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Capital Structure and Financial Performance of Moroccan Agricultural Small- and Medium-Sized Enterprises: Moderating Effects of Government Subsidies

Imad Nassim [1,2,*] and Bouchra Benraïss [1]

[1] Studies and Research in Management of Organizations and Territories Laboratory (ERMOT Lab.), Faculty of Legal, Economic and Social Sciences, Sidi Mohamed Ben Abdellah University, Fez 30000, Morocco; bouchra.benraiss@usmba.ac.ma
[2] Multidisciplinary Research Laboratory (LAREM HECF), Fez 30000, Morocco
* Correspondence: mr.imad.nassim@outlook.com; Tel.: +212-662-761032

Abstract: In the context of implementing the new agricultural strategy, "Generation Green 2020–2030", Moroccan agricultural SMEs are benefiting from specific lines of credit and significant financial incentives. This study focuses on assessing how the capital structure influences the financial performance of these medium-sized enterprises, based on an analysis of a sample of 30 agricultural SMEs over a period of 4 years from 2019 to 2022. This examination delves into the effects of debt, government subsidies, and their combined impact on the return on equity and assets of these SMEs. The findings reveal a significant negative correlation between capital structure and the financial performance of agricultural SMEs. This underscores the importance of advocating for self-financing in line with the pecking order theory, as debt appears to significantly diminish asset returns. Additionally, although government subsidies alone do not significantly influence enterprise profitability, their interplay with capital structure—especially long-term debt—exhibits a detrimental moderating effect on asset returns. This suggests that subsidies play a significant role in moderating the relationship between capital structure and SME financial performance, albeit with an adverse effect.

Keywords: capital structure; financial performance; government subsidies; agricultural SMEs

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1. Introduction

Understanding the capital structure is crucial for any business, particularly small- and medium-sized enterprises (SMEs), which face unique financing challenges. The foundational theories of capital structure, initiated by Modigliani and Miller (1958), highlight critical aspects of financing decisions. Modigliani and Miller initially proposed that a company's market value is unaffected by its capital structure, emphasizing its irrelevance to a firm's total value (Modigliani and Miller 1958). However, their later work incorporated the effects of taxation, demonstrating the tax advantages of debt financing (Modigliani and Miller 1963). These insights led to the development of key theories such as the trade-off theory (Kraus and Litzenberger 1973), the pecking order theory (Myers 1984; Myers and Majluf 1984), and the agency cost theory (Jensen and Meckling 1976).

For SMEs, especially those in the agricultural sector, these theories have particular implications. The trade-off theory suggests that SMEs might use limited debt due to lower tax benefits and higher financial distress costs (Ang 1991). The pecking order theory, on the other hand, highlights a preference for internal financing to avoid high external financing costs, which is often observed in SMEs (Myers and Majluf 1984; Pettit and Singer 1985; Ang 1991). Studies supporting the pecking order theory are numerous. For example, research conducted on a sample of 500 SMEs in Croatia from 2005 to 2011 by Šarlija (2016) confirmed that Croatian SMEs are primarily financed from internally generated funds. This preference for internal financing influences their profitability, growth, tangible assets, and enterprise

size (Šarlija 2016), aligning with the observation that SMEs often prioritize self-financing over debt (Pettit and Singer 1985; Ang 1991).

In addition to financing preferences, another critical element in understanding capital structure, especially for SMEs, is the role of government subsidies. These subsidies are a direct form of state support, providing recipients with a competitive edge. By enhancing various aspects of a company's operations—such as improving processes, boosting research and development, or modernizing marketing strategies—subsidies can positively influence profitability (Lim et al. 2018). Supporting this, studies by Jacob et al. (2016) and Buneta (2021) demonstrate the beneficial impact of subsidies on company performance. Jacob et al. (2016) found that investors in companies and/or funds that unexpectedly lose government support face significant financial costs, underscoring the critical nature of consistent subsidy support.

The agricultural sector in Morocco stands as a cornerstone of the national economy, wielding significant economic and social influence. Accounting for 13% of the national GDP and mirroring a comparable share in exports, it serves as a vital source of employment for nearly 72% of the rural populace, approximately 10 million individuals (Louali 2019; World Bank 2021). Yet, to guarantee its ongoing viability and advancement, there is an urgent need to modernize and cultivate agricultural SMEs and enterprises. These entities, situated downstream in the agricultural value chain, emerge as pivotal catalysts for innovation, productivity enhancement, and sustainability within the sector.

The adoption of the new agricultural strategy, "Generation Green 2020–2030", underscores the paramount importance of sustainability in agricultural development. This foundational principle operates on a holistic framework, encompassing not only economic considerations but also social and environmental dimensions. The overarching objective is to leverage the advancements initiated by the Green Morocco Plan (GMP) while enacting measures geared toward ensuring the sector's sustainable progression. This commitment manifests in targeted initiatives addressing various facets, including agricultural sectors, distribution chains, quality standards, and innovation. Moreover, concrete actions are being undertaken to preserve natural resources and bolster the sector's resilience against the looming challenges posed by climate change and environmental pressures.

The achievement of these objectives hinges significantly on the availability of sufficient financing within the agricultural sector. Therefore, the active engagement of both the public and private sectors is paramount. The public sector plays a vital role by allocating financial resources through the general budget and special accounts. Simultaneously, the private sector's involvement, facilitated by initiatives such as dedicated credit lines, is indispensable. This collaboration between public and private financing channels will fortify the financial capabilities of the agricultural sector, thereby providing robust support for the realization of the ambitious objectives outlined in the "Generation Green" strategy.

In this context, the government assumes a central role by channeling financial incentives via the Agricultural Development Fund (FDA) to support farmers and agricultural enterprises, with the overarching aim of fostering private agricultural investments. These public funds are further reinforced by loans and grants procured from both national and international organizations. Concurrently, the private sector emerges as a pivotal stakeholder in agricultural investment endeavors. Through initiatives like specialized credit lines, it actively contributes to the advancement of agricultural projects with substantial socio-economic ramifications.

Government subsidy schemes and credit lines serve as indispensable pillars in furnishing financial assistance to the agricultural sector, particularly in rural and underprivileged regions where access to financing may be constrained. These initiatives are primarily designed to spur investment in agriculture by furnishing valuable financial incentives to farmers and sectoral entrepreneurs. Government subsidies materialize through funds allocated by the state to bolster specific projects within the agricultural domain. Typically, they are deployed to finance endeavors aimed at augmenting productivity, modernizing agricultural infrastructure, and fostering the adoption of innovative technologies.

Moreover, credit lines serve as a pivotal avenue for stakeholders in the agricultural sector to secure both short-term and long-term financing for their operations. Typically administered by entities like the Credit Agricole Group of Morocco and its subsidiaries, in partnership with the Ministry of Agriculture, Maritime Fisheries, Rural Development, and Water and Forests, these credit facilities are tailored to address the specific requirements of farmers and agricultural SMEs. The funds availed through these credit lines can be allocated toward a myriad of agricultural activities, including covering operational expenses, acquiring land, investing in modern agricultural machinery, erecting storage and processing facilities, and enhancing distribution and marketing channels.

The prevailing landscape prompts critical inquiries into the effectiveness of diverse financing mechanisms and financial incentives introduced under the new agricultural strategy concerning the financial sustainability of Moroccan SMEs and agricultural enterprises. Consequently, our research aims to explore several pertinent questions. Specifically, this study seeks to address the following research questions:

- What impact does the capital structure of Moroccan agricultural SMEs exert on their financial performance?
- How do government subsidies influence the financial performance of recipient SMEs?
- What moderating role do these government subsidies play in shaping the relationship between the capital structure and financial performance of agricultural SMEs?

