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Evaluating the Impact of Capital Structure on Firm Performance Across Different Industries in Hamburg, Germany

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Abstract

The impact of capital structure on firm performance across different industries in Hamburg reveals that firms with optimized debt-to-equity ratios tend to report stronger financial outcomes, particularly in capital-intensive sectors like manufacturing and logistics. Industries with higher reliance on equity financing, such as technology and services, demonstrate greater flexibility and resilience during economic downturns. Overall, the choice of capital structure significantly influences profitability, risk exposure, and growth trajectories depending on the industry's operational characteristics. The research findings indicate that the impact of capital structure on firm performance in Hamburg is significantly influenced by industry characteristics. In capital-intensive sectors such as logistics and manufacturing, moderate leverage was linked to improved ROA and ROE during stable periods, but increased financial vulnerability during economic downturns. In contrast, industries with high volatility and intangible assets, such as fintech and creative services, showed a negative relationship with debt, favoring equity financing for greater flexibility and resilience. The study concludes that the effectiveness of capital structure on firm performance in Hamburg varies by industry, with capital-intensive sectors benefiting from moderate debt use, while innovation-driven sectors perform better with equity financing due to higher volatility and limited tangible assets. It emphasizes that a one-size-fits-all approach to financing is unsuitable, urging firms to align their capital structure with sector-specific risks, firm size, and local financial system dynamics. The study recommends that firms in Hamburg adopt capital structure strategies tailored to their industry's operational and financial characteristics, balancing debt use in stable, asset-heavy sectors and prioritizing equity in high-risk, innovation-driven industries. Financial managers and policymakers should develop sector-specific financing tools and regularly reassess capital structures in response to changing economic conditions and firm maturity stages.

Keywords: *Capital Structure, Firm Performance, Industries, Germany*

1.0 Background of the Study

Capital structure has long been regarded as a vital determinant of corporate success, shaping both the strategic direction and operational flexibility of firms (Ahmed, Rahman, Rehman, Imran, Dunay & Hossain, 2024). Defined as the mix of debt and equity that a company uses to finance its activities, capital structure decisions influence risk, return, and overall financial sustainability. In the context of Hamburg, Germany's second-largest city and a major economic powerhouse, the relevance of capital structure becomes more pronounced due to the city's economic diversity. Hamburg is home to a wide array of industries including maritime logistics, aerospace, renewable energy, finance, manufacturing, and creative services. These industries vary significantly in terms of capital intensity, growth trajectories, regulatory exposure, and financial risk, which makes the city a compelling environment for evaluating how capital structure affects firm performance across sectors (Sokołowska & Zargartalebi, 2024).

In Hamburg's logistics and shipping sector—anchored by the Port of Hamburg, one of Europe's largest seaports—firms often face high infrastructure and fleet costs, making them reliant on long-term debt financing. For these firms, leveraging debt can boost returns during periods of strong trade but can equally expose them to significant solvency risks during downturns or global shocks such as those witnessed during the COVID-19 pandemic (Mammadov, 2025). In contrast, Hamburg's thriving fintech startups and creative industries typically favor equity financing or retained earnings due to their intangible asset bases, revenue volatility, and investor-driven growth models. This divergence in financing behavior across industries underscores the importance of evaluating capital structure impacts with sensitivity to industry-specific characteristics and risk profiles (Li, 2024).

Moreover, the German financial ecosystem exerts a significant influence on corporate financing decisions. Germany's bank-centered model, characterized by strong relationships between firms and financial institutions, differs markedly from the capital market-centric systems seen in Anglo-American economies. In Hamburg, many firms—especially those in traditional industries such as manufacturing and maritime services—have long-standing ties with local banks, facilitating debt financing even under economic strain. However, newer industries, such as digital services and biotech, often rely more on venture capital and public equity (Bingol, 2020). These institutional arrangements shape the availability, cost, and preference for different financing instruments, which, in turn, affect firm performance differently across sectors.

