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Research article

Zero-leverage determinants: A study for Portuguese SMEs

Carina Barbosa[1], Filipe Sardo[1,2] and Luís Pacheco[3,*]

[1] Departamento de Economia, Gestão, Engenharia Industrial e Turismo (DEGEIT), Universidade de Aveiro, Aveiro, Portugal
[2] CEFAGE-UBI – Center for Advanced Studies in Management and Economics, University of Beira Interior, Covilhã, Portugal
[3] Departamento de Economia e Gestão, Universidade Portucalense, REMIT – Research on Economics, Management and Information Technologies, Porto, Portugal

* **Correspondence:** Email: luisp@upt.pt.

Abstract: This paper contributes to the literature on capital structure by analyzing the determinants of the adoption of zero leverage by Portuguese SMEs. The aim is to assess whether financial constraints, financial flexibility, profitability, and an external shock (COVID-19) affect the likelihood of a company operating without debt. Based on a panel of data for the period 2018–2023, a dynamic probit regression model was estimated to analyze the persistence of zero debt and its main determinants. The results indicate that smaller and older companies are more likely to adopt a zero-debt policy, partially confirming the financial constraints hypothesis. Also, liquidity, tangibility, profitability, and the pandemic context do not significantly influence the adoption of that policy, indicating that other factors, such as the financial system's structure and credit barriers, may play a prominent role. One of the main results is the high persistence of zero leverage over time, suggesting that this decision is the result of a deliberate strategy. The findings of this study provide valuable insights into the financing decisions of Portuguese SMEs and present implications for managers, investors, financial institutions, and policymakers.

Keywords: zero-leverage firms; financial constraints; financial flexibility; small and medium-sized enterprises; capital structure

JEL Codes: G32, L26

1. Introduction

The capital structure of firms has been extensively debated within the field of corporate finance since the seminal work of Modigliani and Miller (1958). Their initial theory, which posited the irrelevance of capital structure, was subsequently revised to incorporate the role of corporate taxation (Modigliani and Miller, 1963). This revision laid the foundation for decades of research concerning corporate financing decisions. Much of the extant literature has focused on identifying the optimal level of indebtedness, examining the trade-off between the tax benefits associated with debt and the increased risk of bankruptcy resulting from external financing (Fama and French, 2002).

Whilst the majority of studies have concentrated on the presence of debt and its determinants, a noteworthy phenomenon has gained prominence: a considerable number of firms opt to remain debt-free, maintaining balance sheets without financial liabilities. This phenomenon is of increasing relevance, particularly given the rise in the proportion of debt-free firms in recent years. According to DeAngelo and Roll (2015), capital structures evolve over time, with firms exhibiting low leverage tending to display greater financial stability. Deb and Banerjee (2015) estimated that approximately 20% of firms in the United States operate without debt, while Byoun and Xu (2013) observed that such behavior spans a range of industries. Similarly, Strebulaev and Yang (2013) identified a significant number of firms maintaining minimal levels of indebtedness. A global analysis by Saona et al. (2020), encompassing firms from 47 countries between 1996 and 2014, found that many firms sustained debt-free capital structures over extended periods. On an international scale, Bessler et al. (2013) highlighted a strong tendency toward extreme debt aversion across 20 developed economies. El Ghoul et al. (2018) also contended that the absence of debt constitutes a global phenomenon. Caban (2018) noted that the literature often regards this form of capital structure as an anomaly, referring to it as the "zero-leverage puzzle" (Graham, 2000) or the "zero-leverage mystery" (Strebulaev and Yang, 2013).

The increasing prevalence of this financial policy raises fundamental questions regarding the underlying reasons for firms' avoidance of debt. The determinants of zero leverage may be broadly categorized as internal or external. Recent contributions, such as Jiang et al. (2024), suggest that the existence of debt-free firms is not solely attributable to firm-specific strategies but is also influenced by broader institutional and macroeconomic factors. Furthermore, sectoral and geographical variation indicates that the zero-leverage choice may reflect specific market or regulatory characteristics.

Despite significant scholarly attention, empirical findings remain inconclusive, complicating efforts to develop a unified understanding of the zero-leverage phenomenon (Devos et al., 2012; Byoun and Xu, 2013; Strebulaev and Yang, 2013; D'Mello and Gruskin, 2014). Although scholars such as Lotfaliei (2018), Haddad and Lotfaliei (2019), and Lundberg and Lotfaliei (2020) have made important contributions, a comprehensive theoretical model explaining zero leverage is yet to emerge. Furthermore, much of the existing research is concentrated on jurisdictions with civil law traditions, where bank financing dominates. Prior studies have shown that SMEs frequently face obstacles in accessing external capital, which may explain their reliance on internally generated funds (Martinez-Cillero et al., 2020; Lefebvre, 2021). Bigelli et al. (2014) further suggested that small, private firms often maintain low levels of indebtedness in order to preserve financial flexibility.

This study seeks to analyze the internal and external factors that determine the adoption of zero leverage by SMEs in Portugal. Given that most Portuguese firms are SMEs, this research acquires relevance by seeking to identify the implications of operating without debt for firm growth, sustainability, and competitiveness.

Our findings indicate that smaller and older companies are more likely to adopt this policy, partially confirming the financial constraints hypothesis. Furthermore, the results show a high persistence of zero leverage policy over time, suggesting that this decision is the result of a deliberate strategy and not just financial constraints. Finally, the COVID-19 pandemic has not significantly influenced the financing structure of companies.

The article is organized as follows: Section 2 reviews the relevant literature on capital structure and zero leverage, addressing key theoretical frameworks and empirical findings. Section 3 outlines the research methodology, including sample selection, variable definition, and statistical methods. Section 4 presents the results of the empirical analysis, followed by a discussion in Section 5. Finally, Section 6 provides the study's main conclusions, highlights its contributions and limitations, and offers suggestions for future research.

2. Literature review

2.1. The zero-leverage concept

The term "zero leverage" refers to a firm's decision—whether strategic or compelled—to forgo the use of debt in its capital structure, encompassing both short- and long-term liabilities (Graham, 2000; Devos et al., 2012; Strebulaev and Yang, 2013). This behavior has been characterized in the corporate finance literature as a "puzzle" or "mystery", as it appears to challenge traditional capital structure theories such as the trade-off theory (Kraus and Litzenberger, 1973) and the pecking order theory (Myers, 1984).

The absence of debt is neither an isolated nor an exceptional phenomenon. Caban (2018) noted that in many firms, the financial leverage ratio is below 5%, indicating a capital structure almost entirely composed of equity. This observation is corroborated by Ghose and Kabra (2016) and Saona et al. (2020), who classified firms with such low leverage as having predominantly equity-based structures. According to Strebulaev and Yang (2013) and Morais et al. (2024), firms across various sizes and sectors, from large, listed corporations to unlisted small and medium-sized enterprises (SMEs), in both developed and emerging economies, adopt this approach. The increasing prevalence of zero-leverage policies suggests that traditional capital structure theories may not fully account for the diversity of financial behaviors observed across firms of different sizes and institutional contexts (Strebulaev and Yang, 2013; Saona et al., 2020). A range of factors, including financial constraints (Devos et al., 2012; Bessler et al., 2013), the pursuit of financial flexibility (Gamba and Triantis, 2008), and institutional or environmental characteristics (Saona et al., 2020; Jiang et al., 2024), often underpin this decision.