Within this context, our research aims to evaluate the effects of various financing mechanisms proposed under the new agricultural strategy on the financial performance of agricultural SMEs in Morocco. These financing options include financial incentives as well as short- and long-term credit lines. Our empirical approach seeks to clarify the dynamics between debt and government subsidies—key components of the capital structure of Moroccan agricultural SMEs—and their influence on financial performance. Additionally, it explores the implications of debt, subsidies, and their interaction on the profitability of these enterprises. This study focuses on the impact of external financing—whether through subsidies or debt—on the profitability of Moroccan agricultural operations. This constitutes the first practical contribution of the study, offering valuable insights for public authorities, financing providers, agricultural enterprise managers, farmers, and institutional stakeholders. The findings aim to illuminate the often-neglected link between external financing and the financial performance of agricultural holdings, particularly their return on assets.

2. Literature Review

2.1. Theoretical Perspective

The theory of capital structure finds its origins in Modigliani and Miller's seminal work, "The Cost of Capital, Corporation Finance, and the Theory of Investment" (Modigliani and Miller 1958). Since its inception, the inquiry into capital structure has sustained enduring interest within academic circles.

Modigliani and Miller's theory challenged conventional wisdom regarding optimal financing structures. They introduced several propositions, among which one stands as a cornerstone for subsequent discourse on capital structure. This proposition posits that the total market value of a company remains invariant to its capital structure, assuming perfect capital markets with no taxes, transaction costs, or bankruptcy costs. In other words, under these ideal conditions, whether a firm is financed by debt or equity does not affect its overall value. This assertion fundamentally altered the understanding of corporate finance by emphasizing that the value of a firm is determined by its earning power and the risk of its underlying assets rather than how those assets are financed. By diverging from the prevailing perspectives in traditional finance, which primarily described existing practices without offering comprehensive explanatory frameworks, the authors initiated a paradigm shift in understanding corporate finance dynamics.

Five years following their seminal work, Modigliani and Miller (1963) revisited their initial theory, integrating taxation into their analysis. In doing so, they challenged the

concept of financial structure independence and demonstrated that the value of a company is no longer neutral. Instead, it emerges from the amalgamation of the economic value of assets and the influence of debt on taxation. Financial charges become economically advantageous owing to their tax deductibility. Consequently, the total value of the company is redefined as the summation of the economic assets' value and the present value of tax savings generated by debt. This revised perspective on optimizing financial structure leans toward maximizing indebtedness.

The groundbreaking contributions of Modigliani and Miller established the bedrock for extensive research in corporate finance, particularly in domains like capital structure, investment policy, and dividend distribution. This body of research has given rise to three prominent theories that hold sway within the scientific and academic community: the trade-off theory (TOT), the pecking order theory (POT), and agency cost theory.

The trade-off theory (Kraus and Litzenberger 1973; Myers 1984), stemming from the re-evaluation of Modigliani and Miller's seminal works in 1958, integrates considerations of taxation and the perils of financial distress (Modigliani and Miller 1963). First formalized by Kraus and Litzenberger (1973), the trade-off theory endeavors to optimize financial structure by maximizing shareholder benefits while mitigating external constraints, predominantly influenced by the tax ramifications of debt. This theory progresses to account for bankruptcy costs and strives to strike a balance between the tax advantages of debt and its potential adverse repercussions. Central to its framework is the notion of financial leverage, aimed at optimizing the financing mix.

The pecking order theory (POT), pioneered by Myers (1984) and subsequently expanded upon by Myers and Majluf (1984), examines financial structure through the lens of information asymmetry between internal and external stakeholders of the company. According to the pecking order theory, companies prioritize their financing sources based on the principle of least resistance or least effort. They prefer internal financing first, as it requires minimal information disclosure. If external financing is necessary, firms will opt for debt over equity due to lower information asymmetry and issuance costs associated with debt, using equity as a last resort. This is followed by a hierarchy of debt types arranged according to risk and information transparency, culminating in equity issuance.

The agency theory, introduced by Jensen and Meckling (1976), focuses on the pivotal role of financing decisions in resolving conflicts within companies. It conceptualizes firms as collections of contracts among stakeholders, characterized by agency relationships wherein managers act as agents on behalf of shareholders. Shareholder–manager interests often diverge, with shareholders typically seeking to maximize firm value and returns on investment, while managers might prioritize personal benefits, such as job security and perks. Debt is used as a mechanism to align these interests by imposing mandatory interest and principal repayments, which disciplines managers to generate sufficient cash flow and reduce wasteful expenditures. This, in turn, aligns managers' actions with the goal of maximizing shareholder value. Additionally, the presence of debt enhances monitoring and builds trust from creditors, as they are assured of a committed repayment schedule and have the right to impose restrictive covenants that limit managerial discretion. Researchers such as Bradley et al. (1984), Titman and Wessels (1988), and Kester (1986) have delved into bankruptcy costs and the influence of agency conflicts on capital structure, highlighting debt's function in mitigating these conflicts. In essence, agency theory furnishes a critical perspective for comprehending the dynamics of financing decisions, accentuating conflict resolution and information asymmetry management in companies' capital structure.

2.2. Hypotheses' Development

Our study is primarily grounded in two prominent theories of capital structure: the trade-off theory and the pecking order theory. These theories reconceptualize financial structure as pivotal internal determinants of a firm's profitability and as drivers of its overall performance and value generation.

Moreover, our hypothesis development is intimately intertwined with the new development strategy of the agricultural sector in Morocco, known as "Generation Green". The subsidies extended through the Agricultural Development Fund (FDA) and the financing opportunities proposed by the Crédit Agricole Group of Morocco as part of its backing for the new strategy, notably encompassing investment and operational credits, constitute fundamental elements underpinning our hypotheses.

These governmental endeavors establish an enabling framework for investigating the interplay between capital structure, subsidies, and the profitability of agricultural SMEs. Through the analysis of these dynamics, we endeavor to deepen our comprehension of financial dynamics within the Moroccan agricultural sector.

2.2.1. Relationship between Capital Structure and Financial Performance

The trade-off theory of capital structure, introduced by Modigliani and Miller (1958), posits that a company can augment its profitability and value by employing an appropriate level of debt (Modigliani and Miller 1963). This theory, rooted in tax implications and the positive impact of financial leverage, suggests that interest expenses, being tax-deductible, incentivize companies to maximize debt utilization to enhance profitability and value.

However, escalating debt levels bring about associated bankruptcy costs and agency costs of debt. These considerations, emphasized by Titman and Wessels (1988), Warner (1977), and Jensen and Meckling (1976), necessitate careful balancing to optimize the company's value. The trade-off theory thus advocates for the identification of an optimal financial structure that minimizes the cost of capital, maximizes profitability, and ensures competitiveness.

It is postulated that each company possesses its unique optimal capital structure, with additional debt acquired to uphold this equilibrium. This approach, as delineated by Jensen and Meckling (1976) and Miller (1977), aims to bolster value and sustain a competitive advantage.

However, the applicability of the trade-off theory to small- and medium-sized enterprises (SMEs) is subject to scrutiny. Ang (1991) suggests that SMEs may not fully exploit debt due to their lower baseline tax rates and limited profitability compared to larger enterprises. A study by Ray and Hutchinson (1984) indicated that SMEs often exhibit a lesser reliance on debt, citing factors such as diminished profitability and heightened susceptibility to bankruptcy risk (McConnell and Pettit 1984; Pettit and Singer 1985).

