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RESEARCH ARTICLE

Determinants of Corporate Capital Structure and the Emerging Role of Intangibles and Innovation: The Case of Japanese Corporations[1]

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This study aims to modernize capital structure determinants in line with changing economic environments by incorporating the function of intangible assets, particularly innovations, into capital structure decisions. Traditional independent variables such as tangibility, firm size, profitability, growth opportunities, and profitability have been thoroughly researched, but the growing importance of intangible assets and innovations in the contemporary economy with advanced technology calls for a reassessment of their impact on capital structures. I examine 95 enterprises listed in the Nikkei over 11 years (2014–2024) using cross-section generalized least squares regression and dynamic panel data estimation. Results show that corporate leverage decisions (debt-to-equity ratio) across Japanese firms are still significantly shaped by conventional factors, but innovations and intangible assets emerge as important determinants. Manufacturing companies have lower leverage than non-manufacturing companies, with tangibility as the main collateral. Higher market capitalization leads to decreased debt-to-equity ratios, suggesting a reshaping of capital markets for firms.

Keywords: capital structure, financial, innovation, intangibles

JEL Classifications: G32 , G3 , G34

The capital structure of a corporation, measured in terms of debt-to-equity ratio, is fundamental in determining its financial health and strategic direction. Its traditional determinants, such as profitability, asset structure, growth opportunities, and market conditions, have been extensively studied in financial literature. However, the increasing prominence of intangible assets and innovations in the modern economy necessitates a re-evaluation of these determinants. Intangible assets, including intellectual property, brand reputation, and human capital, have become pivotal in driving corporate value and competitive advantage. In the digital economy, innovations (research and development) are imperative in the conduct of modern businesses.

The rise of technology-driven sectors and the transition to a knowledge-based economy have increased the value of these assets. Intangible assets are becoming increasingly essential in the modern economy.

Lev and Daum (2004) noted that the emergence of the knowledge economy has resulted in a large increase in the share of intangible assets on corporate balance sheets. These assets frequently give competitive advantages and are essential for a company's long-term development. Innovations have revolutionized modern economic activities, and the capitalization or expense of research and development (R&D) has altered how organizations are financed and structured.

This study aims to fill this gap by examining the role of intangible assets and innovations in shaping corporate capital structures. By integrating traditional financial metrics with measures of intangible assets and R&D, this paper provides an empirical analysis of the factors influencing a firm's leverage decisions. The objectives of this research are threefold: (a) to identify and quantify the traditional determinants of capital structure in the classic capital structure theories; (b) to investigate how capital structures differ across Japanese sectors of manufacturing and non-manufacturing; and (c) to present the emerging role of intangible assets and innovations in influencing leverage decisions.

This study highlights the significance of managing intangible assets and innovations alongside traditional financial metrics to optimize capital structure, providing a refined framework for evaluating firm value and risk profiles in the context of intangible-driven growth. Firms that effectively leverage their intangible assets while maintaining a balanced capital structure are likely to achieve sustainable growth. I therefore explore the research question: How do determinants of capital structures, including intangibles and innovations, impact the debt-to-equity ratio of Japanese manufacturing and non-manufacturing corporations?

This research is positioned within the existing body of literature on corporate finance and presents a contemporary perspective on capital structures, taking into account the evolution of businesses over time. I provide empirical evidence from Japanese corporations that has a substantial impact on global trade and the economy, particularly in relation to mergers and acquisitions, the establishment of goodwill and other intangible assets, and the capitalization and expensing of research and development.

Objectives of the study:

1. To revisit and reestablish the significant determinants of the corporate capital structure of Japanese companies;
2. To explore the differences between manufacturing and non-manufacturing sectors;
3. To present the emergence of intangibles and innovations as significant determinants of capital structures.

Literature Review

Capital structure theory is a fundamental area of financial research, focusing on the optimal mix of debt and equity financing to maximize a firm's value. Key theoretical frameworks and empirical findings are presented in this review, with a particular focus on Japan and contrasted with Western developed economies. The Modigliani-Miller theory (Modigliani & Miller, 1958) is the foundation of modern capital structure theory, asserting that in an efficient market, without taxes, bankruptcy costs, agency costs, and asymmetric information, the value of a firm is unaffected by its capital structure.