Saona et al. (2020) observed that firms adopting zero-leverage policies typically maintain them over extended periods. This persistence may be partly attributed to behavioral factors. Sardo et al.

(2024), for instance, identified a form of "state dependence", whereby a firm's experience of operating without debt influences its future financing decisions. This consistent behavior is also emphasized by DeAngelo and Roll (2015), who argued that firms with historically low leverage levels are more likely to sustain such policies, reflecting the long-term stability of capital structure decisions. These strategic choices have direct implications for firms' financing capacity, growth prospects, and resilience in periods of crisis (Jiang et al., 2024).

The characteristics of the financial system exert a significant influence on firms' decisions to adopt zero-leverage policies, affecting both their capital structure and their willingness or ability to avoid debt. Market-based financial systems are characterized by well-developed, liquid capital markets that are attractive to external investors (Drobetz et al., 2015). This infrastructure provides firms with a broader array of financing options and may encourage the adoption of a zero-leverage strategy (Drobetz et al., 2015). In Europe, where both systems coexist, the determinants of zero leverage vary. For instance, Morais et al. (2024) demonstrated that the European sovereign debt crisis significantly increased firms' propensity to remain debt-free, particularly in market-oriented economies. They also confirmed the existence of two distinct groups of debt-free firms: those that are financially constrained and cannot access credit, and those that deliberately choose to avoid debt (Bessler et al., 2013; Morais et al., 2024).

In the Portuguese context, the financial system is predominantly bank-based, operating within a civil law regime that offers relatively low protection for creditors. Following the 2007 financial crisis, a notable contraction in bank lending, coupled with high ownership concentration, revealed structural constraints that continue to shape firms' financing strategies (Raposo et al., 2022). Consequently, many firms have responded by accumulating free cash flows as a means of mitigating information asymmetries and agency problems.

In conclusion, the structure and institutional features of national financial systems play a critical role in shaping zero-leverage policies. Market-oriented systems tend to provide greater financial flexibility, making zero leverage a strategic choice, whereas bank-based systems often impose constraints that push firms toward debt avoidance as a necessity.

2.2. Internal determinants

The analysis of internal determinants of zero leverage reveals a multitude of factors that interact to shape corporate financial decisions. Several theoretical frameworks help explain how internal characteristics—such as asset structure, profitability, corporate governance, and strategic orientation—can influence the adoption of debt-free financing policies. Among the most prominent approaches are the financial constraints theory, financial flexibility theory, and pecking-order theory. In addition, governance mechanisms play a critical role in shaping such decisions, although this determinant is not addressed in the present study.

2.2.1. Financial constraints theory

The financial constraints hypothesis is widely recognized as a key explanation for the zero-leverage phenomenon. It suggests that firms avoid debt due to limited access to external financing, driven by

market imperfections (Devos et al., 2012; Jiang et al., 2024). Central to this view is the role of credit supply conditions in shaping capital structure decisions (Morais et al., 2024).

In imperfect credit markets, information asymmetries hinder lenders from accurately assessing firm risk (Stiglitz and Weiss, 1981), resulting in credit rationing where some firms—despite comparable risk profiles—are denied financing (Saona et al., 2023). Myers (1984) added that such asymmetries lead lenders to demand high-risk premiums or reject applications, forcing many firms to rely on internal funds.

Empirical studies show that financially constrained firms are generally smaller, younger, and possess fewer tangible assets, key factors limiting their borrowing capacity (Hadlock and Pierce, 2010; Strebulaev and Yang, 2013; Saona et al., 2020). Since tangible assets are often used as collateral, firms with low asset tangibility are less likely to use debt, reinforcing the link between asset structure and financing constraints (El Ghoul et al., 2018).

As a result, small firms with limited collateral and weaker market reputations face greater obstacles in securing credit. Research shows these firms often adopt zero-leverage policies out of necessity rather than preference (Devos et al., 2012; Bessler et al., 2013; Huang et al., 2017). Moreover, during periods of declining profitability or when investing in intangible assets, agency and informational costs rise, prompting firms to favor equity over debt (Gatchev et al., 2009).

Thus, the financial constraints theory argues that zero leverage is largely driven by credit access limitations and is associated with internal characteristics such as smaller size, lower tangibility, and early-stage development. In this study, firm size, age, and asset tangibility are used as proxies for financial constraints, consistent with prior literature (Almeida and Campello, 2007; Frank and Goyal, 2009; Pacheco, 2022). Based on the arguments above, we propose the following hypothesis:

Hypothesis 1 (H1): *Firms facing greater financial constraints are more likely to adopt a zero-leverage policy.*

2.2.2. Financial flexibility theory

The financial flexibility theory argues that some firms deliberately avoid debt as a strategic choice to preserve their ability to respond to future opportunities and unexpected events. Unlike the financial constraints hypothesis, which suggests that firms are restricted by market conditions, this theory views zero leverage as a proactive approach to financial management (Saona et al., 2023; Morais et al., 2024).

Financial flexibility is defined as a firm's capacity to adapt to changes in cash flows and operational needs while maintaining the ability to fund attractive investment opportunities (Marchica and Mura, 2010; Ferrando et al., 2017). According to Marchica and Mura (2010), firms that prioritize flexibility tend to be more cautious in investment decisions, allocating resources only to projects with high return potential.

Additionally, firms adopting this strategy emphasize liquidity preservation and avoid debt in order to maintain borrowing capacity for future use under more favorable conditions (Gamba and Triantis, 2008). This approach also mitigates underinvestment problems, where conflicts between shareholders and creditors hinder financing for high-growth projects (Myers, 1977).

In sum, the financial flexibility theory suggests that zero leverage can be a deliberate strategy to maintain liquidity and optimize resource management, enabling firms to better respond to

growth opportunities and adverse shocks. Following the approach of Almeida and Campello (2007), this study includes cash holdings as a proxy for financial flexibility, leading to the formulation of the following hypothesis:

Hypothesis 2 (H2): *Firms with greater financial flexibility are more likely to adopt a zero-leverage policy.*

2.2.3. Pecking-order theory

The pecking-order theory, developed by Myers (1984), posits that firms follow a financing hierarchy driven by the relative costs of capital, primarily shaped by information asymmetries. Unlike the trade-off theory, which assumes an optimal capital structure, the pecking-order theory suggests that firms prefer internal financing, resorting to debt only when internal resources are insufficient.