The pecking order theory (Myers and Majluf 1984; Myers 1984) posits that highly profitable companies tend to rely less on external capital, including debt, opting instead to utilize internally generated profits to fund investment and growth projects. When external financing becomes necessary, the pecking order theory suggests that companies prioritize debt over equity issuance, regarding equity as a last-resort option.

Under the pecking order theory, capital structure decisions are driven by a company's residual borrowing capacity, with profitable companies borrowing less due to their lower external capital requirements. However, taking on debt can potentially diminish a company's profitability due to additional financial costs, thereby creating an inverse relationship between profitability and indebtedness. This hypothesis finds support in the work of Abel (2018), who observed that increasing profitability may lead to a reduction in the optimal debt ratio.

In the context of SMEs, Pettit and Singer (1985) underscore the relevance of the pecking order theory (POT), as SMEs encounter higher external financing costs compared to larger corporations. Similarly, Ang (1991) highlights that the pecking order theory aligns well with the characteristics and behavior of SMEs, emphasizing their preference for internal financing. SMEs typically exhibit stable income streams, which facilitate financial forecasting, and tend to adopt a cautious approach to investments, favoring less risky options.

Furthermore, according to Berger and Udell (1995), the pecking order theory offers insights into how SMEs manage information asymmetry, resonating with the objectives of

SME owner-managers and shaping their financing decisions. The prioritization of funding sources is driven by their need for independence, flexibility, and tax advantages, with internal financing often favored in accordance with pecking order theory principles. SMEs prioritize internal financing to maintain control and avoid the higher costs and stringent requirements associated with external funding. This approach allows them to remain agile and responsive to market changes without the pressure of external debt obligations. Consequently, SMEs frequently opt for internal financing, in line with the tenets of the pecking order theory (POT) (Janssen and Wtterwulghe 1998; Wtterwulghe et al. 1994).

Within Morocco's agricultural sector, a myriad of financing options are available to agricultural enterprises as part of the new agricultural strategy. Consequently, we posit the overarching hypothesis that capital structure, influenced by both the trade-off theory (TOT) and the pecking order theory (POT), significantly impacts the profitability of agricultural enterprises. We anticipate that adept management of capital structure, striking a balance between debt and equity levels, will positively affect profitability.

Aligned with the trade-off theory, we propose that maintaining an optimal capital structure will serve to minimize the cost of capital, enhance profitability, and sustain competitive advantage within the agricultural sector. Concurrently, adhering to the principles of the pecking order theory and considering the unique characteristics of SMEs and agricultural enterprises, we hypothesize that prioritizing financing sources, with a preference for internal financing while harnessing the benefits of debt, will play a pivotal role in determining the profitability of these enterprises. Hence, the first hypothesis is developed as follows:

Hypothesis 1. *The capital structure of SMEs and agricultural enterprises, influenced by both the trade-off theory and the pecking order theory, significantly impacts their financial performance. Specifically, maintaining an optimal balance between debt and equity levels, in accordance with TOT and POT principles, will positively influence the profitability of these enterprises.*

2.2.2. Relationship between Government Subsidies and Financial Performance

Government subsidies constitute a direct form of support extended by the state to beneficiary companies. Allegations from competitors of Chinese companies suggest that these subsidies bestow an unfair competitive advantage on firms based in China (Schuman 2012). The strategic allocation of these subsidies, such as enhancing operational processes, bolstering research and development capabilities, or modernizing marketing strategies, has been demonstrated to positively influence company profitability (Lim et al. 2018). Studies, such as those by Jacob et al. (2016) and Buneta (2021), demonstrate the beneficial impact of subsidies on company performance. Jacob et al. (2016) highlighted a significant decrease in the performance of funds following the cessation of tax subsidies provided to state-sponsored venture capital firms in Canada, indicating a tangible positive impact of government subsidies on company performance. Moreover, if these government subsidies lead to a reduction in the cost of debt, resulting in interest savings and decreased capital mobilization costs, the positive impact on company performance should be further amplified. Supported by empirical evidence, Buneta's study confirmed that government subsidies granted to a cohort of Croatian companies yielded positive effects on their financial results, albeit with a noticeable skew toward larger companies in terms of employee count (Buneta 2021).

Furthermore, Bojnec and Žampa (2021) indicated that subsidies can be important for cash flow into enterprises, providing necessary liquidity for ongoing operations and investments. Additionally, research in Vietnam by Trong et al. (2017) found that technical support from the government, such as export promotion, human resource training, and technology programs, have insignificant linkages with firm financial performance. However, financial support, including tax exemptions, soft loans, and investment incentives, plays an essential role in promoting financial efficiency and is vital for the development of Vietnamese private SMEs (Trong et al. 2017).

Considering the "Generation Green" agricultural strategy, which advocates for sustainable agricultural development through financial incentives from the Agricultural Development Fund, we hypothesize that government subsidies granted to SMEs and agricultural enterprises will significantly enhance their profitability. This hypothesis is grounded in the notion that when utilized effectively, these subsidies can augment operational processes, fortify research and development capabilities, and modernize operational strategies, thereby fostering improved financial performance. Thus, the second hypothesis is developed as follows:

Hypothesis 2. *Government subsidies granted to SMEs and agricultural enterprises will positively impact their financial performance*.

2.2.3. Relationship between Capital Structure, Government Subsidies, and Financial Performance

In our study, we posit that the interaction between capital structure and government subsidies significantly influences the financial performance of businesses. Specifically, we hypothesize that when companies strategically utilize government subsidies alongside an optimized capital structure characterized by a balanced mix of debt and equity, it will synergistically enhance their profitability.

Supporting evidence from a study by Špička (2018) on 550 small businesses in the food and beverage industry in the Czech Republic between 2007 and 2015 bolsters this hypothesis. The findings indicate that investment subsidies positively impact supported businesses compared to non-participants, leading to increased fixed assets, debt-to-credit ratios, and labor productivity among beneficiary companies.

Additionally, Assagaf et al. (2017) found that the interaction between capital structure and government subsidies has a significant positive impact on financial strength. Their study suggests that the higher the composition of debt used for a company's financing and investment operations, the more government subsidy funding reinforces the level of financial strength. This means that effectively leveraging both debt and subsidies can substantially bolster a company's financial stability and performance.

According to the trade-off theory, companies aim to optimize their capital structure by leveraging debt to capitalize on tax advantages while adopting a balanced approach to minimize associated costs (Jensen and Meckling 1976; Miller 1977; Modigliani and Miller 1963). Government subsidies could serve to further maintain this optimal structure by reducing debt costs and facilitating profitable investments.

Conversely, the pecking order theory suggests that profitable companies prefer using internally generated profits for investment and growth rather than external capital (Myers 1984; Myers and Majluf 1984). This tendency is particularly evident in SMEs, which typically prioritize self-financing over debt (Pettit and Singer 1985; Ang 1991). However, the availability of government subsidies can alter this preference by providing access to external funding without the need for excessive debt, thus encouraging investment in profitable ventures.

Our hypothesis suggests that optimizing capital structure through the effective utilization of government subsidies creates a positive synergy, resulting in a significant enhancement of profitability for agricultural enterprises. This hypothesis is grounded in the notion that the combined effect of these factors can mitigate potential debt-related costs while empowering companies to invest in value-generating initiatives. Therefore, the third hypothesis is developed as follows:

Hypothesis 3. *Government subsidies positively impact the financial performance of SMEs and agricultural enterprises, particularly when effectively integrated with an optimized capital structure*.

