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**IMPACT OF GEARING AND LAGGED R&D EXPENDITURES ON
PROFIT-MARGINS OF PUBLICLY LISTED COMPANIES**

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ВПЛИВ ФІНАНСОВОГО ЛЕВЕРИДЖУ ТА ВІДСТРОЧЕНИХ ВИТРАТ НА ДОСЛІДЖЕННЯ І РОЗРОБКИ (R&D) НА РЕНТАБЕЛЬНІСТЬ ПРОДАЖУ ПУБЛІЧНИХ КОМПАНІЙ

The article examines the essence of the category impact of financial leverage and lagged R&D expenditures on corporate profitability. The study focuses on analyzing the relationship between financial leverage (2024), R&D intensity (2022), and the profit margin of more than 200 publicly traded companies, selected from the Orbis database. The primary objective is to determine how capital structure and innovation investments influence firms' financial performance in the medium term and to assess the significance of these factors for investment decisions by shareholders, potential investors, and traders. To achieve this, correlation and multiple regression analyses were employed to evaluate the direction and statistical significance of the impact of financial leverage and R&D expenditures on profitability. The findings reveal a weak negative correlation between financial leverage and profit margin, consistent with the trade-off theory: excessive debt financing increases financial risks and reduces

profitability due to higher debt servicing costs. In contrast, R&D intensity with a two-year lag exhibits a moderate positive correlation with profit margin, underscoring the delayed but substantial impact of innovation investments on financial outcomes. The regression model ($R^2 = 0.1522$) accounts for 15.2% of the variance in profit margin, indicating statistical significance ($F = 18.86$, $p < 0.00000003$), yet also suggesting the influence of additional factors such as industry-specific dynamics, operational efficiency, or macroeconomic conditions. Regression coefficients indicate that a one-unit increase in financial leverage reduces profit margin by 2.32% ($p = 0.0012$), while a one-unit increase in R&D intensity boosts it by 61.6% ($p < 0.00001$). These results highlight the critical role of a balanced capital structure and sustained R&D investments in ensuring long-term profitability, particularly in competitive and innovation-driven sectors. The study also acknowledges industry heterogeneity affecting the strength and direction of these relationships and provides a replicable methodology for further profitability analysis, incorporating time lag and industry specifics. The findings offer practical implications for financial managers seeking to optimize capital structure and for investors evaluating the long-term potential of firms. Additionally, the results can inform policymakers to design incentives for innovation and financial stability. To enhance the model's explanatory power, future research could incorporate additional variables, such as macroeconomic factors, firm size, or corporate governance, and expand the sample to include a broader range of industries.

У статті досліджено сутність категорії впливу боргового навантаження та витрат на дослідження і розробки (НДДКР) з попередніх періодів на прибутковість компаній. Дослідження спрямоване на аналіз взаємозв'язку між борговим навантаженням (2024 року), інтенсивністю витрат на НДДКР (2022 року) та маржею прибутку більш ніж 200 провідних компаній, акції яких котируються на біржах, відібраних з бази даних Orbis. Метою роботи є визначення, як структура капіталу та

інвестиції в інновації впливають на фінансові результати компаній у середньостроковій перспективі, а також оцінка значущості цих факторів для прийняття інвестиційних рішень акціонерами, потенційними інвесторами та трейдерами. Для досягнення цієї мети використано методи кореляційного та множинного регресійного аналізу, які дозволили оцінити напрямок і статистичну значущість впливу боргового навантаження та НДДКР на прибутковість. Результати дослідження демонструють слабку негативну кореляцію між борговим навантаженням і маржею прибутку, що узгоджується з теорією компромісу: надмірне боргове фінансування підвищує фінансові ризики та знижує прибутковість через зростання витрат на обслуговування боргу. Натомість інтенсивність НДДКР із дворічною затримкою виявляє помірну позитивну кореляцію з маржею прибутку, що підкреслює відтермінований, але значний вплив інноваційних інвестицій на фінансові результати. Регресійна модель ($R^2 = 0.1522$) пояснює 15.2% варіації маржі прибутку, що вказує на статистичну значущість моделі ($F = 18.86$, $p < 0.00000003$), але також свідчить про вплив інших факторів, таких як галузеві особливості, операційна ефективність чи макроекономічні умови. Коефіцієнти регресії показують, що зростання боргового навантаження на одну одиницю знижує маржу прибутку на 2.32% ($p = 0.0012$), тоді як зростання інтенсивності НДДКР на одну одиницю підвищує її на 61.6% ($p < 0.00001$). Ці результати підкреслюють важливість збалансованої структури капіталу та послідовних інвестицій у НДДКР для забезпечення сталого зростання прибутковості, особливо в конкурентних та інноваційно орієнтованих секторах. Дослідження також враховує галузеву неоднорідність, що впливає на силу та напрямок виявлених зв'язків, і пропонує відтворювану методологію для подальшого аналізу прибутковості з урахуванням часових затримок і специфіки галузей. Отримані висновки мають практичне значення для фінансових менеджерів, які прагнуть оптимізувати капітальну структуру, та інвесторів, які оцінюють довгостроковий потенціал