Smaller firms, according to Saona et al. (2023), are more affected by information asymmetries, making debt financing less accessible. Byoun and Xu (2013) highlight that mature, profitable firms with limited investment needs often distribute dividends to address agency issues related to excess cash. In contrast, firms anticipating future growth may adopt zero-leverage policies to sidestep high capital adjustment costs and the risks associated with issuing asymmetric information-sensitive securities (Saona et al., 2023). Empirical evidence supports these patterns, showing a strong link between firm profitability and zero-leverage behavior. Studies by Ramalho et al. (2018), Saona et al. (2020), Strebulaev and Yang (2013), and Lotfaliei (2018) found that smaller, more profitable firms tend to self-finance, reducing dependence on external funding. This approach not only minimizes financing frictions but also enhances firm reputation, paving the way for future equity issuance over debt.

In summary, the pecking-order theory offers a structured view of the financing hierarchy and associated costs. It complements other capital structure theories while clarifying the relationship between profitability, firm size, and zero-leverage policies. Using the approach proposed by Öztekin (2015), this study incorporates firm profitability as a proxy for the pecking-order theory and presents the following hypothesis:

Hypothesis 3 (H3): *Firms with higher profitability are more likely to adopt a zero-leverage policy, in accordance with the pecking-order theory.*

2.3. External determinants: impact of COVID-19

External determinants significantly influence firms' capital structure decisions, shaping strategic choices such as the adoption of zero-leverage policies. Key determinants include credit accessibility—reflecting constraints imposed by financial institutions—macroeconomic conditions, affecting stability and growth, and global risks that amplify uncertainty, such as the COVID-19 pandemic.

The pandemic presented substantial challenges, forcing firms to adjust their financing strategies. Lockdowns triggered sharp revenue declines, prompting many companies to seek loans to cover essential operating costs. Additional expenses related to health measures and supply chain disruptions further strained budgets, leading to increased corporate indebtedness and reduced financial flexibility (Goldstein et al., 2021).

In Europe, the expiration of crisis-era credit moratoria exposed the vulnerability of firms dependent on temporary support. This shift contributed to a rise in bankruptcies, particularly among "zombie firms" sustained only through extraordinary interventions (GEE, 2023). In Portugal, the pandemic-driven downturn exacerbated corporate debt burdens, increasing leverage and insolvency risk (Augusto and Mateus, 2021). Furthermore, Choi (2025) found that the crisis also prompted companies to reassess their debt policies. Firms previously adhering to zero-leverage strategies increased their use of credit to address liquidity shortages and to sustain investments during the crisis.

In summary, the COVID-19 pandemic compelled firms to adjust their financing strategies, underscoring the importance of prudent debt management to enhance resilience against economic uncertainty. To assess the pandemic's effect on the adoption of zero-leverage policies, this study introduces a COVID-19 variable, leading to the formulation of the following hypothesis:

Hypothesis 4 (H4): *The COVID-19 pandemic reduced the likelihood of firms adopting a zero-leverage policy.*

Figure 1 presents a graphic illustration of the research hypotheses:

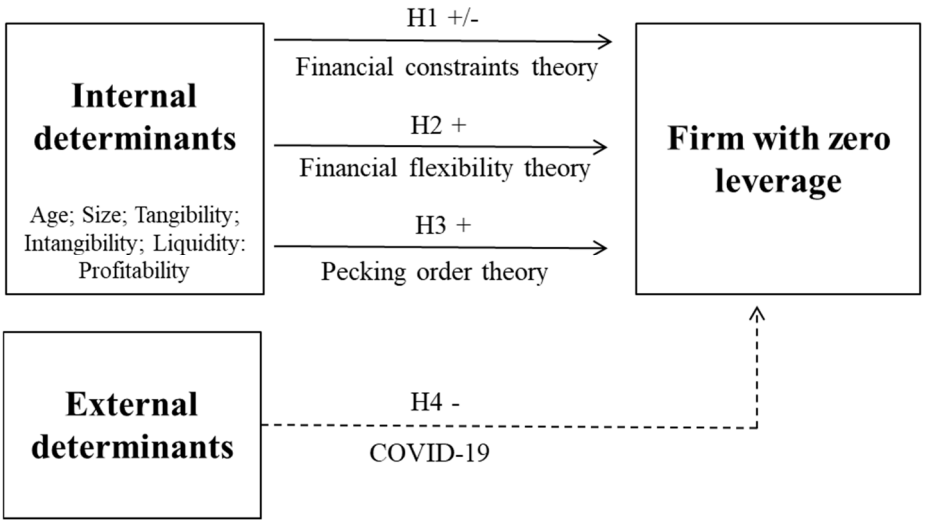

Figure 1. Research hypotheses and expected signs.

3. Methodology and sample

This study aims to analyze the determinants of zero-leverage policy adoption among Portuguese small and medium-sized enterprises (SMEs). To this end, an empirical approach grounded in applied econometrics on capital structure is employed to evaluate the relationship between internal and external factors and the likelihood of a firm holding no short- or long-term debt.

The methodology follows the principles of dynamic probit regression analysis, in line with the existing literature on the topic. Specifically, the approach builds upon the contributions of Dang (2013), who investigated both strategic and restrictive reasons for firms adopting zero-leverage policies, and Sardo et al. (2024), who emphasized the persistence of this policy among SMEs.

3.1. Sample

This research uses a sample composed of SMEs located in Portugal, covering the period from 2018 to 2023. This timeframe enables the analysis to account for both the pre-pandemic period and the subsequent years, including the impact of the COVID-19 pandemic and other significant geopolitical events, thereby allowing for a more comprehensive assessment of their effects on firms' capital structures.

Firm selection was based on the official SME definition, which includes companies with a minimum of 11 and a maximum of 250 employees and an annual turnover between €10 million and €50 million. The sample was restricted to firms that met the following criteria: (a) headquartered in Portugal; (b) at some point adopted a zero-leverage policy; (c) had complete financial data for the entire analysis period; and (d) maintained continuous operations throughout the study years. Firms in the financial and insurance sectors were excluded due to the unique characteristics of their capital structures, as were those with incomplete data for any of the analyzed variables, ensuring the reliability of the results.

The initial sample consisted of 397 firms; however, after applying the exclusion criteria and removing outliers, the final sample comprised 253 firms. Given the 6-year analysis period, the final dataset includes a total of 1518 firm-year observations. Table 1 presents the distribution of firms by sector of activity, according to the Nomenclature of Economic Activities (NACE Rev. 2).

Table 1. Distribution of firms by sector of activity.

Industry	Number	%
A – Agriculture, forestry, and fishing	5	1.98%
B – Mining and quarrying	2	0.79%
C – Manufacturing	50	19.76%
D – Electricity, gas, steam, and air-conditioning supply	4	1.58%
E – Water supply, sewerage, waste management, and remediation	6	2.37%
F – Construction	13	5.14%
G – Wholesale and retail trade, repair of motor vehicles and motorcycles	99	39.13%
H – Transportation and storage	24	9.49%
I – Accommodation and food service activities	3	1.19%
J – Publishing, audiovisual, and broadcasting activities	22	8.70%
L – Real estate activities	3	1.19%
M – Consulting, scientific, technical, and similar activities	12	4.74%
N – Administrative and support service activities	7	2.77%
Q – Human health services and social work activities	1	0.40%
R – Arts, entertainment, and recreation	2	0.79%
Total	253	100%

Distribution according to the Nomenclature of Economic Activities (NACE Rev. 2). Source: Own elaboration.

