0,04589306	0,99798843
North America-Euro	-0,00664117	-0,03077191	0,01748956	0,98386434
Oceania-Europe	-0,06791820	-0,08747811	-0,04835829	0,00000000
Asia excluding India	0,02333896	-0,00404398	0,05072191	0,15438645
India-Africa	0,02228013	-0,00321694	0,04777719	0,13311252
Latin America-Africa	0,02895209	-0,02958516	0,08748934	0,76935489
North America-Afric	0,03290340	0,00429772	0,06150908	0,01236775
Oceania-Africa	-0,02837362	-0,05324494	-0,00350230	0,01359541
India-Asia excluding	-0,00105884	-0,02479276	0,02267508	0,99999956
Latin America-Asia e	0,00561312	-0,05217795	0,06340420	0,99995523
North America-Asia	0,00956444	-0,01748152	0,03661039	0,94399286
Oceania-Asia exclud	-0,05171258	-0,07477297	-0,02865220	0,00000000
Latin America-India	0,00667196	-0,05024977	0,06359369	0,99986499
North America-India	0,01062328	-0,01451153	0,03575808	0,87581147
Oceania-India	-0,05065375	-0,07143970	-0,02986779	0,00000000
North America-Latin	0,00395131	-0,05442906	0,06233169	0,99999473
Oceania-Latin Amer	-0,05732571	-0,11396991	-0,00068151	0,04511260
Oceania-North Amer	-0,06127702	-0,08577683	-0,03677722	0,00000000
TUKEY - Leverage Debt/Equity				
Geographical area	**Difference**	**Lower**	**Upper**	**Adjusted p-value**
Africa-Europe	-0,07355355	-0,18305077	0,03594366	0,42680323
Asia excluding India	-0,20195371	-0,30323029	-0,10067713	0,00000009
India-Europe	-0,16132327	-0,25224227	-0,07040427	0,00000358
Latin America-Europ	-0,07239779	-0,32476641	0,17997082	0,98001562
North America-Euro	-0,00127926	-0,10909163	0,10653311	1,00000000
Oceania-Europe	-0,31477608	-0,40216669	-0,22738546	0,00000000
Asia excluding India	-0,12840016	-0,25074287	-0,00605745	0,03241056
India-Africa	-0,08776972	-0,20168661	0,02614717	0,25764046
Latin America-Africa	0,00115576	-0,26037953	0,26269105	1,00000000
North America-Afric	0,07227429	-0,05553142	0,20008000	0,63771981
Oceania-Africa	-0,24122252	-0,35234368	-0,13010136	0,00000000
India-Asia excluding	0,04063044	-0,06540900	0,14666988	0,91899476
Latin America-Asia e	0,12955592	-0,12864558	0,38775742	0,75701750
North America-Asia	0,20067445	0,07983735	0,32151155	0,00002049
Oceania-Asia exclud	-0,11282236	-0,21585254	-0,00979218	0,02124901
Latin America-India	0,08892548	-0,16539191	0,34324286	0,94689890
North America-India	0,16004401	0,04774564	0,27234238	0,00053115
Oceania-India	-0,15345281	-0,24632119	-0,06058442	0,00002319
North America-Latin	0,07111853	-0,18971585	0,33195292	0,98462885
Oceania-Latin Amer	-0,24237828	-0,49545572	0,01069915	0,07085048
Oceania-North Amer	-0,31349681	-0,42295812	-0,20403551	0,00000000
TUKEY - ROA volatility				
Geographical area	**Difference**	**Lower**	**Upper**	**Adjusted p-value**
Africa-Europe	-1,62127999	-2,68989797	-0,55266200	0,00015800