The trade-off theory emerged as a response to unrealistic assumptions of the Modigliani-Miller theory, introducing the concept of a balance between the tax advantages of debt financing and the costs of potential financial distress in search of the optimal debt-to-equity ratio (Graham, 2000; Kraus & Litzenberger, 1973). Graham (2000) pointed out that growth firms use debt conservatively; likewise, large, profitable, and liquid firms also use debt sparingly.

The pecking order theory proposes that firms prefer internal financing over external financing (Myers & Maljuf, 1984; Fama & French, 2002), and, if external financing is required, debt is preferred over equity. Empirical evidence by Fama and French (2002) has tested these theories with mixed results, with some finding support for the trade-off theory but also not fully exploiting the tax benefits of debt (Graham, 2000). Capital structure determinants vary across countries and are influenced by different institutional and market environments (Kumar et al., 2017).

In Japan, the *keiretsu* system, characterized by interlocking business relationships and shareholdings, has influenced capital structure decisions. Hoshi et al. (1991) revealed that Japanese firms with close banking relationships have easier access to debt financing,

suggesting that these firms rely more on debt than equity, supporting the trade-off theory. Nakamura (2006) linked the bank-based *keiretsu* systems with debt financing but noted that the shift in capital markets and funds flow to Japan in the 1990s turned to external equity financing, thereby reducing their reliance on bank loans.

Frank and Goyal (2009) introduced intangible assets alongside tangible assets as determinants of capital structure. However, they undermined the impact of intangible assets as these are not easily assigned a value by external financers, particularly goodwill resulting from a business acquisition. Consequently, they considered an analogous prediction that making large discretionary expenditures on selling, general and administrative expenses, and R&D have more intangible assets and consequently less debt (Frank & Goyal, 2009).

Japanese firms are known for their high investment in R&D and innovation, which are primary components of intangible assets. Hoshi et al. (1991) examined Japanese firms and found that those with higher R&D intensity tend to have lower debt ratios. Similarly, innovative Japanese firms rely more on equity financing to preserve financial flexibility and avoid the constraints of debt financing.

Corporate governance, characterized by close relationships with banks, also impacts the capital structure decisions of firms with substantial intangible assets. Aoki et al. (1994) highlighted that Japanese firms with significant intangible assets often maintain lower leverage due to the stringent collateral requirements of banks.

Japan as a Debt-Oriented Economy

Japan, a debt-oriented economy, has a high debt-to-GDP ratio exceeding 200%, resulting in fiscal deficits and national debt accumulation. The "Lost Decade" in the early 1990s led to extensive fiscal stimulus and increased public debt. Japan's aging population also contributes to the issue, with increasing social security and healthcare expenditures (Hansen & Imrohoroglu, 2016). High national debt can lead to higher interest payments, limiting fiscal policy flexibility, and investor concerns about fiscal sustainability (Doi et al., 2011). However, Japan's majority of debt is held domestically, mitigating the risk of a sudden loss of investor confidence. To address high debt levels, Japan has implemented policy measures like consumption tax increases and fiscal consolidation efforts. However, the effectiveness of these measures is debated, and without significant structural reforms, Japan's debt situation may remain precarious.

Currently, the debt-to-equity balance of Japanese companies is skewed toward debt, which is their preferred method of financing. Although debt takes precedence over equity, the majority of equity holders in Japanese companies are the same banks (or investment houses). Nakamura (2006) provided evidence that bank loans play an important role in Japanese enterprises' capital structures, reflecting the country's banking-oriented financial system. Additionally, institutional investors have a considerable impact on firms' leverage decisions and corporate governance standards. According to Nakamura (2006), the interaction between banks and institutional investors is a fundamental determinant of capital structure in Japan, as opposed to the capital market-oriented systems found in Western nations.

Determinants of Capital Structure of Japanese Manufacturing Companies

In a 2012 paper, Cortez and Susanto explored firm size, profitability, asset tangibility, growth opportunities, non-debt tax shields, and industry effects as determinants of corporate financial performance of Japanese manufacturing companies. They found that larger Japanese firms tend to have higher leverage ratios. This is attributed to the lower risk of bankruptcy and the greater ease with which large firms can access credit. Additionally, larger firms often benefit from better relationships with creditors, reducing the need for collateral.