компаній. Крім того, результати можуть бути корисними для розробки політик, спрямованих на стимулювання інновацій та фінансової стабільності компаній. Для підвищення пояснювальної сили моделі майбутні дослідження можуть включати додаткові змінні, такі як макроекономічні фактори, розмір компанії чи корпоративне управління, а також розширити вибірку для охоплення більшої кількості галузей.

Keywords: *financial leverage, R&D expenditures, profitability, capital structure, innovation, profit margin.*

Ключові слова: *боргове навантаження, витрати на НДДКР, прибутковість, капітальна структура, інновації, маржа прибутку.*

Problem statement and its relation to significant scientific or practical issues. The problem of understanding how financial leverage and lagged research and development (R&D) expenditures impact corporate profitability is critical in the context of modern financial management and strategic decision-making. Firms operate in increasingly competitive environments where the optimization of capital structure and innovation investments directly influences their ability to generate sustainable profits and maintain a competitive edge [1]. Financial leverage, defined as the ratio of debt to equity, affects a firm's cost of capital, financial risk, and operational flexibility [3, p.10]. Excessive reliance on debt can amplify financial risks, increase interest burdens, and potentially erode profitability, while a balanced approach may yield tax benefits and enhance returns. Simultaneously, R&D expenditures reflect a firm's commitment to innovation, enabling the development of new products, processes, or technologies that drive long-term revenue growth and market leadership. However, the benefits of R&D are often delayed, requiring a time lag to translate into measurable financial outcomes, which complicates their immediate impact on profitability.

This study addresses the gap in understanding the combined effects of these two factors—financial leverage and lagged R&D intensity—on profit margins,

particularly in the context of the top 250 publicly traded companies. The problem is significant because it bridges financial theory and practical application, offering insights for stakeholders such as financial managers, investors, and policymakers. Scientifically, the research contributes to the ongoing discourse on capital structure theories, such as the Modigliani-Miller propositions, trade-off theory, and agency theory, by empirically testing their relevance in a contemporary setting [7]. It also extends the literature on innovation economics by exploring the delayed effects of R&D investments, aligning with endogenous growth theory, which posits that innovation drives long-term economic performance.

Practically, the problem is relevant to corporate decision-making, as firms must balance short-term financial constraints with long-term strategic investments to maximize shareholder value. For investors and traders, understanding how leverage and past R&D expenditures shape profitability informs portfolio allocation and risk assessment. For policymakers, the findings can guide the design of incentives to promote innovation while ensuring financial stability [2]. The complexity of these relationships, influenced by industry dynamics, firm size, and economic conditions, underscores the need for rigorous empirical analysis to provide actionable insights [4]. This study aims to address these issues by employing a robust methodology, including correlation and regression analyses, to quantify the impact of financial leverage and lagged R&D intensity on profit margins, thereby contributing to both academic knowledge and practical financial strategy.

In this article, the observations of 213 companies have been made to support the future investing activities of shareholders, potential investors and traders. The study explores different capital structure approaches to show the most profitable ones.

The idea of research comes naturally and logically as it is the most common assumption [5]. It implies the more credit funding companies get, the more risky and less profitable it is. Profits concern each level of management and owners. And Gearing, or financial leverage, affects the cost of capital and risk exposure, while

research and development (R&D) spending reflects a firm's commitment to long-term innovation and competitive advantage.

This study investigates the relationship between profit margin and two explanatory variables: gearing (in 2024) and lagged R&D intensity (from 2022). Using databases, correlation and multiple regression methods to identify the direction and significance of these determinants. The findings contribute to a more nuanced understanding of how financial decisions and past innovation strategies interact to shape corporate profitability in the medium term.

Analysis of recent research and publications. The relationship between capital structure, innovation investment, and corporate profitability has been extensively studied, yet empirical evidence remains varied and often context dependent. In classical financial theory, the Modigliani–Miller propositions assert that under perfect market conditions, capital structure is irrelevant to firm value [7]. However, subsequent developments in capital structure theory, including trade-off theory and agency theory, suggest that financial leverage can influence firm performance through tax shields, debt discipline, and bankruptcy risk [8, p.576]. Empirical studies [1] affirm these claims, demonstrating that higher levels of financial leverage negatively correlate with profitability, especially in capital-intensive firms. Using regression and correlation analysis, the authors report a significant inverse relationship between gearing and financial performance indicators, including profit margins.