Asia excluding India	-0,94852922	-1,93691943	0,03986099	0,06975331
India-Europe	-1,06458850	-1,95189583	-0,17728118	0,00740714
Latin America-Europ	-0,48282682	-2,94577198	1,98011834	0,99742114
North America-Euro	2,17404741	1,12187241	3,22622241	0,00000002
Oceania-Europe	4,55564017	3,70276751	5,40851283	0,00000000
Asia excluding India	0,67275077	-0,52123045	1,86673199	0,64175614
India-Africa	0,55669148	-0,55505949	1,66844246	0,75880429
Latin America-Africa	1,13845316	-1,41395253	3,69085885	0,84496803
North America-Afric	3,79532740	2,54803104	5,04262375	0,00000000
Oceania-Africa	6,17692016	5,09245359	7,26138672	0,00000000
India-Asia excluding	-0,11605928	-1,15093176	0,91881319	0,99989575
Latin America-Asia e	0,46570240	-2,05416776	2,98557255	0,99814664
North America-Asia	3,12257663	1,94328913	4,30186412	0,00000000
Oceania-Asia exclud	5,50416939	4,49866527	6,50967351	0,00000000
Latin America-India	0,58176168	-1,90020220	3,06372556	0,99311236
North America-India	3,23863591	2,14268059	4,33459124	0,00000000
Oceania-India	5,62022867	4,71389671	6,52656064	0,00000000
North America-Latin	2,65687423	0,11130894	5,20243952	0,03414209
Oceania-Latin Amer	5,03846699	2,56860421	7,50832978	0,00000004
Oceania-North Amer	2,38159276	1,31332520	3,44986032	0,00000000
TUKEY - ROE volatility				
Geographical area	**Difference**	**Lower**	**Upper**	**Adjusted p-value**
Africa-Europe	-2,12434698	-4,14780537	-0,10088859	0,03230907
Asia excluding India	-2,82181028	-4,69335511	-0,95026546	0,00017954
India-Europe	-2,13581130	-3,81595283	-0,45566978	0,00338867
Latin America-Europ	-2,17286555	-6,83652191	2,49079080	0,81579261
North America-Euro	3,52900127	1,53667813	5,52132441	0,00000376
Oceania-Europe	3,63609586	2,02115733	5,25103438	0,00000000
Asia excluding India	-0,69746330	-2,95830053	1,56337392	0,97113365
India-Africa	-0,01146433	-2,11659626	2,09366761	1,00000000
Latin America-Africa	-0,04851858	-4,88157098	4,78453382	1,00000000
North America-Afric	5,65334824	3,29155731	8,01513918	0,00000000
Oceania-Africa	5,76044283	3,70697470	7,81391096	0,00000000
India-Asia excluding	0,68599898	-1,27356134	2,64555929	0,94660055
Latin America-Asia e	0,64894473	-4,12250072	5,42039018	0,99967908
North America-Asia	6,35081155	4,11779731	8,58382579	0,00000000
Oceania-Asia exclud	6,45790614	4,55395563	8,36185665	0,00000000
Latin America-India	-0,03705425	-4,73672309	4,66261459	1,00000000
North America-India	5,66481257	3,58959015	7,74003499	0,00000000
Oceania-India	5,77190716	4,05574195	7,48807238	0,00000000
North America-Latin	5,70186682	0,88176691	10,5219667	0,00884339
Oceania-Latin Amer	5,80896141	1,13220633	10,4857165	0,00468969
Oceania-North Amer	0,10709459	-1,91570026	2,12988944	0,99999878