3. Methodology

3.1. Data

Our study relied on data obtained from financial reports accessed through the Moroccan Office of Industrial and Commercial Property (OMPIC) via the online platform "Directinfo". This platform provided indispensable information, including legal documentation, financial statements, and auditor reports, which were purchased for the research. However, the accessibility and availability of data represent the major limitations of our study. The only option for obtaining financial statements from agricultural SMEs is to purchase them from the "Directinfo" platform. Public authorities refuse to make such documents available to researchers in Morocco despite ongoing calls to promote scientific research, particularly within the academic environment. Additionally, another limitation arises when agricultural SMEs do not frequently declare their agricultural income or when the financial statements for a particular year are unavailable.

To ensure the integrity and relevance of our analysis, we meticulously compiled the dataset, adhering to strict criteria for selecting target agricultural SMEs. Specifically, our focus was on SMEs operating within the agriculture, horticulture, and livestock sectors, aligning with the scope of our study. Furthermore, we targeted specific organizational structures prevalent in agricultural SMEs, including limited liability companies (SARL), single-member SARLs, and economic interest groupings (GIE).

In assessing the potential impact of financing offers and subsidies provided under the "Generation Green 2020–2030" strategy, we incorporated data from the year 2019. This strategic decision enables us to capture any early changes in the capital structure and financial performance of agricultural enterprises following the introduction of this initiative. It is important to note that financial reports for 2023 were unavailable at the time of analysis and therefore were not included in our sample.

After rigorous selection procedures, our final sample comprised 30 carefully chosen agricultural SMEs, providing a robust foundation for our analysis. Initially, our sample encompassed 37 agricultural SMEs, but 7 were excluded due to the unreliability of their data, particularly regarding undeclared revenues. Each SME contributed data for the years 2019 to 2022, resulting in a total of 120 observations. To analyze these data, we employed panel data methodology due to its inherent advantages. Panel data allow for the simultaneous consideration of behavioral dynamics and their diversity, which is crucial for understanding complex phenomena like those in our study. Pirotte (2011) highlights the central aspect of panel data, focused on modeling behavioral disparities among individuals over time. The representation of this heterogeneity can vary depending on the modeling of individual and/or temporal heterogeneity.

3.2. Variables

3.2.1. Dependent Variables

Our study narrows its focus to two accounting-based measures: return on assets (ROA) and return on equity (ROE). ROA, calculated by dividing net operating income by total assets, evaluates the efficiency of asset utilization in generating profits. On the other hand, ROE, calculated by dividing net operating income by equity, including share capital and reserves, provides insights into the return on equity, a crucial financial indicator for management decisions. These measures align with previous research conducted by Abata and Migiro (2016), Mohammad et al. (2019), Sakr and Bedeir (2019), and Prekazi et al. (2023), further validating their relevance in assessing financial performance. Additionally, we have chosen these two ratios with consideration of the specific nature of Moroccan agricultural SMEs, as these entities are not listed, and market-based values are unavailable. Table 1 provides details of the variables used in this study together with their measures.

Table 1. Variables used in this study.

Variables		Notation	Proxies	Measures
Dependent Variables	Financial Performance	ROA	Return On Assets	Net income/Total Assets
		ROE	Return On Equity	Net income/Shareholders' Equity
Independent Variables	Capital Structure	STD	Short-term Debt to Assets	Short-term Debt/Total Assets
		LTD	Long-term Debt to Assets	Long-term Debt/Total Assets
Moderating Variable	Government Subsidies	SUB	Total amounts of government subsidies	Received Subsidies/Total Assets
Control Variables	Agricultural SME's Size	SIZE	Natural logarithm (Ln) of Total Assets	Ln (Total Assets)
	Agricultural SME's Age	AGE	Number of years since establishment	Current year—Year of creation

3.2.2. Independent Variables

- Explanatory Variables:

This research employed two key indicators to measure capital structure: short-term debt (STD) and long-term debt (LTD). While some researchers advocate for using total debt over total assets as a singular measure of capital structure, our approach acknowledges the importance of distinguishing between short-term and long-term debt. Ting and Lean (2011) noted that focusing solely on total debt can obscure meaningful differences between debt maturities. This sentiment was echoed by Wahba (2013), who emphasized that the structure of debt maturities, rather than the overall debt level, significantly influences financial performance. To address this concern, our study adopts a comprehensive approach by incorporating two distinct debt indicators: short-term debt and long-term debt. This approach aligns with previous research (Abor 2005; Salawu 2009; Gill and Biger 2011; Ebrati et al. 2013; Hasan et al. 2014; Sakr and Bedeir 2019; Wieczorek-Kosmala et al. 2021) and ensures a nuanced analysis of capital structure's impact on financial performance.

- Moderator Variable:

In corporate finance, recent research underscores the importance of incorporating moderating variables into both theoretical and empirical frameworks. For instance, Ahmed et al. (2023) found that agency cost, when measured as a moderating variable using the Asset Utilization Ratio (AUR), influences the relationship between capital structure and firm performance. Similarly, Peng and Yang (2014) investigated how ownership concentration acts as a moderating variable in the relationship between corporate social performance and financial performance. The use of moderating variables is a valuable approach for developing and testing theories that address the inherent complexity of these phenomena.

Moderator variables play a crucial role in understanding the nuanced relationship between independent and dependent variables. Sharma et al. (1981) emphasized the significance of moderator variables in interacting with the independent variable and influencing the dependent variable. Aligned with our research objectives, we aim to evaluate the impact of government subsidies, our chosen moderator variable, on the profitability of agricultural SMEs. Moreover, we seek to analyze how the interaction between these subsidies and capital structure affects the financial performance of these enterprises.

To effectively assess the influence of government subsidies, our study adopted the SUB ratio, as proposed by Lim et al. (2018) and Buneta (2021), to measure government subsidies. This ratio, calculated by dividing the total subsidies received by the enterprise by its total assets, provides a clear indication of the subsidies' proportional weight relative to the company's overall resources (Lim et al. 2018). By utilizing this measure, we aim to gain a comprehensive understanding of how government subsidies influence

the financial performance of agricultural SMEs, considering their significance within the capital structure.

3.2.3. Control Variables

The inclusion of control variables in our study is supported by research conducted by Eriksen and Knudsen (2003), who found that firm-level factors significantly influence profitability. Nunes et al. (2007) reinforced this notion by demonstrating that larger firms tend to exhibit higher levels of profitability, a trend that persists over time. This observation was further substantiated by Fareed et al. (2017) and Asimakopoulos et al. (2009), who examined Greek-listed firms and highlighted the positive influence of firm size on profitability. However, Martínez-Sola et al. (2014) reported contrasting results, suggesting that younger firms with better growth prospects and cost-effectiveness tend to be more profitable. Conversely, Yazdanfar (2013) analyzed a large sample of Swedish firms and found that while firm size positively impacts profitability, firm age has a negative effect. Furthermore, Fareed et al. (2017) identified that both firm age and productivity negatively influence profitability.

Building upon these insights, we included agricultural SME age (AGE) and size (SIZE) as control variables in our empirical study. Firm size is represented by the natural logarithm of firm assets, while firm age is quantified by the number of years since establishment (Kieschnick and Moussawi 2018).

3.3. Empirical Models

Our study employs a multiple regression analysis on panel data to investigate two primary relationships: the association between capital structure and the financial performance of agricultural SMEs and the moderating influence of government subsidies. This analytical approach allows us to explore the correlation between a dependent variable and multiple explanatory variables (Ngatno et al. 2021), a methodology utilized by various researchers (Dawar 2014; Siddik et al. 2017; Liu et al. 2019; Ayalew 2021; Ahmed et al. 2023).