Cortez and Susanto (2012) further posited that there is a negative relationship between profitability and leverage, consistent with the pecking order theory. Profitable firms prefer using internal funds over external debt to avoid the costs associated with issuing debt and to maintain financial flexibility (Kayhan & Titman, 2007). Firms with higher tangible assets are more likely to use debt financing. Tangible assets serve as collateral, reducing the risk for lenders and thus encouraging higher leverage. Furthermore, firms with significant growth opportunities tend to have lower leverage. High-growth firms prefer equity financing to avoid the restrictions and risks associated

with debt. Additionally, these firms may find it challenging to obtain debt due to the riskier nature of their investments.

Furthermore, Cortez and Susanto (2012) observed a negative relationship between non-debt tax shields (such as depreciation) and leverage. This aligns with the trade-off theory, which suggests that non-debt tax shields can substitute for the tax benefits of debt, reducing the need for leverage. The industry in which a firm operates also influences its capital structure. Different industries have varying asset structures, risk profiles, and financing needs, which impact their leverage decisions. The study highlights that firms with significant ownership by financial institutions or foreign entities tend to have lower debt levels. This is due to the influence these owners have on corporate governance and risk management practices, which often leads to more conservative financing strategies.

Research Gap

Cortez and Susanto (2012) provided a detailed examination of how various factors, including firm size, profitability, asset tangibility, growth opportunities, non-debt tax shields, industry effects, and ownership structure, influence the capital structure of Japanese manufacturing firms. Similarly, Ozkan (2001) presented panel data on U.K. companies and how companies adjust their capital structures to meet long-term goals, whereas Rajan and Zingales (1995) presented non-financial international corporations from G-7 countries. In a summary analysis of determinants of capital structure studies over the past 40 years, Kumar et al. (2017) found that the majority of studies are conducted on large-sized firms from developed economies, with secondary data and regression as the dominant statistical technique at the organizational level and are framed by the pecking order theory. They showed conflicting coefficients supported by the static trade-off theory and the pecking order theory on profitability, size, tangibility, liquidity, age, growth, management ownership, distinctiveness, operating cash flow, non-debt tax shield, company risk, bankruptcy, and dividend payout.

However, over the last decade, business environments and the global investment climate have changed as a result of mergers and acquisitions, goodwill recognition, brand valuation, R&D capitalization, integrated enterprise systems, and online transactions becoming common business activities. Manufacturing companies now rely on technology-enabled enterprise and fulfillment systems, whereas customers use electronic wallets, make purchases online, transfer payments, and invest online. These highlight the growth of intangible assets and innovations as key determinants of how modern corporations structure their organizations. Intangible assets, such as intellectual property, brand value, and human capital, have distinct features that separate them apart from tangible assets and influence how businesses finance their operations.

Based on the foregoing literature, apriori expectations arise accordingly:

Table 1. *Apriori Expectations of the Relationship Between Capital Structure and its Determinants Dependent Variable: Debt-to-Equity Ratio*

Independent variables	Trade Off Theory	Pecking Order Theory
Tangibility	+	-
Profitability	+	-
Firm size	+	-
Growth	-	+
Non-debt tax shield	-	+-
Intangibles & innovation		

Excerpt from Kumar et al. (2015); Cortez and Susanto (2012).

The pursuit of a unified theory on capital structure decisions remains elusive as a result of the numerous factors that influence these decisions across various economic landscapes. The trade-off and pecking order theories provide valuable insights into the prospective impact of these factors on the financial performance of firms and the process by which they make financing decisions. Nevertheless, the impact of intangibles and innovation on capital structures has not yet been definitively established. Instinctively, it may be perceived as having an inverse relationship with tangibility. Consequently, this paper inexorably delves into the development of theories and frameworks regarding the role of intangible assets as a new determinant of corporate capital structure.

Methodology

This descriptive-exploratory study employs a quantitative research approach to investigate the determinants of corporate capital structure as originally posited by Cortez and Susanto (2012) and the emerging role of intangible assets and innovations. By analyzing panel data of Nikkei 225 companies across industries from 2014 to 2024, this research aims to provide empirical insights into the factors influencing leverage decisions in the context of contemporary corporate finance.