Source: author's own elaboration based on Bloomberg data.

Appendix Table 5. Multicollinearity test - main OLS model

	VIF
Leverage D/A	2,1959
Geographical area	1,5025
Log Total Assets	1,2552
Average ROA	1,1855
MTBR	1,0527
GICS sector	1,0318
Leverage D/A - Geographical area	1,5675

Source: author's own elaboration based on Bloomberg data.

Appendix Table 6. Breusch-Pagan tests - main OLS model

HETEROSKEDASTICITY TEST
BP = 577,23
df = 26
p-value < 0,00000000000000022

Source: author's own elaboration based on Bloomberg data.

Appendix Table 7. Robust standard errors - Model 1, 2, 3

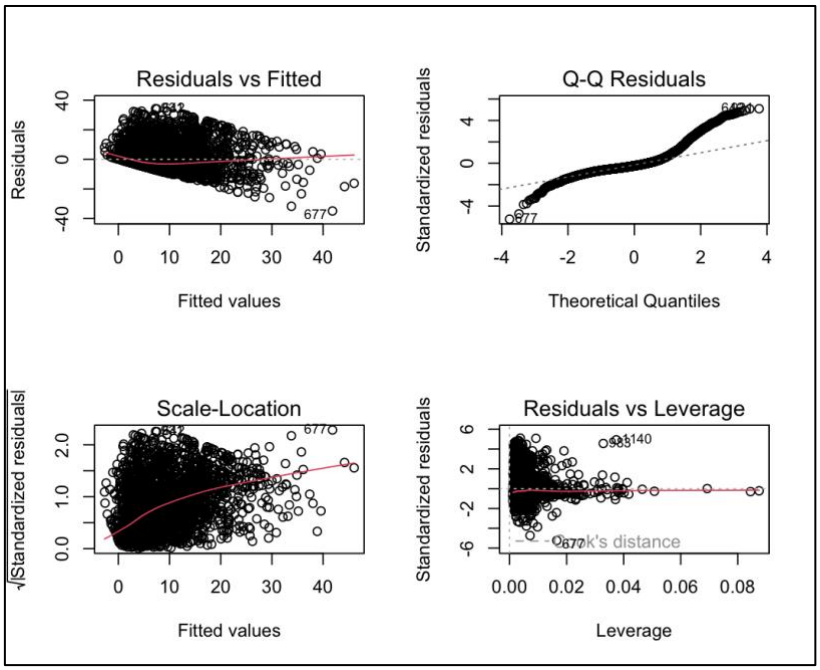
ROBUST STANDARD ERRORS - MODEL 1				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	11,1914	0,6310	17,7346	0,0000
Leverage D/A	-3,2427	0,4608	-7,0370	0,0000
Log Total Assets	-0,2246	0,0203	-11,0889	0,0000
Average ROA	-0,1992	0,0081	-24,6336	0,0000
MTBR	0,1874	0,0411	4,5608	0,0000
GICS sector - Consumer Discretionary	-1,0081	0,4560	-2,2108	0,0271
GICS sector - Consumer Staples	-0,7075	0,5000	-1,4149	0,1572
GICS sector - Energy	1,3656	0,6687	2,0423	0,0412
GICS sector - Financials	-1,2544	0,4773	-2,6282	0,0086
GICS sector - Health Care	-0,4404	0,5569	-0,7907	0,4291
GICS sector - Industrials	-1,1271	0,4508	-2,5001	0,0124
GICS sector - Information Technology	-0,0115	0,5336	-0,0216	0,9827
GICS sector - Materials	0,3202	0,4827	0,6632	0,5072
GICS sector - Real Estate	-1,3684	0,4734	-2,8905	0,0039
GICS sector - Utilities	-0,0789	0,7920	-0,0997	0,9206

ROBUST STANDARD ERRORS - MODEL 2				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	11,2961	0,6539	17,2757	0,0000
Leverage D/A	-3,0666	0,4622	-6,6342	0,0000
Africa	1,3630	0,2806	4,8571	0,0000
Asia excluding India	0,2829	0,2524	1,1210	0,2623
India	1,1611	0,2693	4,3113	0,0000
Latin America	1,8158	0,7779	2,3342	0,0196
North America	0,3781	0,3362	1,1246	0,2608
Oceania	0,8598	0,2889	2,9759	0,0029
Log Total Assets	-0,2527	0,0211	-11,9533	0,0000
Average ROA	-0,1997	0,0082	-24,2158	0,0000
MTBR	0,1718	0,0422	4,0713	0,0000
GICS sector - Consumer Discretionary	-1,2324	0,4581	-2,6900	0,0072
GICS sector - Consumer Staples	-0,9578	0,4967	-1,9285	0,0538
GICS sector - Energy	1,2453	0,6744	1,8465	0,0649
GICS sector - Financials	-1,3889	0,4824	-2,8791	0,0040
GICS sector - Health Care	-0,5068	0,5570	-0,9098	0,3629
GICS sector - Industrials	-1,2135	0,4512	-2,6898	0,0072
GICS sector - Information Technology	-0,0056	0,5341	-0,0104	0,9917
GICS sector - Materials	-0,0244	0,4871	-0,0500	0,9601
GICS sector - Real Estate	-1,3981	0,4726	-2,9586	0,0031
GICS sector - Utilities	0,0012	0,7838	0,0015	0,9988