The general econometric model formulated for our study is expressed as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 M_{it} + \beta_3 (X_{it} * M_{it}) + \beta_4 C_{it} + \varepsilon_{it} \quad (1)$$

Here, Y_{it} represents the dependent variable, β_0 indicates the constant term, β_1 to β_4 represent the vectors of explanatory variables, X_{it} signifies the independent variable, M_{it} indicates an independent and moderating variable, $X_{it} * M_{it}$ represents the interaction between the independent and moderating variables, C_{it} stands for a control variable, and ε_{it} indicates a statistical random error.

To test the hypotheses of our study, we designed two econometric models based on the definitions of the variables provided in Table 1, aiming to estimate the samples from the complete cross-sectional section.

Model 1—Return on Assets (ROA)

a. Model 1 without moderation

$$ROA_{it} = \beta_0 + \beta_1 STD_{it} + \beta_2 LTD_{it} + \beta_3 SUB_{it} + \beta_4 AGE_{it} + \beta_5 SIZE_{it} + \varepsilon_{it} \quad (2)$$

b. Model 1 with moderation

$$ROA_{it} = \beta_0 + \beta_1 STD_{it} + \beta_2 LTD_{it} + \beta_3 SUB_{it} + \beta_4 (STD_{it} * SUB_{it}) + \beta_5 (LTD_{it} * SUB_{it}) + \beta_6 AGE_{it} + \beta_7 SIZE_{it} + \varepsilon_{it} \quad (3)$$

Model 2—Return on Equity (ROE)

a. Model 2 without moderation

$$ROE_{it} = \gamma_0 + \gamma_1 STD_{it} + \gamma_2 LTD_{it} + \gamma_3 SUB_{it} + \gamma_4 AGE_{it} + \gamma_5 SIZE_{it} + \varepsilon_{it} \quad (4)$$

b. Model 2 with moderation

$$ROE_{it} = \gamma_0 + \gamma_1 STD_{it} + \gamma_2 LTD_{it} + \gamma_3 SUB_{it} + \gamma_4 (STD_{it} * SUB_{it}) + \gamma_5 (LTD_{it} * SUB_{it}) + \gamma_6 AGE_{it} + \gamma_7 SIZE_{it} + \varepsilon_{it} \quad (5)$$

3.4. Data Analysis

Multiple regression analysis on panel data was conducted to explore the degree and direction of the relationships between variables. Common estimation techniques for panel data include pooled OLS, fixed effects (FE), and random effects (RE) methods.

Ensuring the reliability of our results in the presence of potential issues such as multicollinearity, heteroscedasticity, and serial correlation in panel data is essential. Diagnostic tests are imperative to identify these issues and guide the selection of the most suitable model estimator. Once these diagnostic tests are completed, we will specify the appropriate regression model (pooled OLS, fixed effects, or random effects) for each of our two econometric models: return on assets (ROA) and return on equity (ROE).

The determination of the appropriate regression model will follow a methodical process developed by Dougherty (2011), which involves conducting statistical tests such as the Hausman test and the Lagrange Multiplier (LM) test. These tests will provide insights into the suitability of each regression model for our panel data analysis. By carefully assessing the results of these tests, we can confidently select the optimal regression model that best addresses the unique characteristics and challenges presented by our dataset.

3.4.1. Multicollinearity Test

Multicollinearity occurs when two or more independent variables in a regression model are correlated. While some degree of multicollinearity may not pose significant problems, moderate to high levels can become critical issues that require attention (Daoud 2017).

In our study, we evaluate multicollinearity using two key measures: the Variance Inflation Factor (VIF) and tolerance. A VIF below 10 is generally considered acceptable, with a tolerance value of at least 0.1 (Kamaiah 2006; Hair et al. 2013; Newbold et al. 2013; Ahmed et al. 2023). The results presented in Table 2 indicate that the highest VIF is 7.581, while the minimum tolerance is 0.132. Therefore, we can confidently conclude that the variables in our study are free from multicollinearity issues, and our models are not affected by this condition.

Table 2. Tolerance and Variance Inflation Factors.

Model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
STD	0.132	7.581
LTD	0.139	7.185
SUB	0.743	1.347
SIZE	0.579	1.726
AGE	0.824	1.214

3.4.2. Heteroscedasticity Test

The heteroscedasticity test aims to determine whether the variance of residuals in a linear regression remains constant. When employing the ordinary least squares (OLS) method, a fundamental assumption is that the variance of residuals remains constant.

To assess whether our models meet this assumption, we employ three statistical tests: the White test, the modified Breusch–Pagan test, and the F-test. These tests all share the null hypothesis that the variance of residuals is constant, indicating homoscedasticity.

The analysis of the results from the three heteroscedasticity tests for models 1 and 2 (Table 3) reveals the rejection of the null hypothesis for the first model. Specifically, the chi-square probability value (Sig.) is less than 0.05, indicating that this model is affected by heteroscedasticity. Conversely, the null hypothesis is not rejected for the second model, with a chi-square probability value greater than 0.05 in all three tests. These findings confirm that the second model satisfies the condition of homoscedasticity.

Table 3. Heteroscedasticity tests.

Tests	Model 1 (ROA)	Model 2 (ROE)
White Test for Heteroscedasticity		
Chi-Square	47.353	13.285
Sig.	0.001	0.865
Modified Breush–Pagan Test for Heteroscedasticity		
Chi-Square	32.680	1.070
Sig.	0.000	0.957
F Test for Heteroscedasticity		
F	8.533	0.205
Sig.	0.000	0.960

3.4.3. Serial Correlation Test

Detecting serial correlation in the error term of a panel data model is essential to ensure the validity of the analysis (Drukker 2003). The Durbin–Watson (DW) test serves as a statistical tool to evaluate the presence of autocorrelation within the residuals of an econometric model. This method compares the calculated DW statistic to specific reference values based on the number of observations (n) and the number of explanatory variables (k').

In our study, the DW statistic is interpreted by comparing it to the lower (D_{inf}) and upper (D_{sup}) bounds derived from the Savin and White table (Savin and White 1977), considering the sample size (n) and the number of terms in the model (k'). For our analysis with 120 observations and 6 terms in each model (5 estimated coefficients + the constant term), the corresponding bounds are D_{inf} = 1.441 and D_{sup} = 1.647.

Based on the results presented in Table 4, we conclude that the first model demonstrates serial correlation as the DW statistic (DW = 1.164) falls below the lower bound (D_{inf} = 1.441). Conversely, the second model does not exhibit serial correlation since the DW statistic (DW = 2.013) exceeds the upper bound (D_{sup} = 1.647).

Table 4. Autocorrelation test.

	Model 1 (ROA)	Model 2 (ROE)
Durbin–Watson	1.164	2.013

3.5. Model Specification

Our study employs regression models to estimate two econometric models and evaluate the relationship between dependent and independent variables. We conducted tests using both the fixed effects methodology (FEM) and random effects methodology (REM) with ordinary least squares (OLS). The determination of the appropriate model was contingent upon the outcomes of the Hausman test and the Lagrange multiplier test (Hausman 1978; Breusch and Pagan 1980), as illustrated in Table 5 below. In selecting the suitable regression model, we adhered to the methodological framework outlined by Dougherty (2011) for panel data analysis.

Table 5. Model estimation.