The sectoral distribution reveals marked differences in the prevalence of zero-debt firms across economic activities. The majority of the firms in the sample operate within sector G (Wholesale and retail trade; repair of motor vehicles and motorcycles) (n = 99 or 39.13% of the total sample), followed by sector C (Manufacturing), with 19.76% (n = 50). Sectors such as Q (Human health services and social work activities) (0.40%), R (Arts, entertainment, and recreation) (0.79%), and B (Mining and quarrying) (0.79%) are represented by a very small number of zero-leverage firms.

3.2. Variables and econometric model

Following Strebulaev and Yang (2013), the dependent variable in this study is binary in nature, taking the value 1 if the firm holds no short- or long-term debt at the end of the fiscal year, and 0 otherwise. The explanatory variables are grouped into two categories: internal determinants, referring to the structural and financial characteristics of the firms (firm age, size, asset tangibility and intangibility, liquidity, and profitability), and external factors, represented in this study by the impact of the COVID-19 pandemic.

Table 2 presents the definition of the variables employed in this study.

Table 2. Definition of the variables used in the empirical analysis.

Variables	Definition	References
Dependent variable:		
Firms with zero leverage	This variable is dichotomous: it assumes the value 1 if the company has no long-term or short-term debt at the end of the fiscal year and 0 otherwise.	Strebulaev and Yang (2013)
Internal determinants:		
Age	Natural logarithm of the difference between the year of observation and the incorporation date available in ORBIS.	Pacheco (2022)
Size	Logarithm of total assets.	Frank and Goyal (2009)
Tangibility	Total tangible fixed assets divided by total assets.	Almeida and Campello (2007)
Intangibility	Proportion of intangible assets as a function of total assets.	Pacheco (2017)
Liquidity	Cash and cash equivalents divided by total assets.	Almeida and Campello (2007)
Profitability	Earnings before interest, taxes, and amortization (EBITDA) divided by total assets.	Öztekin (2015)
External determinant:		
COVID-19	This is a dummy variable equal to 1 for the years 2020 and 2021 and 0 for the remaining years.	Choi (2025)

Source: Own elaboration.

Additionally, the inclusion of a lagged dummy variable indicating the firm's zero-leverage status in the previous year allows for the control of policy persistence. This provides a more comprehensive understanding of how internal and external factors relate to the adoption or continuation of a zero-leverage strategy over time.

To test the proposed hypotheses, this study applies a dynamic random effect probit estimator, as proposed by Wooldridge (2005), and an alternative conditional maximum likelihood estimator in

which initial conditions are assumed to be exogenous. This approach makes it possible to assess both the factors influencing the likelihood of adopting a zero-debt policy and the persistence of this decision over time. Following the methodology of Sardo et al. (2024), the model accounts for "state dependence", i.e., the possibility that firms that adopted a zero-leverage policy in a given year are more likely to maintain this strategy in subsequent years. To capture this temporal dynamic, the model incorporates dynamic random effects, thereby enabling the analysis to reflect both the continuity of zero-leverage decisions over time and firm-specific heterogeneity.

The model describing a firm's propensity to maintain zero leverage at time *t* can be represented using the latent variable $\text{Zero Leverage}_{i,t}$ as follows:

$$\text{Zero Leverage}^*_{it} = \gamma \text{Zero Leverage}_{i,t-1} + \beta X_{it} + \tau_i + u_{it} \quad (1)$$

where $I = 1, ..., N$ and $t = 1, ..., T$, with I indexing firms and t indexing time periods. The variable $\text{Zero Leverage}_{i,t-1}$ represents the lagged dependent variable; X_{it} is a vector of explanatory variables; $\bar{X}_i$ denotes the time averages of each firm-specific characteristic included in $\bar{X}_i$ over the observation period; τ_i captures the unobserved, time-invariant firm-specific effect; and u_{it} represents the idiosyncratic error term.

Following the approach of Mundlak (1978) and Chamberlain (1984), potential correlation between the unobserved firm-specific effects (τ_i) and the observed explanatory variables (X_{it}) can be addressed by modelling τ_i as a function of the time averages of the explanatory variables, i.e.,

$$\tau_i = \bar{X}_i \alpha + \alpha_i$$

where $\alpha_i \sim iid\ N(0, \sigma_\alpha^2)$ and is assumed to be independent of both X_{it} and u_{it} for all *i* and *t*. Here, again, $\bar{X}\bar{X}_i$ captures the time-varying means of the firm characteristics in X_{it} across the sample period. Under this formulation, Equation (1) can be rewritten as:

$$\text{Zero Leverage}^*_{it} = \gamma \text{Zero Leverage}_{i,t-1} + \beta X_{it} + \bar{X}_i \alpha + \alpha_i + u_{it} \quad (2)$$

The estimation of dynamic models requires an assumption regarding the initial conditions, *Zero* $\text{Zero Leverage}_{i0}$, and their potential correlation with τ_i, the firm-specific unobserved effect (unobserved heterogeneity). To address the issue of initial conditions in dynamic random effects models, we adopt the approach proposed by Wooldridge (2005). This method employs an alternative conditional maximum likelihood estimator that assumes the exogeneity of the initial conditions. Under this framework, the relationship between α_i and $\text{Zero Leverage}_{i0}$ is specified as:

$$\alpha_i = b_0 + b_1 Zero\ Leverage_{i0} + \zeta_i \quad (3)$$

where ζ_i represents a distinct unobserved firm-specific effect that is uncorrelated with the initial zero-leverage status. By substituting Equation (3) into Equation (2), the resulting model can be expressed as follows:

$$\text{Zero Leverage}^*_{it} = \gamma \text{Zero Leverage}_{i,t-1} + \beta X_{it} + \bar{X}_i \alpha + b_0 + b_1 \text{Zero Leverage}_{i0} + \zeta_i + u_{it} \quad (4)$$

4. Results

4.1. Descriptive analysis

Table 3 presents the annual distribution of the sample firms between 2018 and 2023, distinguishing between zero-leverage and leveraged firms. This temporal distribution provides an initial overview of the sample structure and supports the contextualization of the determinants under investigation, as well as the evolution of differences between the sub-samples over time.

Table 3. Annual distribution (in absolute and relative terms) of the firm sample according to their leverage structure.

Year	Total sample		
	With zero leverage	Without zero leverage	Total
2018	165 (65.2%)	88 (34.8%)	253
2019	163 (64.4%)	90 (35.6%)	253
2020	162 (64.0%)	91 (36.0%)	253
2021	167 (66.0%)	86 (34.0%)	253
2022	175 (69.2%)	78 (30.8%)	253
2023	185 (73.1%)	68 (26.9%)	253

Source: Own elaboration.