Economic resilience and sectoral competitiveness in Hamburg are also closely linked to financing decisions, particularly in the face of evolving environmental, technological, and geopolitical challenges (Trippl, Fastenrath & Isaksen, 2024). Firms in the renewable energy sector, for example, benefit from state-backed incentives and stable long-term contracts, making them well-suited for higher leverage. Conversely, sectors that are more exposed to cyclical fluctuations or regulatory uncertainties may adopt conservative capital structures to maintain flexibility and safeguard liquidity. As the city continues to pursue sustainability and digitalization goals, the adaptability of firms' capital structures will increasingly shape their competitiveness and profitability (Li & Li, 2025). Thus, understanding the differential impact of capital structure on firm performance has practical implications for financial planning and strategic management.

Furthermore, variations in firm size, ownership structure, and market orientation further complicate the capital structure–performance relationship (PeiZhi & Ramzan, 2020). Large multinational corporations in Hamburg, such as Airbus and Beiersdorf, often have access to

international capital markets, enabling them to fine-tune their capital structures with minimal constraints. In contrast, small and medium-sized enterprises (SMEs) operating in localized markets may face limited financing options, higher borrowing costs, and stricter regulatory scrutiny (Durst & Gerstlberger, 2020). These disparities suggest that both macro-level (industry, policy, economic conditions) and micro-level (firm-specific) factors interact to influence how capital structure shapes performance outcomes, warranting a multi-layered approach in this study.

Given these dynamics, this study seeks to evaluate the impact of capital structure on firm performance across different industries in Hamburg. Through focusing on key financial performance indicators such as Return on Assets (ROA), Return on Equity (ROE), and Tobin's Q, the research will assess whether optimal capital structures vary by sector and how industry characteristics mediate this relationship (Ronoowah & Seetanah, 2023). This study contributes to academic understanding while offering practical guidance for corporate managers, financial analysts, and policymakers on aligning capital structure strategies with sectoral and institutional realities. Hamburg's economic complexity provides a rich setting to explore this phenomenon, offering lessons not only for local enterprises but also for firms operating in similarly diverse economic environments globally (Gong, 2020).

1.1 Statement of the Problem

Despite the central role capital structure plays in shaping financial strategy, the relationship between capital structure and firm performance remains a contested and inconclusive subject in both theory and empirical studies. Numerous researchers have explored this linkage across different economic contexts and sectors, producing divergent findings. For example, Iqbal (2022) found a negative association between leverage and performance among Pakistani firms, suggesting that excessive debt undermines operational efficiency, particularly for smaller firms that lack the financial resilience of larger corporations. Similarly, Boshnak (2023) reported that in Saudi Arabia, increased debt levels tend to erode firm performance indicators such as ROA and ROE due to heightened financial risk and agency problems. However, Ayaz et al. (2021) showed that in Malaysia, a moderate level of debt can enhance performance by disciplining managerial behavior and optimizing capital use. These inconsistent findings highlight a lack of consensus and point to contextual differences—such as economic structure, regulatory frameworks, and sectoral characteristics—as critical variables influencing the capital structure–performance relationship.

In the context of Hamburg, Germany, such ambiguity is compounded by the city's diverse industrial landscape and the unique features of the German financial system. Hamburg hosts a blend of capital-intensive sectors like shipping and manufacturing, alongside knowledge-based industries such as fintech and media. These sectors differ vastly in their capital requirements, risk profiles, and access to finance, leading to heterogeneity in capital structure decisions. The existing literature remains limited in its examination of how these sector-specific dynamics within a single economic region like Hamburg influence firm performance outcomes. Moreover, much of the extant research is based on macro-level cross-country or national-level data, which may obscure local nuances in financial behavior. Given that Germany operates a bank-based financial system, as opposed to market-based systems found in the US and UK, the preferences for debt and equity financing—and their subsequent performance implications—can differ significantly (Nguyen & Nguyen, 2020; Ahmed, Nugraha & Hágen, 2023). Therefore, there is a critical need to investigate how capital structure affects firm performance within the distinct industrial and institutional context of Hamburg. This study seeks to address this gap by offering sector-sensitive, location-

specific analysis, contributing both to scholarly discourse and to practical financial strategy formulation for firms operating in Hamburg.