Tests	ROA		ROE	
	Chi-Sq. Statistic	Prob.	Chi-Sq. Statistic	Prob.
Correlated Random Effects—Hausman Test Test Cross-section Random Effects	30.621	0.0000	2.043	0.8432
Lagrange Multiplier Tests for Random Effects Breusch–Pagan	31.256	(0.0000)	0.203	(0.6526)

The results presented in Table 5 reveal that the Hausman test statistic for our first econometric model (ROA) is highly significant, with a probability value of 0.000, falling below the conventional 5% threshold. Consequently, we reject the null hypothesis (H_0: The coefficients of the explanatory variables are the same in fixed effects and random effects models) and favor the fixed effects model (FEM). The significance of the Hausman test suggests that the coefficients of the explanatory variables vary among individuals, indicating a correlation between individual effects and the explanatory variables. Thus, the use of the fixed effects model is justified.

However, since our first model is affected by heteroscedasticity and serial correlation issues, we resort to employing the fixed effects model with cross-section weights (FEM with cross-section weights) to address these challenges. In this model, observations are weighted based on their cross-sectional variability, aiming to correct potential biases in coefficient estimation. Utilizing fixed effects (FE) estimation with cross-section weights offers several advantages. Firstly, it aids in correcting heteroscedasticity by assigning more weight to observations with lower variance, thereby reducing potential distortions caused by unequal variance of residuals. Similarly, this method helps mitigate autocorrelation by giving less weight to observations that are highly correlated over time. By better capturing cross-sectional variation in the data, fixed effects can alleviate autocorrelation issues in the residuals. Additionally, utilizing cross-section weights stabilizes the variance of residuals, rendering parameter estimates of the model more robust and reliable (Greene 2012; Wooldridge 2013).

For our second model (ROE), the Hausman test statistic is not significant (0.8432 > 0.05), prompting us to assess the significance of the LM test to determine the presence of random effects in this model. According to the previous table, the LM test is not statistically significant, with a *p*-value (0.6526) exceeding the 5% threshold. This suggests that there is not sufficient evidence to conclude the presence of random effects in the model. In this scenario, the appropriate model is the pooled ordinary least squares (Pooled OLS). Since this model does not suffer from heteroscedasticity and serial correlation issues encountered in the first model, we can confidently conclude that the chosen estimation will not be biased.

4. Findings

4.1. Descriptive Statistics of Data

Summary statistics of all variables as proxies of capital structure, financial performance, government subsidies, and control variables are shown in Table 6.

Table 6. Descriptive statistics.

Variables	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Skewness Statistic	Kurtosis Statistic
ROE	120	−5.357	19.333	0.443	2.664	5.778	36.512
ROA	120	−2.434	0.246	−0.076	0.366	−4.676	23.570
STD	120	0.022	43.836	2.008	7.180	5.252	26.343
LTD	120	0.000	1.584	0.113	0.291	4.284	18.904
SUB	120	0.000	0.661	0.039	0.101	4.004	18.085
SIZE	120	12.905	22.980	17.685	2.433	−0.152	−0.863
AGE	120	5	74	22.77	15.376	1.715	2.522

The financial performance indicators of the agricultural SMEs in our sample are primarily assessed through return on equity (ROE) and return on assets (ROA). The average ROE and ROA for the entire sample stand at 44.3% and −7.6%, respectively. These data highlight a notable dispersion in performance metrics, with ROE ranging from −5.357 to 19.333 and ROA from −2.434 to 0.246. Such significant variations underscore the diverse financial performance among agricultural enterprises during the study period (2019–2022). The average ROA below zero (−7.6%) indicates challenges in effectively leveraging assets

among agricultural SMEs. Conversely, the average ROE of 44.4% suggests substantial profitability derived from the investments made by owners/operators.

Turning to capital structure, the descriptive statistics reveal that the average ratios of long-term debt (LTD) and short-term debt (STD) are 0.113 and 2.008, respectively. Additionally, the average ratio of received subsidies (SUB) is 3.9%, indicating a relatively low proportion within the capital structure of the analyzed enterprises.

Notably, agricultural businesses in our study heavily rely on short-term borrowing, as evidenced by the dominance of the short-term debt ratio over the long-term debt ratio. Moreover, considerable variability in capital structure is observed, particularly in the short-term debt ratio, with a standard deviation of 7.18 compared to 0.291 for the long-term debt ratio. This variability likely reflects diverse financial strategies, debt policies, and levels of financial risk among the agricultural enterprises under examination.

The skewness and kurtosis values indicate that the sample datasets do not follow a normal distribution, with ROE, STD, LTD, SUB, and AGE showing positive skewness and ROA and SIZE showing negative skewness. The Jarque–Bera test further confirms this, with probabilities below the 5% critical threshold for all models, strongly suggesting that the residuals are not normally distributed. Despite this, according to Greene (2012) in "Econometric Analysis", normality of data is not an absolute requirement for multiple regression analysis, meaning the regression results can still be interpreted even if the data are not normally distributed.

4.2. Correlation Analysis

Table 7 shows the correlation coefficients between the variables used in the regression models.

Table 7. Correlation analysis.

		ROE	ROA	STD	LTD	SUB	SIZE	AGE
ROE	Pearson Correlation	--						
ROA	Pearson Correlation	−0.085	--					
	Sig. (2-tailed)	0.358						
STD	Pearson Correlation	−0.021	−0.941 **	--				
	Sig. (2-tailed)	0.818	<0.001					
LTD	Pearson Correlation	−0.045	−0.869 **	0.917 **	--			
	Sig. (2-tailed)	0.629	<0.001	<0.001				
SUB	Pearson Correlation	0.011	0.101	−0.072	−0.119	--		
	Sig. (2-tailed)	0.903	0.271	0.433	0.197			
SIZE	Pearson Correlation	−0.047	0.337 **	−0.279 **	−0.166	0.443 **	--	
	Sig. (2-tailed)	0.607	<0.001	0.002	0.069	<0.001		
AGE	Pearson Correlation	−0.046	0.130	−0.119	−0.083	0.198 *	0.419 **	--
	Sig. (2-tailed)	0.617	0.157	0.197	0.366	0.030	<0.001	

Note: ** and * denote correlation significance at the 0.01 (2-tailed) and 0.05 (2-tailed) levels, respectively.

It can be observed that there is a strong positive correlation between the SUB ratio and our control variables SIZE and AGE, significant at the 1% and 5% levels, respectively. This suggests that government subsidies are mainly allocated to larger and older agricultural SMEs. These positive correlations raise questions about the mechanisms for allocating these financial incentives as well as about subsidy policies. Within the framework of this new agricultural strategy, "Generation Green", it is envisaged that these incentives will be primarily targeted toward small and new agricultural enterprises, which raises questions about the effectiveness of the policies implemented.

The debt ratios show a significant negative correlation with ROA, indicated by negative and highly significant correlation coefficients at the 1% level. However, no significant correlation was observed between the ROE ratio and the other variables.

Additionally, the control variable SIZE is positively correlated with ROA (0.337) but negatively correlated with STD (−0.279), both significant at the 1% level. This suggests

that larger agricultural enterprises manage their assets better and do not resort to short-term debt.

4.3. Regression Results

The regression results for our two econometric models, ROA (Model 1) and ROE (Model 2), are presented in this section. To evaluate the moderating effect of the SUB ratio, we estimated two equations for each model: one without moderation and one with moderation. The main columns show the results of ordinary least squares (OLS) regressions, fixed effects (FE) regressions, and random effects (RE) regressions. For Model 1, which had issues with heteroscedasticity and serial correlation, we included a final fixed effects regression with cross-section weights to address these problems (Greene 2012; Wooldridge 2013).