ROBUST STANDARD ERRORS - MODEL 3				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	11,2961	0,6539	17,2757	0,0000
Leverage D/A	-3,0666	0,4622	-6,6342	0,0000
Africa	1,3630	0,2806	4,8571	0,0000
Asia excluding India	0,2829	0,2524	1,1210	0,2623
India	1,1611	0,2693	4,3113	0,0000
Latin America	1,8158	0,7779	2,3342	0,0196
North America	0,3781	0,3362	1,1246	0,2608
Oceania	0,8598	0,2889	2,9759	0,0029
Log Total Assets	-0,2527	0,0211	-11,9533	0,0000
Average ROA	-0,1997	0,0082	-24,2158	0,0000
MTBR	0,1718	0,0422	4,0713	0,0000
GICS sector - Consumer Discretionary	-1,2324	0,4581	-2,6900	0,0072
GICS sector - Consumer Staples	-0,9578	0,4967	-1,9285	0,0538
GICS sector - Energy	1,2453	0,6744	1,8465	0,0649
GICS sector - Financials	-1,3889	0,4824	-2,8791	0,0040
GICS sector - Health Care	-0,5068	0,5570	-0,9098	0,3629
GICS sector - Industrials	-1,2135	0,4512	-2,6898	0,0072
GICS sector - Information Technology	-0,0056	0,5341	-0,0104	0,9917
GICS sector - Materials	-0,0244	0,4871	-0,0500	0,9601
GICS sector - Real Estate	-1,3981	0,4726	-2,9586	0,0031
GICS sector - Utilities	0,0012	0,7838	0,0015	0,9988

Source: author's own elaboration based on Bloomberg data.

Appendix Figure 1. Diagnostic boxplots - main OLS model



Source: author's own elaboration based on Bloomberg data.

Appendix Table 8. Multicollinearity test - robustness checks

ROBUSTNESS CHECK 1	**VIF**
Leverage D/A	2,1558
Geographical area	1,5009
Log Total Assets	1,2617
Average ROE	1,1541
MTBR	1,0495
GICS sector	1,0317
Leverage D/A - Geographical area	1,5616
ROBUSTNESS CHECK 2	**VIF**
Leverage D/E	1,8354
Geographical area	1,2941
Log Total Assets	1,2564
Average ROA	1,1811
MTBR	1,0555
GICS sector	1,0276
Leverage D/E - Geographical area	1,3371
ROBUSTNESS CHECK 3	**VIF**
Leverage D/E	1,8359
Geographical area	1,2909
Log Total Assets	1,2623
Average ROE	1,1534
MTBR	1,0542
GICS sector	1,0270
Leverage D/E - Geographical area	1,3357

Source: author's own elaboration based on Bloomberg data.

Appendix Table 9. Breusch-Pagan tests - robustness checks

HETEROSKEDASTICITY TEST - ROBUSTNESS CHECK 1
BP = 179,98 df = 26 **p-value < 0,00000000000000022**
HETEROSKEDASTICITY TEST - ROBUSTNESS CHECK 2
BP = 568,78 df = 26 **p-value < 0,00000000000000022**
HETEROSKEDASTICITY TEST - ROBUSTNESS CHECK 3
BP = 189,57 df = 26 **p-value < 0,00000000000000022**

Source: author's own elaboration based on Bloomberg data.