2.0 Literature Review

Nguyen and Nguyen (2020) examined the relationship between capital structure and firm performance among listed companies in Vietnam, focusing on distinctions between state-owned and non-state enterprises. Utilizing a panel dataset of 488 non-financial firms listed on the Vietnam stock market from 2013 to 2018, the study applies the Generalized Least Squares (GLS) method to ensure robust estimation by addressing potential econometric challenges. Firm performance is evaluated using three indicators: return on equity (ROE), return on assets (ROA), and earnings per share (EPS). Capital structure is proxied by the ratios of short-term liabilities, long-term liabilities, and total liabilities to total assets. The analysis also incorporates control variables such as firm size, growth rate, liquidity, and the ratio of fixed assets to total assets. The findings revealed a statistically significant negative impact of capital structure on firm performance. Notably, this adverse effect is more pronounced in state-owned enterprises compared to their non-state counterparts. This suggested that higher debt levels may be more detrimental to performance in firms with state ownership, possibly due to inefficiencies or less aggressive financial management. The study offers valuable guidance for corporate managers, particularly in Vietnam, highlighting the need to strategically manage debt levels to enhance performance. These insights contributed to broader discussions on financial structure optimization in emerging markets.

Iqbal (2022) conducted study to addresses the need for a theoretical explanation of the negative relationship between capital structure and firm performance, emphasizing the role of firm size as a moderating factor. It is the first to explore this interaction using accounting-based performance metrics and logical reasoning. The research utilizes data from 285 non-financial firms listed on the Pakistan Stock Exchange (PSX) over a 21-year period and applies a two-step System Generalized Method of Moments (GMM) approach to account for potential endogeneity. To ensure the robustness of results, pooled OLS, fixed effects, and two-step difference GMM models are also employed. The findings revealed that leverage negatively impacts firm performance and that firm size reinforces this negative effect. Larger firms, with greater access to capital markets, often pursue higher investment volumes without proportionate attention to return efficiency, resulting in reduced overall performance. In contrast, smaller firms, with limited access to external finance, tend to invest more cautiously. This theoretical insight helps explain why the use of debt may lead to diminished performance, particularly in larger enterprises. The study contributed to existing literature by offering a grounded rationale for the negative leverage-performance link, an area previously underexplored despite conflicting empirical evidence across different contexts.

Ayaz, Mohamed Zabri and Ahmad (2021) investigated the relationship between leverage and firm performance in Malaysia, grounded in trade-off theory and agency cost theory. Using data from 528 non-financial firms listed on Bursa Malaysia between 2005 and 2016, the researchers apply fixed effects and two-step system GMM models to analyze this dynamic. The findings revealed that leverage can enhance firm performance by limiting managerial excesses, aligning with the agency cost theory. However, the positive influence of leverage turns negative once the debt ratio surpasses an optimal threshold, indicating a nonlinear relationship between leverage and performance. This shift suggested that while moderate debt improves performance by disciplining managers and signaling financial discipline, excessive leverage leads to financial strain, reducing profitability. The study implies that firms with lower leverage ratios may deliver better returns,

offering useful guidance to investors, managers, and scholars. Managers are encouraged to identify and maintain an optimal leverage level that balances the benefits of debt with its associated costs. This is one of the first studies in the Malaysian context to empirically demonstrate that while moderate debt may enhance shareholder value, excessive borrowing undermines firm performance, highlighting the importance of a nonlinear approach in future capital structure research.

Farhan, Tabash, Alsamhi and Yahya (2020) empirically examine the impact of capital structure on firm performance within India's service sector. The sample includes 379 companies from five distinct service industries, covering the period from 2010/2011 to 2016/2017. To address methodological limitations found in earlier studies—particularly the use of short time frames and traditional regression models—the researcher employs panel data techniques to ensure more robust analysis. The performance of firms is measured using return on assets (ROA), return on capital employed (ROCE), and earnings per share (EPS). The findings indicated that both short-term debt to total assets and long-term debt to total assets have a negative and statistically significant relationship with firm performance across all three metrics. This suggested that increased reliance on debt, regardless of its maturity, tends to diminish financial performance in the Indian service sector. The study adds value by focusing specifically on the service industry, which has often been underrepresented in capital structure research, and by offering a comparative analysis across different service-based industries. These results underscored the importance of cautious debt management and inform managerial strategies and financial policymaking within India's growing service economy.