4.3.1. Return on Assets

As shown in Table 8, the fixed effects model analysis indicates that both short-term debt and long-term debt significantly explain the variation in asset returns in the model without moderation. However, in the moderated model, only short-term debt remains significant. The coefficients for the debt ratios are negative and significant at the 1% and 5% levels, respectively, in the model without moderation. This pattern persists in the moderated model, with the short-term debt ratio remaining negative and highly significant at the 1% level. Conversely, the control variables, SIZE and AGE, have no significant impact on either regression.

Subsequently, the fixed effects model with cross-section weights was employed to address the heterogeneity and autocorrelation issues in the ROA econometric model. In this framework, the negative influence of both short-term debt (STD) and long-term debt (LTD) variables persists in the model without moderation, with high significance at the 1% level for both variables. Specifically, the coefficients for the short-term debt ratio and long-term debt ratio are -0.121 and -0.354, respectively. This indicates that a 1% increase in the short-term debt ratio, for example, leads to a decrease of approximately 0.12% in ROA, all else being equal.

In the moderated model, the fixed effects estimation with cross-section weights (FE with cross-section weights) confirms the previous results, showing that both the short-term debt ratio (STD) and long-term debt ratio (LTD) have a negative and highly significant impact on asset returns (ROA) at the 1% level, with coefficients of -0.120 and -0.194, respectively. Notably, the coefficient for LTD decreases from -0.354 in the regression without moderation to -0.194 in the regression with moderation. This reduction suggests a decrease in the proportion of variability in ROA explained by LTD when the moderation effect is considered. However, no significant variation was observed in the coefficient for STD.

These results indicate a notable interaction between the subsidy ratio (SUB) and LTD when the moderation effect is included in the regression, elucidating a portion of the observed variability in ROA. The coefficient of the interaction term, LTD*SUB, is -3.676 and highly significant at the 1% level. This suggests a significant impact of the LTD*SUB moderation effect on ROA, with an approximate decrease of 3.68%. Thus, the findings affirm the previous conclusion that considering the moderation effect diminishes the proportion of ROA variability explained by LTD.

Therefore, it is plausible to assume that higher levels of debt lead to lower profitability in agricultural SMEs, indicating a negative and significant impact of capital structure on their financial performance. Regarding the control variables, the age of the SME (AGE) has been found to be an important factor in its financial performance, as measured by ROA. Specifically, in the fixed effects model with cross-section weights, the AGE variable has a negative and significant impact at the 5% level in both regressions (with and without moderation), suggesting that older SMEs experience lower returns on their assets.

Table 8. Return on assets—comparative analysis between multiple regression results.

Variables	OLS				FE				RE				FE with Cross-Section Weights			
	Model 1		Model 1—Moderation		Model 1		Model 1—Moderation		Model 1		Model 1—Moderation		Model 1		Model 1—Moderation	
	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.
Intercept	−0.241 **	−2.400	−0.213 **	−2.051	−0.538	−0.878	−0.530	−0.856	−0.215	−1.456	−0.175	−1.114	0.004	0.019	0.006	0.032
STD	−0.042 ***	−9.799	−0.046 ***	−10.037	−0.112 ***	−8.040	−0.112 ***	−8.010	−0.046 ***	−8.904	−0.051 ***	−8.878	−0.121 ***	−7.383	−0.120 ***	−7.618
LTD	−0.121	−1.170	−0.034	−0.309	−0.427 **	−2.407	−0.319	−1.412	−0.079	−0.664	0.050	0.371	−0.354 ***	−5.575	−0.194 ***	−3.104
SUB	−0.044	−0.341	0.207	0.437	−0.002	−0.021	−0.362	−0.320	−0.000	−0.003	0.321	0.501	0.032	1.164	−0.197	−0.775
SIZE	0.016 **	2.560	0.014 **	2.241	0.049	1.347	0.051	1.376	0.015	1.655	0.012	1.304	0.016	1.302	0.016	1.350
AGE	−0.000	−0.501	−0.000	−0.487	−0.006	−0.800	−0.008	−1.013	−0.001	−0.589	−0.001	−0.621	−0.004 **	−1.991	−0.005 **	−2.442
STD*SUB			−0.218	−0.398			0.414	0.341			−0.303	−0.434			0.266	0.978
LTD*SUB			−8.121 **	−2.200			−2.155	−0.543			−6.522 **	−2.032			−3.676 ***	−4.264
R-Square	0.893		0.897		0.966		0.966		0.740		0.750		0.956		0.971	
Adjusted R-Square	0.888		0.891		0.952		0.951		0.729		0.735		0.939		0.958	
F-statistic	190.118		139.876		70.279		65.408		64.928		48.062		54.562		77.008	
Prob.	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	

Note: *** and **: level of significance at 1% and 5%, respectively.

4.3.2. Return on Equity

In our second model (Table 9), focusing on return on equity (ROE), the adjusted R-squared values present a challenge, as they are negative (−0.036 for the regression without moderation and −0.042 for the moderated model).

Table 9. Return on equity—comparative analysis between multiple regressions results.

Variables	OLS				FE				RE			
	Model 2		Model 2—Moderation		Model 2		Model 2—Moderation		Model 2		Model 2—Moderation	
	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.
Intercept	1.501	0.676	1.357	0.582	7.974	0.383	9.341	0.458	1.496	0.655	1.356	0.587
STD	0.027	0.279	−0.002	−0.024	−0.106	−0.225	−0.157	−0.341	0.028	0.283	−0.003	−0.030
LTD	−1.071	−0.469	−0.325	−0.132	−6.735	−1.117	4.206	0.565	−1.101	−0.469	−0.311	−0.127
SUB	0.782	0.273	−3195	−0.300	0.047	0.012	−16366	−0.440	0.767	0.263	−3226	−0.306
SIZE	−0.050	−0.373	−0.042	−0.298	−0.718	−0.579	−0.614	−0.503	−0.050	−0.361	−0.042	−0.300
AGE	−0.006	−0.331	−0.004	−0.206	0.270	1.087	0.094	0.364	−0.006	−0.318	−0.004	−0.205
STD*SUB			5.722	0.464			20.317	0.506			5.767	0.473
LTD*SUB			−79.604	−0.960			−249.645 *	−1.908			−81.747	−1.000
R-Square	0.008		0.019		0.248		0.299		0.008		0.020	
Adjusted R-Square	−0.036		−0.042		−0.053		−0.005		−0.036		−0.042	
F-statistic	0.179		0.314		0.825		0.984		0.175		0.322	
Prob.	0.970		0.946		0.732		0.507		0.971		0.943	

Note: * indicate the level of significance at 10%.

These negative values indicate that the included independent variables inadequately explain the variability in ROE. Essentially, this suggests a disconnection between the variation in financial performance, as measured by ROE, and the variation in capital structure. Furthermore, the F* values for the second model (ROE) fall below the theoretical F values from the Fisher table at the 5% threshold. This signifies that the independent variables in this model do not significantly influence ROE. These findings echo the conclusions drawn from the adjusted R-squared values, further emphasizing the limited efficacy of the models in explaining financial performance.

The lack of significance observed in the impact of capital structure, government subsidies, and their interaction on the return on equity (ROE) of the sampled agricultural SMEs effectively refutes our three hypotheses for this model. This outcome contradicts previous findings by Abor (2005), Gill and Biger (2011), Vătavu (2015), and Le and Phan (2017), which suggested a discernible influence of capital structure on return on equity. However, it aligns with the conclusions drawn from the study by Ngoc et al. (2021), where no significant impact of capital structure on return on equity (ROE) was identified.