Appendix Table 10. Robust standard errors - robustness check 1, 2, 3

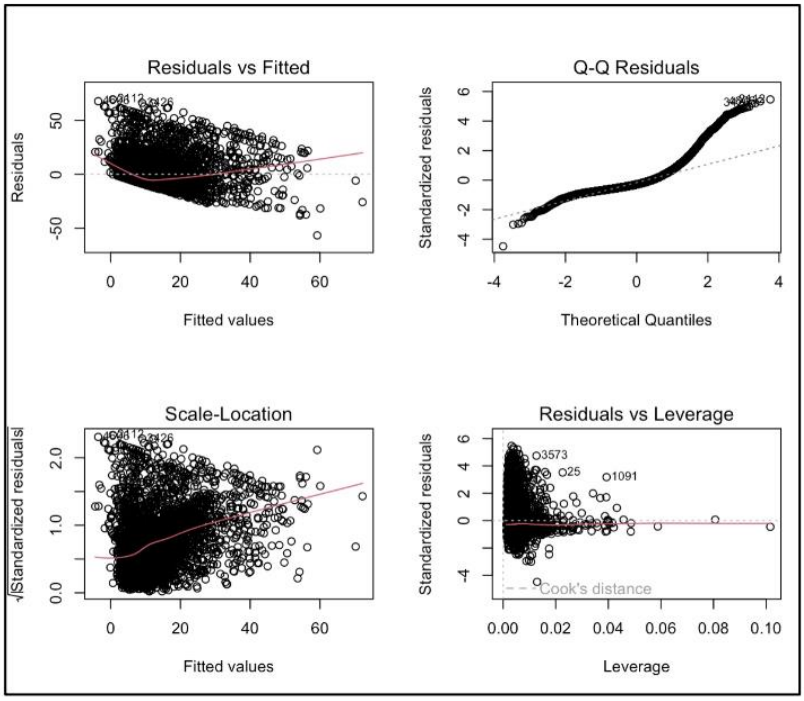
ROBUST STANDARD ERRORS - ROBUSTNESS CHECK 1				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	14,9712	1,4260	10,4985	0,0000
Leverage D/A	3,5252	1,9614	1,7973	0,0723
Africa	3,0057	0,8837	3,4013	0,0007
Asia excluding India	-1,4936	0,7587	-1,9687	0,0490
India	1,3662	0,8673	1,5752	0,1153
Latin America	0,1403	1,9622	0,0715	0,9430
North America	-1,0922	0,9032	-1,2092	0,2266
Oceania	-1,6735	0,7741	-2,1619	0,0307
Log Total Assets	-0,1888	0,0486	-3,8840	0,0001
Average ROA	-0,2281	0,0100	-22,8880	0,0000
MTBR	0,6865	0,0919	7,4690	0,0000
GICS sector - Consumer Discretionary	-1,3190	0,9508	-1,3872	0,1654
GICS sector - Consumer Staples	-1,9138	1,0171	-1,8817	0,0599
GICS sector - Energy	1,0040	1,2947	0,7755	0,4381
GICS sector - Financials	-2,2954	0,9154	-2,5075	0,0122
GICS sector - Health Care	-2,0300	1,0630	-1,9097	0,0562
GICS sector - Industrials	-1,1942	0,9195	-1,2988	0,1941
GICS sector - Information Technology	-0,6186	1,0113	-0,6116	0,5408
GICS sector - Materials	-1,8140	0,9095	-1,9946	0,0461
GICS sector - Real Estate	-4,7886	0,9381	-5,1044	0,0000
GICS sector - Utilities	-1,3988	1,6195	-0,8637	0,3878
Leverage D/A - Africa	-0,6988	3,4240	-0,2041	0,8383
Leverage D/A - Asia excluding India	2,9535	3,1581	0,9352	0,3497
Leverage D/A - India	-3,0616	3,1783	-0,9633	0,3354
Leverage D/A - Latin America	1,6378	6,8577	0,2388	0,8113
Leverage D/A - North America	8,7941	3,4412	2,5556	0,0106
Leverage D/A - Oceania	7,0247	3,1066	2,2612	0,0238