In parallel, research on the role of innovation investment has highlighted R&D expenditure as a critical driver of long-term firm performance. R&D enables firms to develop competitive advantages, enhance product offerings, and respond to market demands, thereby increasing revenue and profitability. Yet, the payoff from R&D is rarely immediate [6]. Xu, Sim, and Jin explored this time-delayed effect using a two-year lag on R&D investment and found a statistically significant positive association with profit margin and firm value [12]. Similarly, Rađenović et al. analyzed R&D performance among innovation-intensive firms and found mixed results: while high R&D intensity supported higher returns in some sectors, it was

negatively associated with ROA in others, suggesting that industry dynamics and timing effects play a moderating role [10].

The interaction between leverage and R&D is also complex. High debt levels may crowd out innovation spending due to cash flow constraints and risk aversion, while firms with solid internal financing or low gearing are often better positioned to sustain R&D investments. This crowding-out effect was partially supported by the findings of Lee [5, p.71], who noted that companies capitalizing R&D were more sensitive to leverage changes than those expensing it. In another study [6] the authors found that although R&D investment had a significant positive effect on ROE and profit margin, firms with high leverage experienced a weaker link between R&D and profitability, indicating a potential interaction effect.

Further studies provide evidence of heterogeneity in R&D–profitability relationships. Chengjing Dong [2] examined Chinese biomedical firms and found that lagged R&D investment significantly enhanced profitability metrics, including operating margin and ROA, though the effect varied by firm size and ownership structure.

Several authors advocate the inclusion of both leverage and R&D variables in profitability models. Conducted a regression-based study on the interaction of ownership structure, R&D spending, and firm performance, highlighting the moderating influence of strategic governance on innovation outcomes [11, p.2]. In a related study, used long-run panel data across US firms and confirmed that innovation intensity (R&D-to-revenue ratio) significantly predicted profitability and shareholder returns [3, p.4]. Meanwhile, employed autoregressive distributed lag (ARDL) models to demonstrate both short- and long-term effects of R&D on economic performance in the agricultural sector.

Taken together, the literature suggests a consistent — though nuanced — pattern: gearing tends to have a negative effect on profitability, while R&D expenditures, especially with time lags, are positively associated with profit margins. However, the strength and direction of these relationships depend on firm

characteristics, industry sector, and the time horizon considered. Despite robust modeling approaches, many studies report low to moderate R-squared values, highlighting the complexity of profitability determinants and the influence of unobserved factors.

Formulation of the article's objectives. The primary objective of this study is to thoroughly investigate the combined impact of financial leverage and lagged research and development (R&D) expenditures on the profit margins of 213 leading publicly traded companies, thereby contributing to a deeper understanding of how capital structure and innovation investments interact to shape corporate profitability in the medium term. To achieve this, the research is structured around several interconnected goals, each designed to provide clarity and actionable insights.

This study adopts a quantitative research methodology to investigate the relationship between capital structure, innovation investment, and firm profitability. Specifically, it evaluates the impact of gearing and lagged R&D expenditures on the profit margin of companies, using a combination of correlation and regression analysis. The analysis is based on a cross-sectional dataset for the year 2024, with lagged innovation data taken from 2022, allowing the research to explore delayed effects of R&D investment.

The financial data used in this study were extracted from the Orbis database, a comprehensive global platform that offers standardized and comparable company-level financial data. The final sample consists of 213 firms across different industries with complete records for all relevant variables in the years 2022 and 2024. The selection was based on data availability and consistency to ensure the reliability of the regression model and comparability across firms.

Presentation of the main research material. The dependent variable is the profit margin in 2024, defined as net profit divided by operating revenue, which reflects a company's ability to convert revenue into profit.

The two independent variables are: 1) gearing ratio (2024) which is defined as total debt divided by equity, representing financial leverage, 2) R&D Intensity

(2022): measured as R&D expenditure divided by operating revenue, representing innovation efforts with a two-year lag to capture delayed returns on R&D investments.

All variables were converted into ratio form to normalize values across companies of different sizes.

First, Pearson correlation coefficients were calculated to examine the strength and direction of linear relationships between variables. This preliminary analysis helped identify the presence of multicollinearity and assess pairwise associations.