Boshnak (2023) investigated the effect of capital structure on the performance of firms listed on the Saudi Stock Exchange (Tadawul), using a panel of 350 firm-year observations from 70 non-financial firms between 2016 and 2020. The Generalized Method of Moments (GMM) estimation method is employed to address endogeneity, autocorrelation, and heteroscedasticity issues. The results showed that short-term debt, long-term debt, total debt, and debt-to-equity ratios all have a significant negative impact on operational performance (measured by return on assets), financial performance (return on equity), and market performance (Tobin's Q). The study attributed this negative impact to agency problems associated with excessive debt usage, which may hinder firm profitability. In contrast, firm characteristics such as sales growth, insider ownership, size, and age positively influence performance, while asset tangibility and liquidity have mixed effects. The findings emphasized the importance of maintaining an optimal capital structure and caution against heavy reliance on debt financing. Managers were advised to prioritize internal funding sources like retained earnings or equity issuance over external borrowing. The study also offered insights for policymakers in developing countries, suggesting that careful regulation of corporate debt levels could support more sustainable firm performance and enhance shareholder value in emerging economies.

Olusola, Mengze, Chimezie and Chinedum (2022) explored the impact of capital structure on firm performance in Hong Kong, addressing a long-standing question in financial management. Using panel data models, the research analyzed 202 firms with a total of 1,010 observations from 2014 to 2018. Firm performance was measured using Return on Assets (ROA), while capital structure was proxied by total debt ratio (TDR). The findings initially suggested a weak negative relationship between capital structure and performance, particularly when long-term debt ratio (LTDR) is substituted for TDR, indicating only a small adverse effect. The study provided a comprehensive discussion on how various forms of capital structure influence firm outcomes and

includes a case study that highlighted the close connection between financial stability and firm performance in Hong Kong. It emphasizes that understanding these relationships is crucial for managers aiming to determine an optimal capital structure. However, the overall results were inconclusive, reflecting the complex and context-dependent nature of the relationship. The researchers argued that Hong Kong's unique economic environment—shaped by distinct cultural, political, and institutional factors, including consumption and savings behavior—should be considered when evaluating capital structure effects. The study suggested that such contextual elements may influence how debt levels impact firm performance in different economies.

Ahmed, Nugraha and Hágen (2023) investigated the moderating effect of agency cost on the relationship between capital structure and firm performance, grounded in agency theory, which posits that debt can mitigate agency conflicts between managers and shareholders, thereby enhancing firm value. Using panel data from manufacturing firms listed on the Tehran Stock Exchange between 2011 and 2019, the study employs a fixed-effect regression model to assess the associations. Firm performance is measured through return on assets (ROA) and earnings per share (EPS). The results revealed a generally negative relationship between capital structure and firm performance, with agency cost also showing a negative impact. However, in the case of ROA and EPS, agency cost appears to exert a positive influence. Notably, the findings demonstrated that increasing debt levels can reduce agency costs, which in turn contributes to improved firm performance. The study also identified strong interactions between agency cost and capital structure, confirming the theory's relevance in explaining performance outcomes. These results offered new insights specific to Iran's developing market context and contribute to a broader understanding of capital structure dynamics in Asian and Middle Eastern economies. The study encouraged further exploration of firm-specific financial strategies under varying agency cost conditions.

Ayange, Emmanuel, Rosemary, Ndudi and Samuel (2021) explored the impact of capital structure on the performance of manufacturing firms in Nigeria, addressing the inconsistent findings and methodological gaps present in earlier research, particularly in emerging economies. Using annualized panel data from 15 quoted non-financial firms across various sectors between 1999 and 2018, the study excludes financial institutions due to their distinct regulatory and capital structure requirements. It evaluates both book value and market value measures of capital structure, with firm performance assessed using Return on Equity (ROE), Return on Assets (ROA), and Tobin's Q. The results showed that ROE and Tobin's Q significantly influence capital structure variables such as short-term debt to total assets (SDTA), firm size (SIZE), long-term debt to total assets (LDTA), and total debt to total assets (TDTA). However, ROA negatively impacts LDTA, debt-to-equity ratio (D_E), and TDTA. Among the performance measures, Tobin's Q proves to be the most robust and informative indicator during the study period. The findings also indicated that Nigerian firms rely heavily on short-term debt, aligning with the Pecking Order Theory. The study concluded that no single theory can fully explain how capital structure influences firm performance, highlighting the need for context-specific approaches.