In total, the sample comprises 1518 firm-year observations, of which 67.0% (n = 1,017) correspond to years in which firms had no debt, and 33.0% (n = 501) refer to years in which these same firms reported having some form of indebtedness. These figures reflect fluctuations in the capital structure of the firms under analysis, highlighting the intermittent adoption of a zero-leverage policy over the study period.

From 2018 to 2020, the number of zero-leverage firms remained relatively stable. However, from 2021 onward, an upward trend is observed, possibly reflecting the economic uncertainty triggered by the COVID-19 pandemic. This increase may indicate a heightened tendency among firms to avoid external financing during certain periods, potentially influenced by economic or sector-specific factors, or by internal financial management strategies.

Table 4 reports the descriptive statistics for the variables used in the study, including the average, standard deviation (SD), and minimum and maximum values. In addition, the results of the Student's t-test are presented to assess whether the averages differ significantly between the sub-samples, along with the average values for each group.

Table 4. Descriptive statistics of the sample and test for difference in means (Student's t-test).

Variables	Total sample				Without zero leverage	With zero leverage	Student's t-test
	Average	S.D.	Min.	Max.	Average	Average	
Age	3.28	0.70	0	5.23	3.242	3.302	−0.059 (p = 0.121)
Size	4.11	0.38	3.08	5.64	4.106	4.107	−0.001 (p = 0.941)
Tangibility	0.15	0.18	0	0.95	0.193	0.124	0.069 *** (p < 0.001)
Intangibility	0.03	0.12	0	0.93	0.035	0.034	0.001 (p = 0.880)
Liquidity	0.20	0.20	1.42e-06	0.90	0.159	0.217	−0.058 *** (p < 0.001)
Profitability	0.13	0.13	-	1.19	0.124	0.133	−0.009 (p = 0.213)

Note: *** indicates statistical significance at 1% (p < 0.01).

Source: Own elaboration.

Overall, the results indicate that certain financial and operational characteristics—such as asset tangibility and cash availability—differ significantly between leveraged and zero-leverage firms. Zero-debt firms show higher asset tangibility, suggesting they are capable of generating sufficient internal cash flows to sustain operations without the need for external financing (El Ghoul et al., 2018; Sardo et al., 2024). Interestingly, these firms do not accumulate large cash reserves, which may indicate more efficient resource use or access to alternative financing sources, such as owner loans (Byoun and Xu, 2013). In contrast, firm age and size do not significantly differentiate the two groups, contradicting studies that associate smaller and younger firms with greater difficulties in accessing external finance (Devos et al., 2012; Huang et al., 2017).

Table 5 presents the correlation matrix between the variables analyzed. This analysis will allow us to verify the association between zero debt and various internal factors.

The Pearson correlation values indicate no evidence of severe multicollinearity. The positive relationship between firm age and size ($\rho = 0.162$), is consistent with business growth literature (Bessler et al., 2013; Dang, 2013; Saona et al., 2023), and that between size and asset intangibility ($\rho = 0.358$) indicates that larger firms invest more in intangible assets crucial for competitiveness and growth (Hall et al., 2004). Conversely, the negative correlation between tangibility and liquidity ($\rho = -0.156$) suggests that firms with more physical assets operate with smaller cash reserves, possibly because they have easier access to credit by using those assets as collateral (Saona et al., 2023).

Multicollinearity tests were performed to assess the potential for excessive correlation among the independent variables. The values for the variance inflation factors (VIF) support the absence of multicollinearity, with all coefficients slightly above 1, which is considered acceptable (Gujarati and Porter, 2009). The highest VIF corresponds to the intangibility variable (1.220), which remains well

below the critical level. Based on these results, it is concluded that the model can be estimated without significant concerns regarding multicollinearity.

Table 5. Correlation matrix.

	Age	Size	Tangibility	Intangibility	Liquidity	Profitability
Age	1.000					
Size	0.162***	1.000				
Tangibility	0.027	0.025	1.000			
Intangibility	−0.060***	0.358***	−0.149***	1.000		
Liquidity	−0.017	−0.023	−0.152***	−0.093***	1.000	
Profitability	−0.077***	−0.024	0.022	0.022	0.156***	1.000
Mean VIF						1.11

Note: the presented values correspond to the Pearson correlation coefficients between the analyzed variables. *** indicates statistical significance at 1% ($p < 0.01$)

Source: Own elaboration.

4.2. Regression model

To test the hypotheses regarding the factors influencing the adoption of a zero-debt policy, a dynamic random effects probit regression model is employed, as previously mentioned.

Panel probit regression is a widely used statistical methodology for modeling the relationship between a binary dependent variable and a set of explanatory variables, while also allowing for the analysis of decision persistence over time. In this study, the approach is applied to test the hypotheses formulated in the theoretical framework, investigating the influence of internal and external factors on firms' decisions to adopt a zero-debt policy. To capture the temporal dynamics, a random effects dynamic model is used, enabling the analysis of the persistence of zero-debt decisions over time. By incorporating past choices, the model provides a more robust interpretation of how debt-related decisions evolve in a longitudinal data context.

Among the internal factors considered are the relationship between financial constraints and zero-debt adoption (H1), the role of financial flexibility in the decision to avoid external financing (H2), and the association between profitability and zero debt, consistent with the assumptions of the pecking order theory (H3). Additionally, external factors are examined, particularly the impact of the COVID-19 pandemic, which may have reduced the likelihood of firms maintaining a zero-debt policy (H4).

The results presented in Table 6 provide important evidence regarding the key determinants of firms' decisions to pursue a zero-debt strategy. The second column reports the results in (average) marginal effects for the dynamic random effects probit model. The third column reports the results of the GMM system for robustness.

Table 6. Probit model results (with dynamic random effects).

Independent variables	Coefficients (zero-leverage firms)	Marginal effects (average)
Age	1.485*** (0.559)	0.344*** (0.128)
Size	−1.304*** (0.559)	−0.302*** (0.116)
Tangibility	−1.105 (0.908)	−0.256 (0.210)
Intangibility	2.811* (1.470)	0.651* (0.340)
Liquidity	0.895 (0.581)	0.207 (0.130)
Profitability	0.841 (0.581)	0.195 (0.134)
Zero leverage in the previous year	1.627*** (0.134)	0.377*** (0.026)
COVID-19	−0.119 (0.096)	−0.027 (0.022)
Initial conditions	*Yes*	*Yes*
Mundlack means	*Yes*	*Yes*
Observations	*1265*	*1265*
Number of firms	*253*	*253*
LR test (chi^2)	*2.23* **	*2.23* **
Wald test	*351.494* ***	*351.494* ***
Log likelihood	*−527.690*	*−527.690*