These results imply that within the unique context of Moroccan agricultural SMEs, factors beyond capital structure and government subsidies likely wield significant influence over their return on equity (ROE). Further exploration into these alternative determinants is warranted to comprehensively understand the dynamics shaping the financial performance of agricultural enterprises in this setting.

5. Results

5.1. Capital Structure and Financial Performance

Trade-off theory suggests that maintaining an optimal capital structure could enhance profitability by balancing debt levels effectively. Consequently, we anticipated that the strategic utilization of financing options proposed under the new agricultural strategy

would positively influence financial performance. Conversely, in line with pecking order theory, we hypothesized that agricultural SMEs, while preferring internal financing, would still consider the benefits of debt to improve profitability.

This study sheds new light on the relationship between capital structure and the financial performance of Moroccan agricultural enterprises. Contrary to our initial expectations based on the trade-off theory (TOT) and the pecking order theory (POT), our empirical findings reveal a different dynamic. Our analysis indicates that both short-term and long-term debt have a negative and significant impact on the return on assets (Vătavu 2015; Mohammad et al. 2019; Le and Phan 2017; Ahmed et al. 2023). This negative relationship between debt and ROA suggests that these enterprises cannot effectively balance the benefits of debt against its costs, which contradicts the trade-off theory proposition. Instead, our results advocate for the adoption of a self-financing strategy in line with the principles of the pecking order theory. According to the pecking order theory, companies should primarily rely on internal financing and resort to external financing only when internal funds are insufficient (Ahmed et al. 2023). Thus, these findings underscore the critical importance of financing decisions in determining the profitability of agricultural SMEs. Guided by the pecking order theory, these enterprises should prioritize self-financing and minimize debt to maximize the profitability of their assets.

5.2. Government Subsidies and Financial Performance

Our study explored whether government subsidies granted to agricultural SMEs under the new agricultural strategy "Generation Green" would positively impact their profitability. This hypothesis was informed by studies conducted by Assagaf et al. (2017), Jacob et al. (2016), Wang et al. (2021), and Buneta (2021). However, the empirical results did not reveal any significant impact of these subsidies on the return on assets of these enterprises, suggesting that their low proportion in the capital structure does not elucidate the nature of their direct influence on financial performance. Consequently, the second hypothesis of our study was refuted. This finding aligns with studies conducted by Lim et al. (2018) and Bojnec and Žampa (2021)—who found limited evidence that profitability improves through public subsidies—but contradicts the studies that formed the basis of our second hypothesis.

5.3. Moderating Effect of Government Subsidies

Studies by Assagaf et al. (2017) and Špička (2018) informed our third hypothesis, which proposed that optimizing the capital structure through the efficient use of government subsidies, in alignment with the trade-off theory (TOT) and the pecking order theory (POT), would create a positive synergy, significantly improving the profitability of agricultural enterprises. This hypothesis was based on the notion that the interaction between these factors could alleviate debt costs while enhancing the enterprises' capacity to invest in value-generating initiatives. Indeed, according to TOT and POT, we anticipated that agricultural SMEs, by receiving subsidies, could leverage the advantages of debt without over-leveraging, thereby bolstering their profitability.

However, the empirical results contradicted the initial expectations of this hypothesis. The findings revealed that neither the interaction between subsidies and short-term debt nor that with long-term debt had a positive effect on the return on assets of Moroccan agricultural enterprises. Nevertheless, the results did affirm that these subsidies moderate the relationship between capital structure and financial performance. Specifically, the interaction between subsidies and long-term debt appears to have a significantly negative effect on financial performance, challenging the idea that government subsidies can positively contribute to financial performance (Assagaf et al. 2017; Špička 2018). Consequently, the trade-off theory has once again been refuted, suggesting its inadequacy in this specific context. Subsidized SMEs must therefore exercise caution in their use of external financing and base their financing strategies on the principles of the pecking order theory.

6. Robustness Check

To ensure the robustness of our findings, we conducted several additional analyses using alternative measures and model specifications.

First, we included dummy variables in our estimations to capture year-specific fixed effects. This approach allowed us to control for time-varying factors influencing the financial performance of agricultural SMEs. The results remained consistent, demonstrating a significant negative relationship between debt and the financial performance of agricultural SMEs, measured by return on assets (ROA). Specifically, both short-term and long-term debt ratios were negatively associated with ROA and significant at the 1% level in models with and without the moderation effect. Furthermore, the interaction between long-term debt and government subsidies remained significant at the 1% level and negatively associated with ROA. A minor difference noted was that the control variable AGE became less significant at the 10% level in the model with moderation.

Second, we tested the robustness of our original empirical model by using an alternative measure of capital structure. Specifically, we employed the total debt ratio as a proxy for capital structure instead of separating short-term and long-term debt ratios. This alternative measure also supported our main findings, consistently showing a negative impact of debt on SME performance. The total debt ratio had negative and highly significant coefficients at the 1% level in models both with and without moderation. Indeed, a 1% increase in total debt leads to a decrease of around 0.13% in return on assets, all else being equal. These observations highlight the significant influence of total debt on ROA.

The robustness checks thus confirm the stability and reliability of our results, reinforcing our conclusion that higher levels of debt are associated with lower ROA in Moroccan agricultural SMEs. Moreover, the negative moderating effect exerted by the interaction between debt and subsidies on ROA remains evident.

To conserve space, the detailed tables presenting these regression results are not reported in this paper but are available upon request. These additional analyses provide strong support for our primary conclusion regarding the negative relationship between debt and the financial performance of agricultural SMEs, including the negative moderation by subsidies.

7. Conclusions and Discussion

This study aimed to investigate the impact of capital structure and government subsidies on the financial performance of Moroccan agricultural enterprises during the period 2019–2022, with a focus on the implications of the "Generation Green" strategy. Our analysis was driven by both practical and theoretical objectives, seeking to understand the influence of financing options and subsidies on profitability while addressing the gap in academic research on this topic.

Our first objective was to assess how the capital structure, particularly debt, influences the financial performance of agricultural SMEs under the "Generation Green" strategy. Contrary to expectations, our findings revealed an inverse relationship between debt and profitability. As the proportion of debt increased, the return on assets decreased, indicating potential inefficiencies in resource management.

Subsequently, we aimed to evaluate the impact of government subsidies on financial performance and their moderating effect on the relationship between capital structure and profitability. Despite anticipating a positive influence, the empirical results showed no significant impact of subsidies on return on equity or return on assets. Additionally, the moderation effect of subsidies on the relationship between capital structure and profitability was negative, suggesting a decrease in profitability as subsidized SMEs incurred more debt.

These findings raise questions about the effectiveness of government subsidies in enhancing profitability, particularly in conjunction with debt. Factors such as eligibility conditions and usage modalities may limit their efficacy. Moreover, the preference given to older and larger enterprises in subsidy allocation calls for scrutiny of the policies governing these incentives.

In conclusion, our study sheds light on the complexities of financing and subsidy mechanisms within the Moroccan agricultural sector. Managing and reducing excessive debt in agricultural enterprises, particularly short-term debt, is crucial to avoid high financial risks and maintain long-term stability. The rise in debt following the adoption of the new agricultural strategy raises concerns about the profitability of these enterprises. Effective management of funds and resources, grounded in the principles of the resource-based view (Wernerfelt 1984; Barney 1996), is essential. Developing robust risk management strategies is necessary to mitigate the negative effects of debt and ensure that investments are well-planned and profitable. Subsidy policies should be revised to target the neediest enterprises and promote sustainable investments. Prudent debt management and the strategic use of funds are indispensable for maximizing profitability and ensuring long-term financial viability.

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