Following that, a multiple linear regression model was constructed with profit margin as the dependent variable and gearing and lagged R&D intensity as explanatory variables. The model included an intercept term along with coefficients representing the impact of each predictor. To assess the importance of these variables, statistical tests such as t-tests, p-values, and confidence intervals were used. The overall effectiveness of the model was measured using R-squared, Adjusted R-squared, and the F-statistics from ANOVA. A 5% significance level was applied throughout to determine whether the results were statistically meaningful.

The scatterplot illustrates a weak to moderate negative relationship between gearing and profit margin in 2024 (Figure 1). The downward-sloping trendline ($y = -0.0259x + 13.996$) implies that, on average, a one-unit increase in gearing is associated with a 0.026 percentage point decrease in profit margin. The spread of data points, especially in the low-to-mid gearing range, indicates that while leverage negatively affects profitability, it is not the sole explanatory variable — consistent with the modest R^2 value observed in the regression model.

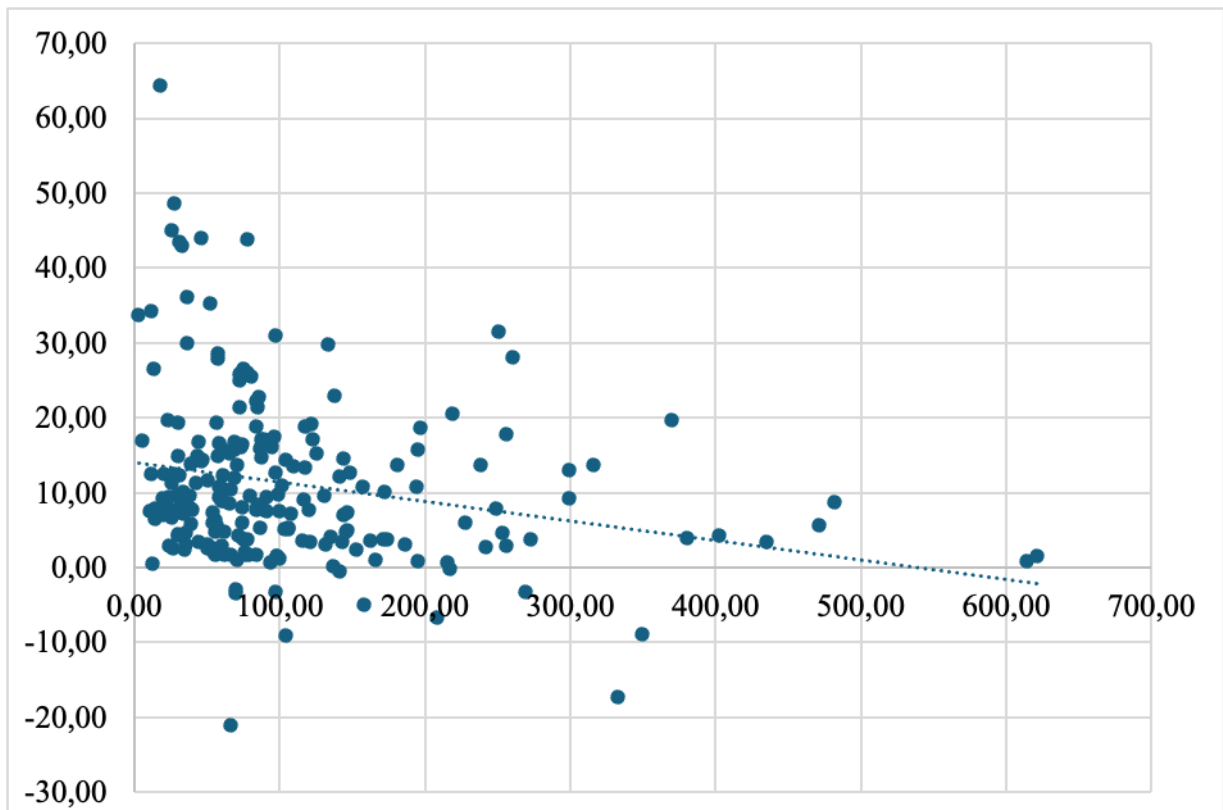


Figure 1. Scatter plot of the relationship between gearing and profit margin in 2024

Source: elaborated by the authors based on [9]

Correlation analysis reveals that gearing in 2024 has a weak negative correlation, meaning that as gearing increases, the profit margin tends to decrease slightly (Table 1). Gearing is not the dominant factor in determining profitability—there are other important drivers as well. This aligns with financial theory: while moderate debt can be beneficial (tax shield effect), excessive leverage increases financial risk and depresses margins due to financing costs.