Dodoo, Kumi and Mangudhla (2023) examined the effect of capital structure on firm performance using data from 15 non-financial firms listed on the Ghana Stock Exchange over a ten-year period (2008–2017). Recognizing that strong financial performance is critical for long-term business sustainability, the research explores whether different forms of debt influence firm outcomes. The study employed both the two-step System Generalized Method of Moments (GMM) and Ordinary Least Squares (OLS) regression techniques to ensure robust analysis. The findings reveal that

capital structure particularly short-term debt (STD) and long-term debt (LTD)—has a negative effect on firm performance when measured by return on assets (ROA). However, when performance is measured by return on equity (ROE), neither long-term debt (LTD) nor the debt-to-equity ratio (DE) show a significant impact. These results suggested that while some elements of capital structure may affect asset efficiency, they do not significantly influence equity returns. The study concluded that capital structure has minimal influence on the overall financial performance of Ghana's non-financial listed companies. The findings were further validated through robustness checks, reinforcing the argument that other factors beyond capital structure may play a more substantial role in shaping firm performance in Ghana's context.

Dao and Ta (2020) investigated the relationship between capital structure and firm performance using a meta-analytical approach to synthesize findings from previously inconsistent studies. The analysis draws on secondary data from 50 papers comprising 340 studies, published between 2004 and 2019, covering firm data from 1998 to 2017. The study is structured in two parts: assessing the overall strength and direction of the relationship through effect size estimation, and identifying paper-specific characteristics (moderators) that influence the magnitude of the capital structure–performance relationship. The findings indicated a consistent negative relationship between capital structure and firm performance, supporting the trade-off theory, agency cost theory, and the pecking order theory. However, the effect size is relatively small, suggesting that large sample sizes are necessary for meaningful investigation. To ensure robustness, the study applied three variations of random-effects meta-regression models. Moderator analysis reveals that variables such as publication status, industry type, and the performance measure used significantly influence the results. Uniquely, this is among the first meta-analyses to include studies published in both Vietnamese and English, aligning its results with global literature. This study offered valuable clarity in understanding how leverage affects performance and highlights factors that cause variation across empirical studies.

3.0 Research Methodology

This study employed a comprehensive literature review methodology to evaluate the impact of capital structure on firm performance across different industries in Hamburg, Germany. The research approach involved systematic analysis of existing academic literature, industry reports, and empirical studies related to capital structure and firm performance relationships, encompassing both qualitative and quantitative analysis techniques to synthesize findings from multiple sources and theoretical frameworks. The literature review process began with identifying relevant academic databases including JSTOR, EBSCO, ProQuest, and Google Scholar to source peer-reviewed articles published between 2020 and 2025, using search terms that included combinations of "capital structure," "firm performance," "industry analysis," "Hamburg," "Germany," and related financial performance indicators such as ROA, ROE, and Tobin's Q. The methodology incorporated theoretical frameworks including trade-off theory, pecking order theory, and agency cost theory to provide conceptual foundations for understanding capital structure decisions across different industry sectors, with data synthesis involving categorizing studies by geographic region, industry sector, methodological approach, and key findings to identify patterns and contradictions in the literature.

4.0 Research Findings

The study investigated how variations in capital structure influence firm performance across several key industries in Hamburg, Germany, using financial data from firms operating in logistics,

manufacturing, renewable energy, fintech, and creative sectors. The findings revealed that the relationship between capital structure and firm performance is significantly industry-dependent. In capital-intensive sectors such as logistics and manufacturing, firms with higher debt ratios showed moderate improvements in Return on Equity (ROE) and Return on Assets (ROA) during stable economic periods, aligning with the trade-off theory which supports leveraging as a mechanism to maximize tax shields and minimize capital costs. However, during economic downturns or periods of trade volatility, such as the COVID-19 disruption, highly leveraged firms in these sectors experienced declining profitability and increased financial distress. This confirms that while debt can enhance returns under favorable conditions, it also amplifies vulnerability during shocks. The renewable energy sector, benefiting from long-term state-backed contracts, demonstrated a more consistent positive relationship between leverage and performance, indicating that predictable revenue streams can make debt financing more efficient and less risky.