Independent variables	Coefficients (zero-leverage firms)	Marginal effects (average)	GMM system
Age	1.485*** (0.559)	0.344*** (0.128)	0.345*** (0.118)
Size	−1.304*** (0.559)	−0.302*** (0.116)	−0.413** (0.184)
Tangibility	−1.105 (0.908)	−0.256 (0.210)	−0.417 (0.641)
Intangibility	2.811* (1.470)	0.651* (0.340)	0.534 (0.773)
Liquidity	0.895 (0.581)	0.207 (0.130)	−0.289 (1.316)
Profitability	0.841 (0.581)	0.195 (0.134)	0.233 (0.210)
Zero leverage in previous year	1.627*** (0.134)	0.377*** (0.026)	0.700** (0.290)
COVID-19	−0.119 (0.096)	−0.027 (0.022)	−0.008 (0.040)
Industry Dummy NACE_A	−0.287 (0.756)	−0.066 (0.175)	0.018 (0.074)
Industry Dummy NACE_B	−0.957 (0.854)	−0.221 (0.197)	−0.087 (0.098)
Industry Dummy NACE_C	−0.762 (0.672)	−0.176 (0.155)	−0.073 (0.060)
Industry Dummy NACE_D	1.310 (1.077)	0.303 (0.249)	0.189* (0.104)
Industry Dummy NACE_E	0.365 (0.818)	0.085 (0.189)	0.113 (0.114)
Industry Dummy NACE_F	−0.898 (0.721)	−0.209 (0.166)	−0.091 (0.185)
Industry Dummy NACE_G	−0.381 (0.677)	−0.088 (0.157)	−0.057 (0.099)
Industry Dummy NACE_H	−0.609 (0.690)	−0.141 (0.160)	0.027 (0.077)
Industry Dummy NACE_I	−0.333 (0.792)	−0.077 (0.183)	−0.029 (0.051)
Industry Dummy NACE_J	−0.269 (0.697)	−0.062 (0.161)	−0.822 (0.910)
Industry Dummy NACE_L	−0.444 (0.813)	−0.103 (0.188)	−0.094 (0.066)
Industry Dummy NACE_M	−0.816 (0.721)	−0.189 (0.167)	0.035 (0.077)

Continued on next page

Independent variables	Coefficients (zero-leverage firms)	Marginal effects (average)	GMM system
Industry Dummy NACE_N	−0.380 (0.748)	−0.088 (0.173)	2.301 (2.776)
Industry Dummy NACE_Q	−1.663 (1.023)	−0.385 (0.236)	0.076 (0.250)
Industry Dummy NACE_R	*omitted*	*omitted*	0.345*** (0.118)
Initial conditions	Yes	Yes	Yes
Mundlack means	Yes	Yes	Yes
Observations	1265	1265	1265
Number of firms	253	253	253
LR test (chi2)	2.23 **	2.23 **	
Wald test	351.494 ***	351.494 ***	688.19***
Log likelihood	−527.690	−527.690	
Pseudo R^2	*0.196*		
AR(1)			−2.415***
AR(2)			−1.923
Hansen test			1.305

Note: 1. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively. 2. Standard deviations are between parentheses. 3. The estimations include industry dummies. 4. Since the estimator xtprobit in Stata does not report the *Pseudo R^2*, it was calculated by the ratio between the log likelihood of the constant-only model (LL_o) minus the log likelihood of the full model (LL_f) and the log likelihood of the constant-only model (LL_o): (656,13346 – 527,68962)/656,13346 = 0.196. Source: Own elaboration.

Firm age emerges as a significant factor (0.344, $p < 0.01$), indicating that older firms are more likely to maintain a zero-debt policy, thus supporting H1. Conversely, firm size shows a negative and significant coefficient (−0.302, $p < 0.01$), suggesting that smaller firms are more prone to avoid debt. This result is also consistent with H1, which posits that firms facing greater financial constraints are more likely to adopt a zero-debt strategy.

Regarding asset structure, intangibility exhibits a positive and marginally significant coefficient (0.651, $p < 0.10$), implying that firms with a higher proportion of intangible assets may be more inclined to avoid debt. In contrast, tangibility does not show statistical significance (−0.256), indicating that the composition of tangible assets is not a determining factor for the adoption of a zero-debt policy, partly contradicting H1.

Cash holdings have a positive coefficient (0.207), although not statistically significant. This result does not provide support for H2, which suggested that firms with greater liquidity would adopt a zero-debt policy in line with financial flexibility theory. Similarly, profitability displays a positive coefficient (0.195) without statistical significance, offering no confirmation for H3, which posited that more profitable firms would prefer self-financing, in line with the pecking order theory.

The COVID-19 variable has a negative coefficient (−0.027) but lacks statistical significance, suggesting that the pandemic did not have a direct and robust effect on the decision to maintain a zero-debt policy. Consequently, H4 cannot be confirmed based on the results obtained.

Finally, the variable representing the zero-debt decision in the previous year shows a positive and statistically significant coefficient (0.377, $p < 0.01$), confirming the persistence of this policy over time. This finding reinforces the notion that firms that adopt this strategy in one period are more likely to maintain it in the subsequent period.

In addition to the main explanatory variables, the model also includes initial conditions, variable means, and industry sectors. However, none of these coefficients were statistically significant, suggesting that the zero-debt decision is more strongly influenced by internal firm-level factors than by industry-specific or historical characteristics.

In summary, the results indicate that the adoption of a zero-debt policy is significantly influenced by firm age, size, and asset intangibility, while profitability, liquidity, asset tangibility, and the COVID-19 crisis do not have a statistically significant impact. Furthermore, the high persistence of the zero-debt policy suggests it may be associated with structural factors and internal firm preferences.

5. Discussion

This section aims to critically interpret the empirical findings by relating them to capital structure theories and the existing literature on zero-leverage policies. The discussion focuses on the key internal determinants of the decision to avoid debt, highlighting which hypotheses were confirmed and which results diverged from theoretical expectations.

The discussion is structured into two main parts. First, we analyze our key findings and compare their alignment with existing literature. Second, we present the theoretical and practical implications of the findings.

5.1. Key findings and alignment with existing literature

The findings suggest that debt avoidance reflects a deliberate and consistent strategy rather than a reactive response to external shocks. As shown above, the proportion of zero-debt firms remained relatively stable between 2018 and 2020, with an increase observed from 2021 onward. This rise may reflect both the strengthening of self-financing strategies and growing economic uncertainty in recent years, both of which appear to be key drivers in the decision to avoid debt.

During the pandemic period (2020–2021), firms' capital structures remained relatively stable, possibly due to governmental support measures and more cautious managerial behavior amid uncertainty. This reinforces a pre-existing trend of debt avoidance, as suggested by Dang (2013). Beyond short-term conditions, literature suggests that this preference may stem from deliberate financial strategies aimed at minimizing debt-related costs, reinforcing self-financing (Saona et al., 2020), and preserving long-term financial flexibility. This enables firms to quickly adapt investment decisions without excessive reliance on external creditors (Gamba and Triantis, 2008; Saona et al., 2023).

At the industry level, the highest share of zero-debt firms is found in wholesale and retail trade (39.13%), followed by manufacturing (19.76%) and transportation and storage (9.49%). On one hand, firms in the trade sector benefit from short financial cycles, high liquidity, relatively short receivable periods, and favorable negotiation conditions with suppliers—factors that reduce dependency on external financing (Bessler et al., 2013). On the other hand, the manufacturing sector includes more

mature industries with higher profit margins, allowing firms to finance assets internally (Gamba and Triantis, 2008; Jiang et al., 2024). By contrast, sectors such as healthcare and the arts exhibit lower proportions of zero-debt firms due to their high external financing needs to support operations and investment in technology and innovation (Dang, 2013; Strebulaev and Yang, 2013).