ROBUST STANDARD ERRORS - ROBUSTNESS CHECK 2				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	10,1309	0,6419	15,7821	0,0000
Leverage D/E	-0,6843	0,1574	-4,3491	0,0000
Africa	1,1964	0,3588	3,3342	0,0009
Asia excluding India	0,2772	0,3322	0,8345	0,4040
India	1,1519	0,3356	3,4325	0,0006
Latin America	1,6720	1,0115	1,6531	0,0984
North America	0,3573	0,4460	0,8011	0,4231
Oceania	0,7075	0,3653	1,9369	0,0528
Log Total Assets	-0,2174	0,0210	-10,3560	0,0000
Average ROA	-0,2084	0,0085	-24,4980	0,0000
MTBR	0,1675	0,0415	4,0357	0,0001
GICS sector - Consumer Discretionary	-0,9988	0,4364	-2,2889	0,0221
GICS sector - Consumer Staples	-0,8798	0,4731	-1,8596	0,0630
GICS sector - Energy	1,3176	0,6651	1,9812	0,0476
GICS sector - Financials	-1,0960	0,4541	-2,4137	0,0158
GICS sector - Health Care	-0,2125	0,5427	-0,3916	0,6954
GICS sector - Industrials	-1,1384	0,4291	-2,6528	0,0080
GICS sector - Information Technology	-0,0141	0,5113	-0,0275	0,9780
GICS sector - Materials	0,1440	0,4671	0,3082	0,7580
GICS sector - Real Estate	-1,4079	0,4487	-3,1378	0,0017
GICS sector - Utilities	-0,5044	0,6758	-0,7463	0,4555
Leverage D/E - Africa	0,0288	0,2863	0,1007	0,9198
Leverage D/E - Asia excluding India	-0,0033	0,3726	-0,0090	0,9928
Leverage D/E - India	-0,5840	0,2538	-2,3011	0,0214
Leverage D/E - Latin America	-0,5850	0,6554	-0,8927	0,3721
Leverage D/E - North America	0,0779	0,3194	0,2440	0,8073
Leverage D/E - Oceania	0,1544	0,3417	0,4519	0,6513

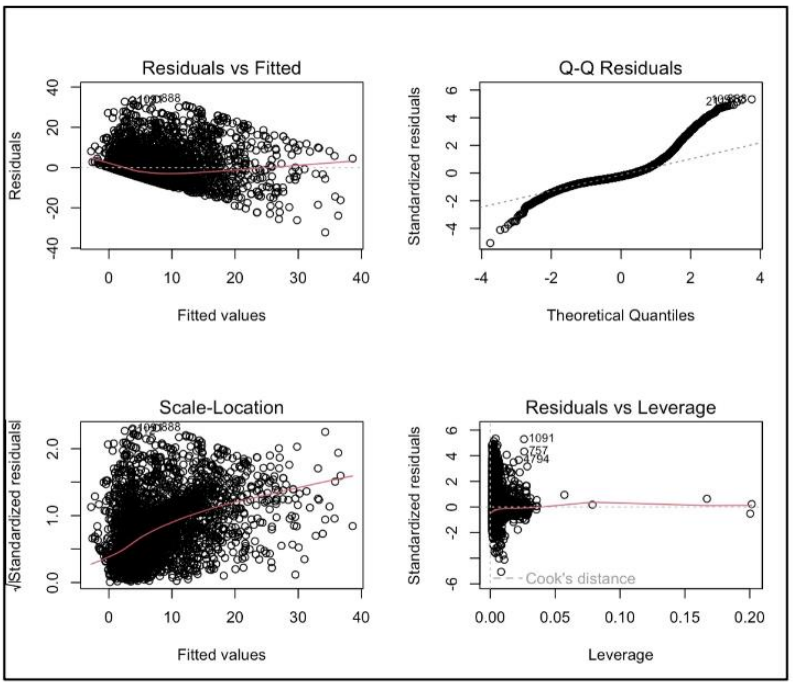
ROBUST STANDARD ERRORS - ROBUSTNESS CHECK 3				
Variable	**Estimate**	**Standard error**	**T value**	**P value**
(Intercept)	15,3759	1,3605	11,3019	0,0000
Leverage D/E	2,0439	0,4590	4,4534	0,0000
Africa	3,0839	0,7808	3,9498	0,0001
Asia excluding India	-1,1721	0,6560	-1,7868	0,0740
India	1,8972	0,7223	2,6264	0,0087
Latin America	0,6717	1,5773	0,4258	0,6702
North America	-0,2353	0,7962	-0,2955	0,7676
Oceania	-0,9621	0,6390	-1,5057	0,1322
Log Total Assets	-0,2402	0,0483	-4,9698	0,0000
Average ROA	-0,2231	0,0098	-22,7381	0,0000
MTBR	0,6224	0,0900	6,9154	0,0000
GICS sector - Consumer Discretionary	-1,2946	0,9402	-1,3770	0,1686
GICS sector - Consumer Staples	-1,7288	1,0054	-1,7196	0,0856
GICS sector - Energy	1,1570	1,2877	0,8985	0,3690
GICS sector - Financials	-2,7085	0,9124	-2,9685	0,0030
GICS sector - Health Care	-1,4873	1,0575	-1,4064	0,1597
GICS sector - Industrials	-1,1234	0,9113	-1,2327	0,2177
GICS sector - Information Technology	-0,3156	1,0033	-0,3146	0,7531
GICS sector - Materials	-1,6631	0,8977	-1,8526	0,0640
GICS sector - Real Estate	-4,4179	0,9218	-4,7926	0,0000
GICS sector - Utilities	-1,5826	1,6162	-0,9792	0,3275
Leverage D/E - Africa	-0,0013	0,8502	-0,0016	0,9988
Leverage D/E - Asia excluding India	1,1574	0,9999	1,1575	0,2471
Leverage D/E - India	-1,3608	0,7379	-1,8442	0,0652
Leverage D/E - Latin America	0,1378	1,7260	0,0798	0,9364
Leverage D/E - North America	1,3469	0,8551	1,5752	0,1153
Leverage D/E - Oceania	1,5890	0,8239	1,9286	0,0538