Next one is R&D expense with moderate positive correlation, suggesting a meaningful relationship between prior R&D investment and future profitability. The time lag (2022 R&D vs. 2024 profit) is logical: R&D takes time to convert into marketable products or cost efficiencies. Firms that invested more in R&D in 2022 tended to enjoy higher profit margins in 2024—indicating a delayed but positive return on innovation. This supports endogenous growth theory and the

innovation-profitability linkage found in literature (e.g., Hall, 2010; Artz et al., 2010).

Table 1. Correlation statistics

	Profit margin 2024	Gearing 2024	R&D expenses / Operating revenue 2022
Profit margin 2024	1		
Gearing 2024	-0.23383706	1	
R&D expenses / Operating revenue 2022	0.329350028	-0.076685935	1

Source: elaborated by the authors based on [9]

Gearing and R&D have a weak negative correlation, essentially suggesting no meaningful relationship between debt level and prior R&D investment. This result implies that a firm's decision to invest in R&D two years earlier was not significantly influenced by how leveraged it is now. The data shows this is not a consistent trend across firms. Alternatively, it could reflect industry-specific norms: some industries (like pharma or tech) are both R&D intensive and willing to carry moderate debt, while others may avoid both.

The regression model based on 213 observations yields an R Square of 0.1522, indicating that approximately 15.2% of the variance in profit margin in 2024 can be explained by gearing and prior R&D intensity. While the model exhibits a statistically valid moderate correlation (Multiple R = 0.39), the relatively low R² suggests that additional variables—such as industry-specific dynamics or operational efficiency—likely contribute significantly to firms' profitability outcomes (Table 2). Nonetheless, the inclusion of R&D expenditure two years prior and current gearing offers valuable insight into structural financial influences on firm performance.

Table 2. Regression statistics

Multiple R	0.390172583
R Square	0.152234644
Adjusted R Square	0.144160689
Standard Error	10.38041595
Observations	213

Source: elaborated by the authors based on [9]

The regression coefficients show that both independent variables—Gearing (2024) and R&D expenditures relative to operating revenue (2022)—have a statistically significant impact on Profit Margin in 2024. Specifically, an increase in gearing by one-unit results in a decrease of 2.32 percentage points in profit margin ($p = 0.0012$) (Table 3), supporting the argument that excessive leverage undermines financial performance. Conversely, a one-unit increase in R&D intensity is associated with a 61.6 percentage point increase in profit margin ($p < 0.00001$), suggesting a strong positive lag effect of innovation on firm profitability. These results emphasize the dual role of financial structure and strategic investment in shaping long-term performance outcomes.

Table 3. Regression coefficients

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	11.14407439	1.195895149	9.318604897	1.6639E-17	8.786576634	13.5015721	8.78657663	13.5015721
Gearing 2024	-0.023208685	0.007048946	-3.29250443	0.00116502	-0.03710445	-0.00931292	-0.03710445	-0.00931292
R&D expenses /Operating revenue 2022	0.61579749	0.125268424	4.915823718	0.0000017797	0.36885274	0.86274224	0.36885274	0.86274224

Source: elaborated by the authors based on [9]

Conclusion and perspectives. This research sets out to examine how a firm's capital structure and historical investment in innovation jointly influence its profitability. By employing gearing as a measure of financial leverage and lagged R&D intensity as a proxy for innovation effort, the study sheds light on the interplay between short-term financial decisions and long-term strategic investments.

The findings confirm that both variables are statistically significant predictors of profit margin, although they exert opposing effects. The negative relationship between gearing and profit margin lends support to the trade-off theory, suggesting that high levels of debt may undermine profitability by increasing financial risk and interest obligations. In contrast, the positive relationship between R&D intensity (with a two-year lag) and profitability underscores the delayed but beneficial impact of innovation expenditure, consistent with prior literature on the long-term returns of R&D investment.

While the model accounts for a modest proportion of variance in profitability ($R^2 = 15.2\%$), the statistical significance of the results demonstrates the reliability of gearing and historical R&D intensity as partial indicators of firm performance. These insights offer practical guidance for corporate financial strategy: balancing debt exposure while maintaining steady innovation investment appears conducive to sustaining profitability, particularly in sectors where innovation is a key competitive driver.

Looking ahead, this study provides a replicable empirical framework for analyzing profitability using firm-level financial and innovation data. Future research may extend this approach by incorporating industry-specific models, broader time frames, or macroeconomic variables to enhance explanatory power and contextual accuracy. Additionally, policymakers could leverage similar models to assess the financial viability of firms when designing innovation incentives or debt-related regulatory measures. Overall, the research contributes to a more nuanced understanding of how capital and innovation strategies interact to shape corporate financial outcomes.

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