Grounded in the theory of financial constraints (Myers, 1984), H1 posits that firms with limited credit access are more likely to operate without debt. This assumption is supported by the negative and statistically significant coefficient for firm size (−1.304, $p < 0.01$), indicating that smaller firms face more barriers to external finance and consequently avoid credit. This finding aligns with Huang et al. (2017) and El Ghoul et al. (2018), who argue that smaller firms, including SMEs (Lefebvre, 2021; Sardo et al., 2024), struggle with financing due to limited collateral and lack of credit history (Diamond, 1991; Berger and Udell, 1998).

The evidence that older firms are more likely to avoid debt (1.485, $p < 0.01$) further reinforces the connection between financial constraints and capital structure. Established firms, having accumulated internal resources over time, reduce their reliance on external financing (Frank and Goyal, 2009; Saona et al., 2020; Sardo et al., 2024). However, this result may also be interpreted through the lens of the corporate life cycle theory (Berger and Udell, 1998), which suggests that younger firms require more external financing to grow, whereas mature firms prefer self-financing to maintain financial independence.

Asset intangibility presents a positive and marginally significant coefficient (2.811, $p < 0.10$), indicating that firms with a higher proportion of intangible assets are more likely to avoid debt. This supports literature suggesting that intangible assets are less acceptable as collateral, making credit access more difficult (Strebulaev and Yang, 2013; Ghose and Kabra, 2016). Consequently, such firms may opt for self-financing to avoid agency costs and mitigate financing frictions (Hall et al., 2004). In contrast, asset tangibility does not show statistical significance, contradicting studies suggesting a negative relationship between tangibility and zero debt (Devos et al., 2012; El Ghoul et al., 2018; Sardo et al., 2024). This result implies that tangible assets may not be a decisive factor in the decision to avoid debt, potentially because some firms—despite having physical assets—prefer not to borrow due to strategic preferences or high internal liquidity (Byoun and Xu, 2013).

H2 tests the relationship between liquidity and zero-debt policies, based on the financial flexibility theory (Gamba and Triantis, 2008), which posits that debt-free firms accumulate cash to respond to financial shocks and avoid creditor dependence. Contrary to Devos et al. (2012), Huang et al. (2017), and Lefebvre (2021), the coefficient for cash availability is positive (0.895) but not statistically significant, suggesting that accumulated liquidity does not directly influence the adoption of a zero-debt policy. This lack of significance may imply that some firms use their resources more efficiently—for example, by investing in operations or distributing dividends—rather than accumulating cash for precautionary purposes (Byoun and Xu, 2013; Saona et al., 2020). Thus, H2 is not confirmed.

H3 is rooted in the pecking-order theory (Myers, 1984), which proposes that more profitable firms prioritize internal financing over external debt. However, the profitability coefficient is positive (0.841) but not statistically significant, indicating that more profitable firms are not necessarily more likely to avoid debt. This contradicts findings by Serrasqueiro and Nunes (2012), Matias and Serrasqueiro (2017), and Sardo et al. (2024). One possible explanation is that, while profitable firms can self-finance, they may still choose to borrow strategically to fund growth projects, take advantage of favorable

interest rates, optimize capital structure, or benefit from the tax advantages of debt (Modigliani and Miller, 1958; Byoun and Xu, 2013). Thus, H3 is also not supported.

H4 examines whether the COVID-19 crisis influenced the decision to avoid debt. It was expected that the pandemic would drive firms to seek credit in response to financial difficulties (Choi, 2025). However, the coefficient for the COVID-19 variable is negative (−0.119) and not statistically significant, suggesting the crisis did not directly impact zero-debt adoption. This may indicate that firms managed to adjust without additional borrowing, possibly through self-financing strategies or relying on government measures such as loan moratoriums and financial support (Augusto and Mateus, 2021). Consequently, H4 is not confirmed.

One of the most noteworthy results is the highly significant and positive coefficient for the lagged zero-debt variable, indicating a strong degree of policy persistence. This finding aligns with prior research suggesting that zero-leverage is not a sporadic decision but a structured and sustained financial strategy (Strebulaev and Yang, 2013; Saona et al., 2020). Studies such as DeAngelo and Roll (2015) and Sardo et al. (2024) reinforce the notion that firms already operating without debt are more likely to continue doing so, highlighting that this practice is typically a strategic choice rather than a response to temporary financial constraints. Persistence in zero debt may also reflect behavioral factors, as suggested by Sardo et al. (2024), who argue that past experiences of operating debt-free shape future financing decisions—creating a "state dependence" where firms become increasingly likely to maintain this policy over time.

The probit regression results are summarized in Table 7. There is partial support for H1, demonstrating that smaller and older firms are more likely to avoid external financing, while asset tangibility is not statistically significant. In contrast, H2, H3, and H4 are not supported, suggesting that liquidity, profitability, and the pandemic context do not significantly influence the adoption of zero-debt policies.

Table 7. Summary of the hypotheses (including expected and found signs and statistical validation).

Hypothesis	Variables (*proxies*)	Expected sign	Found sign	Statistical validation
H1: Firms with greater financial constraints are more likely to adopt a zero-debt policy.	Age	+	+	Partial (tangibility with $p > 0.05$)
	Size	-	-	
	Tangibility	-	-	
H2: Firms with greater financial flexibility are more likely to adopt a zero-debt policy.	Cash availability	+	+	No ($p > 0.05$)
H3: Firms with higher profitability are more likely to adopt a zero-debt policy, according to the pecking-order theory.	Profitability	+	+	No ($p > 0.05$)
H4: The COVID-19 pandemic has reduced the likelihood of firms adopting a zero-debt policy.	COVID-19	-	-	No ($p > 0.05$)

Notes: The expected sign is based on the literature and corresponding theories, while the found sign reflects the empirical results. Statistical validation indicates if the identified relation is statistically significant ($p < 0.05$ or $p < 0.01$) or not ($p > 0.05$). Source: Own elaboration.

5.2. Theoretical and practical implications

The study contributes to the literature on SME capital structure by challenging assumptions embedded in traditional financing theories. Specifically, it questions the applicability of the pecking-order theory in the Portuguese SME context. The observed persistence of zero-debt behavior suggests that financing decisions may be guided less by a hierarchy of funding sources and more by a strategic orientation toward financial conservatism or risk aversion. Additionally, the findings highlight that asset tangibility—a relevant variable in many capital structure models—does not significantly predict zero-leverage adoption among SMEs. This calls into question the universal relevance of collateral-based lending models and underscores the need to incorporate intangible assets and qualitative indicators into theoretical frameworks.