Source: author's own elaboration based on Bloomberg data.

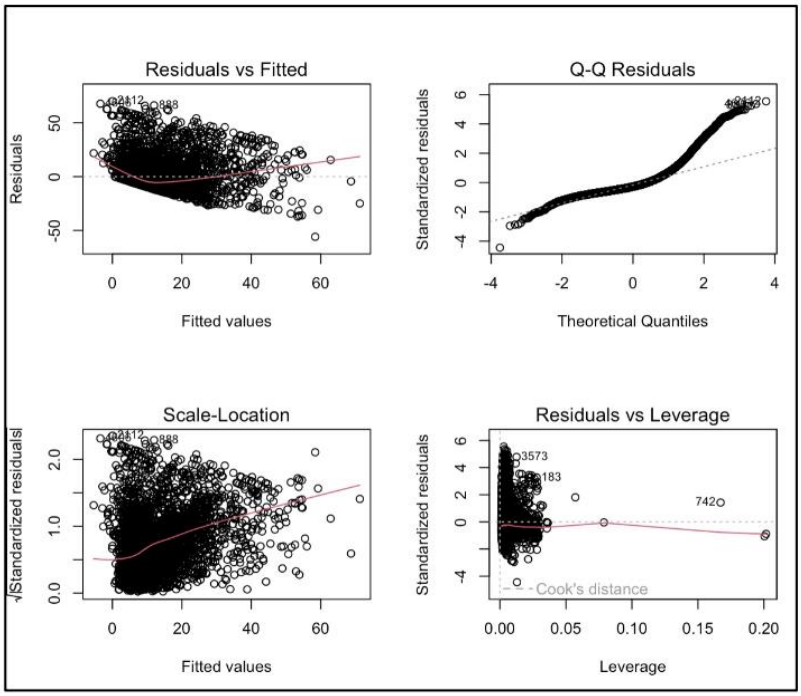
Appendix Figure 2. Diagnostic boxplots - robustness checks



Robustness check 1



Robustness check 2



Robustness check 3

Source: author's own elaboration based on Bloomberg data.

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