Archival secondary data gathered from Bloomberg and EOL financial databases were verified across annual financial statements for inconsistencies. These financial databases provide comprehensive and summarized information on financial metrics, including leverage ratios, profitability indicators, asset structures, intangible asset valuations, and R&D, among others. The dataset covers a sample of 95 firms operating across manufacturing and non-manufacturing companies listed in the Nikkei 225 over a period of 11 years from 2014 to 2024. Variables that did not have complete observations over many years and were tedious to fill in were dropped, as in the case of price-earnings ratio, weighted average cost of capital, and so forth.

The dependent variable is the firm's capital structure, measured as the debt-to-equity ratio. The independent variables are tangibility (net fixed assets), profitability (return on assets, profit margin, and net income), firm size (market capitalization, number of employees), growth (year on year asset total asset growth rate, year on year net fixed asset growth rate, compounded annual growth rate of net sales), and non-debt tax shield (depreciation). The measures of intangible assets (e.g., goodwill, intellectual property, brand value, human capital) are the reported intangibles in the annual financial statements, whereas innovation is measured in terms of reported R&D.

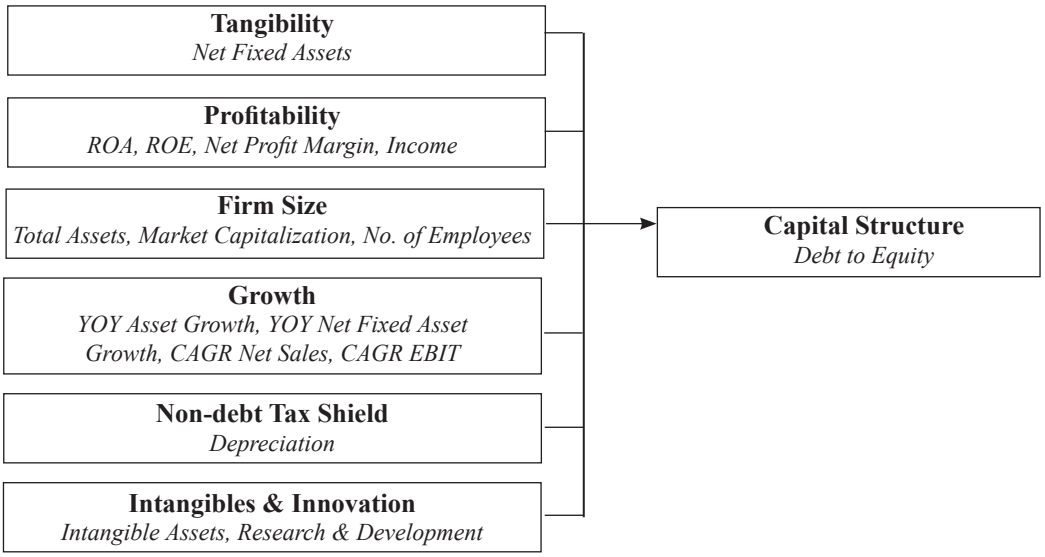

Figure 1
Conceptual Framework – Determinants of Capital Structure in Japan

Model Specification

The econometric model can be specified as follows:

$$Capital\ Structure = \beta_0 + \beta_1 Tangibility + \beta_2 Profitability + \beta_3 Firm\ Size + \beta_4 Non\text{-}debt\ Tax\ Shield + \beta_5 Growth + \beta_6\ IntanglesInnovation + \varepsilon$$

Whereas:

- Capital Structure: the dependent variable represented by debt-to-equity ratio.
- β_0: This is the intercept of the model, which represents the average capital structure when all the independent variables are zero (which is not likely in reality).
- β_1 - β_5: These are the coefficients of the independent variables. They represent the change in capital structure associated with a one-unit change in the respective independent variable, holding all other variables constant. However, for purposes of this research, I only consider the sign of the coefficients and not its predictive power.
- Tangibility: This variable captures the relative ease with which a firm's assets can be converted to cash. Firms with higher tangibility (i.e., more tangible assets) are generally expected to have less debt due to lower bankruptcy risk, which is measured as net fixed assets.
- Profitability: This variable is measured by ROA. Firms with higher profitability are expected to have lower debt levels as they can rely more on internal funds for financing, hence a negative coefficient expectation.
- Firm size: Larger firms tend to have more borrowing capacity and easier access to capital markets. Therefore, firm size is often expected to be positively related to capital structure. This is measured by total market capitalization and the number of employees.
- Non-debt Tax Shield: This variable refers to tax benefits a firm receives from expenses other than interest payments. A higher non-debt tax shield reduces the tax burden of debt, making debt financing more attractive. So, it is expected to have a positive relationship with capital structure. I measured it with depreciation expenses.
- Growth: Firms with high growth prospects may require more capital to finance their expansion. This can lead to a higher capital structure with more debt financing. This is measured with year-on-year (YOY) growth in assets, YOY growth in fixed assets, and CAGR sales.
- Intangibles and innovation: Intangibles are the reverse of fixed assets that arise from mergers and acquisitions, such as goodwill. It includes intellectual properties, copyrights, brand value, trademarks, and so forth. Innovation is measured in terms of research and development. Being intangible in nature, its coefficient is deemed inversely related to tangibility as well as to capital structure.
- ε: This is the error term, which captures the unexplained variation in capital structure not accounted for by the independent variables in the model.