Moreover, the research confirms that information asymmetries and firm size continue to play a role in financing decisions. However, it also shows that some firms voluntarily adopt zero-leverage policies, blending financial constraint and strategic choice. This duality enriches the theoretical discourse by positioning zero-leverage behavior at the intersection of financial limitations and deliberate management practices. Finally, the lack of significant changes in zero-debt policies during the COVID-19 pandemic also suggests a degree of structural persistence in SME financing behavior, contributing to our understanding of financial policy inertia in the face of external shocks.

The findings of this study also provide valuable practical implications for managers, investors, financial institutions, and policymakers. First, managers should recognize that while zero-leverage policies can enhance financial autonomy and reduce agency costs, they may also constrain investment capacity and limit growth opportunities. Especially in competitive or innovation-driven sectors, an overly conservative approach could hinder responsiveness to market shifts. Strategic use of credit, aligned with firm goals and risk tolerance, may improve long-term performance. Second, for investors, the absence of debt can be viewed both positively and negatively. On one hand, debt-free firms exhibit lower insolvency risk and greater stability, appealing to risk-averse investors. On the other hand, the lack of leverage may limit return potential, making these firms less attractive to growth-oriented investors. Third, regarding financial institutions, banks should reconsider lending practices that rely heavily on physical collateral. The fact that asset tangibility was not a significant factor in zero-debt adoption suggests the need for alternative credit assessment models, such as those based on cash flow stability or the value of intangible assets. Institutions may also need to develop short-term or flexible financing products, tailored to firms that traditionally avoid long-term debt. Finally, for policymakers, the persistence of zero-debt behavior, even during economic crises, indicates that short-term emergency measures (e.g., moratoria, grants) may not address underlying financing challenges. Long-term SME financing support should include targeted initiatives for innovative and intangible-asset-rich firms. Additionally, tax incentives for prudent financial management and non-collateral-based credit schemes could enhance access to credit without forcing firms to compromise their autonomy. In summary, this study shows that the adoption of a zero-debt policy among Portuguese SMEs is influenced by firm size and the intangibility of assets, but not directly by liquidity, profitability, or macroeconomic events such as the pandemic. The long-term persistence of this choice reinforces the notion that, for many firms, operating without debt is a deliberate financial strategy rather than a temporary response to funding constraints.

6. Conclusions

This article aimed to analyze the determinants of the adoption of a zero-debt policy by Portuguese SMEs. Drawing on the literature review and the empirical analysis conducted, it was possible to identify that the decision to avoid debt is influenced by both internal and external factors, reflecting not only firms' specific financial conditions but also the structural and institutional characteristics of the market in which they operate.

The empirical results are consistent with the financial constraints hypothesis, which posits that smaller firms may face more difficulties in accessing credit, leading them to opt for self-financing. However, asset tangibility—often cited in the literature as a central factor in capital structure decisions—did not show statistical significance in the model. This implies that asset composition may play a limited role in Portuguese SMEs' decisions to remain debt-free.

Additionally, the findings did not provide empirical support for the financial flexibility theory or the pecking-order theory, as neither cash availability nor profitability were statistically significant in explaining zero-debt behavior. This indicates that while liquidity and profitability may be relevant for some firms, their influence appears to be less pronounced among Portuguese SMEs, where other factors, such as the financial system's structure and credit barriers, may play a more prominent role.

One of the most notable findings of the study was the strong persistence of the zero-debt policy over time. Firms that adopt this strategy tend to maintain it in subsequent years, supporting the notion that zero debt may represent a long-term strategic choice rather than a temporary response to financial constraints. Such persistence may be associated with a more conservative organizational culture, where financial management prioritizes stability and independence from external funding sources. Moreover, the ability to maintain a capital structure based solely on internal funds may be interpreted as a signal of financial soundness and operational resilience to investors and business partners.

Regarding external factors, the results did not indicate a significant impact of the COVID-19 pandemic on the likelihood of a firm adopting a zero-debt policy. Although the pandemic-related economic crisis reshaped the global financial environment, the study suggests that its effects on SMEs' capital structure may have been mitigated by economic and institutional support measures implemented during the period. However, it is possible that the pandemic's impact varied across sectors, warranting more segmented analyses in future research.

Despite the study's contributions, some limitations must be acknowledged. First, the analysis focused exclusively on Portuguese SMEs, limiting the generalization of the findings to larger firms or different geographical contexts. Additionally, certain qualitative variables—such as organizational culture, managers' perception of financial risk, and corporate governance practices—were not captured in the dataset.

Future research could further explore the role of institutional and regulatory characteristics in the adoption of zero-debt strategies, as well as the interaction between internal and external factors in SMEs' capital structure decisions. Moreover, incorporating qualitative approaches, such as interviews with financial managers, could offer a richer understanding of the motivations behind this choice. Another promising direction would be to analyze the impact of zero-debt policies on firm performance, helping to assess whether this financial strategy is associated with greater long-term profitability and stability.

Another important limitation relates to the time span of the dataset. The study covers the period from 2018 to 2023, which allows for the examination of recent macroeconomic events, such as the COVID-19 pandemic. However, this relatively short time frame may not be sufficient to assess the persistence of this phenomenon over full economic cycles. Structural factors influencing capital structure decisions often manifest over longer periods, underscoring the importance of extending the analysis to longer time series to better understand the evolution and determinants of zero-debt adoption.

Although this study employs a dynamic probit regression model, other methodologies could be explored to test the robustness of the findings. Alternative models, such as nonparametric methods and machine learning techniques, could help identify patterns and nonlinear relationships among the variables. Adopting such approaches could lead to a more comprehensive and robust analysis of the factors influencing debt avoidance.

In conclusion, this article contributes to the literature on capital structure by providing empirical evidence on the determinants of zero-debt adoption among Portuguese SMEs. The results suggest that improving credit access could significantly influence SME financial strategies and policy design. Furthermore, the high persistence of the zero-debt policy highlights the importance of understanding this decision not merely as a circumstantial phenomenon but as a long-term strategy with significant implications for the financial and competitive dynamics of SMEs in the Portuguese market. Finally, this study lays the groundwork for future research that can deepen the understanding of this phenomenon, fostering more efficient financial management tailored to the realities of SMEs in Portugal and beyond.

Author contributions

Conceptualization, Carina Barbosa and Luís Pacheco; methodology, Carina Barbosa and Filipe Sardo; software, Carina Barbosa, Filipe Sardo and Luís Pacheco; validation, Filipe Sardo and Luis Pacheco; formal analysis, Carina Barbosa and Luís Pacheco; investigation, Carina Barbosa, Filipe Sardo and Luís Pacheco; resources, Carina Barbosa; data curation, Carina Barbosa and Filipe Sardo; writing—original draft preparation, Carina Barbosa; writing—review and editing, Filipe Sardo and Luís Pacheco; supervision, Filipe Sardo and Luís Pacheco. All authors read and approved the final manuscript.

Use of AI tools declaration

In compliance with COPE guidelines, artificial intelligence (AI), namely the ChatGPT 4.0 language model developed by OpenAI, was used exclusively for correcting the final text.

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Conflict of interest

All authors declare no conflicts of interest in this paper.

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