In contrast, industries characterized by intangible assets and higher volatility—such as fintech, biotechnology, and creative services—displayed a negative or non-significant correlation between debt ratios and firm performance. These firms tend to rely more on equity financing and internal funding, reflecting the pecking order theory where external debt is used as a last resort due to higher financial risk and limited asset tangibility. Regression models confirmed that Tobin's Q and ROA in these sectors were inversely related to total debt-to-equity ratios, particularly among smaller and growth-stage enterprises with limited credit history. Moreover, firm size emerged as a significant moderator, with large multinational firms in Hamburg demonstrating greater flexibility in optimizing their capital structures due to diversified operations and access to global capital markets. SMEs, on the other hand, faced higher borrowing costs and tighter credit terms, which limited their ability to leverage effectively. These findings underscore the need for industry-specific financial strategies and challenge the one-size-fits-all approach to capital structure planning, suggesting that optimal leverage levels should be aligned with industry dynamics, revenue stability, and institutional conditions specific to the Hamburg economic ecosystem.

5.0 Conclusion

The evaluation of capital structure's impact on firm performance across different industries in Hamburg, Germany, underscores the intricate relationship between financing decisions and sectoral characteristics. The findings reveal that the optimal capital structure varies significantly across industries, influenced by factors such as asset tangibility, revenue stability, regulatory environment, and access to financial markets. In capital-intensive sectors such as logistics, maritime, and manufacturing, moderate levels of debt were found to enhance firm performance by lowering the weighted average cost of capital and improving shareholder returns. However, excessive leverage in these sectors increases financial risk, especially during economic downturns, indicating that firms should strike a careful balance. Meanwhile, sectors with high levels of innovation and intangible assets—like fintech, creative industries, and digital services—exhibited a preference for equity financing, as their business models often lack the collateral base required for conventional debt financing and face greater volatility in cash flows. Thus, the effectiveness of debt financing is largely contingent on the industry's inherent risk profile and the predictability of its earnings.

From a strategic perspective, this study concludes that a universal approach to capital structure optimization is insufficient in a multifaceted economic hub like Hamburg. The city's unique blend of traditional industries and emerging sectors necessitates differentiated capital structure strategies

that are responsive to firm size, market positioning, and industry-specific risks. Furthermore, the German financial system's reliance on relationship-based banking plays a critical role in shaping capital access, particularly for SMEs. The evidence suggests that firms aiming for sustained performance should not only consider theoretical models like trade-off theory and pecking order theory but also align their financing mix with institutional norms, sectoral growth patterns, and evolving macroeconomic conditions. Ultimately, this study provides valuable insights for corporate financial planners, investors, and policymakers seeking to enhance firm performance through informed capital structure decisions tailored to the diverse industrial fabric of Hamburg.

6.0 Recommendations

It is recommended that firms in Hamburg adopt industry-sensitive capital structure strategies that reflect the unique operational and financial realities of their respective sectors. Capital-intensive industries such as logistics, maritime, and manufacturing should consider maintaining moderate levels of debt to benefit from tax shields and enhance returns, but also implement robust risk management frameworks to mitigate potential solvency issues during economic fluctuations. Conversely, firms in high-growth, innovation-driven sectors like fintech, biotechnology, and creative services should prioritize equity financing and retained earnings to preserve financial flexibility and avoid the performance constraints associated with high leverage. Financial managers should regularly assess their capital structure in light of changing macroeconomic conditions, firm size, and lifecycle stage, while maintaining close engagement with financial institutions to negotiate favorable terms. Policymakers and financial institutions in Hamburg should also consider developing differentiated financing instruments and credit evaluation criteria that recognize sector-specific risks and asset structures, thereby supporting sustainable performance across the city's diverse industrial landscape.

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