Hypothesis Testing

H1: Tangibility, firm size, and growth positively determine capital structure; profitability and non-debt tax shield negatively determine capital structure.

The trade-off theory contextualized within the Japanese debt-oriented economy posits the positive correspondence due to the collateralization of tangible assets in the financing scheme. As hypothesized by Cortez and Susanto (2012), net fixed assets positively affect debt-to-equity ratio.

As to firm size, the trade-off theory states that bigger companies have lower chances of bankruptcy. Thus, companies are able to borrow more money because creditors are likewise willing to lend. A positive relationship between size and leverage is confirmed by Sayilgan et al. (2006) on Turkish manufacturing companies.

Studies that support the trade-off theory suggest that high-growth companies will have lower leverage due to the reluctance of creditors and the company to lend and borrow money. Firms that are expanding may perceive that their flexibility will be compromised if they obtain financing through debt. For the same reason, creditors may be hesitant to provide loans to expanding businesses that undertake numerous risky projects. This is because they wish to limit corporations to investing exclusively in secure initiatives to mitigate the risk of bankruptcy. On the other hand, proponents of the pecking order theory argue that expanding businesses necessitates a substantial amount of capital

and may seek additional capital from creditors. The risks of financing in the case of Japanese enterprises are mitigated by the close relationship between the corporations and their creditors. If the necessity for capital arises, Japanese companies will be obligated to increase their debt.

The trade-off theory holds that the tax-reducing feature of debt can be replaced with non-debt tax shield offered by depreciation expense.

H2. Manufacturing companies and non-manufacturing companies in Japan have different determinants of capital structures.

The trade-off theory posits that firms would utilize debt financing in lieu of cash flows from profitable operations. The expectation is that profitability will result in a company being more creditworthy, which will lead to a positive correlation. However, from the pecking order theory perspective, and more instinctively, profitable companies tend to prioritize the use of internal funds derived from profitable operations because it is more cost-effective than borrowing from external sources and paying attendant interest. Allen and Mizuno (1989) contended that profitable companies frequently issue their stock to mitigate the discrepancy between the book value and the market value of their stock. This will lead to a negative correlation between profitability and debt-to-equity. This is corroborated by Titman and Wessels' (1988) evidence from manufacturing corporations in the United States.

Considering differences in the nature of Japanese manufacturing and non-manufacturing, I predict varying signs of coefficients for cross-comparative analysis.

H3: In addition to the traditional determinants of capital structures, intangibles and innovations significantly determine the capital structures of Japanese companies.

The impact of innovation and R&D on capital structures is also influenced by sectoral differences. In high-tech industries, where R&D is a critical component of business strategy, firms exhibit distinct financing behaviors in comparison to traditional sectors. In the Japanese context, research has demonstrated that firms with a higher level of R&D intensity tend to have lower leverage ratios. The impact of intangibles and innovations on capital structure is not immediate and possibly has lingering effects on financial performance and capital structure. Therefore, I explore dynamic panel modeling to capture these delayed impacts, which is yet atheoretical and propositions have yet to be established in academic literature.

Results and Discussions

Data Presentation and Descriptive Statistics

I performed cross-section generalized least square regression across 95 listed companies in the Nikkei 225, covering a period of 11 years (2014 to 2024) with 1,045 observations. The firms were purposively chosen according to the completeness of the data. Sub-groups of 74 manufacturing and 21 non-manufacturing firms were set to establish their differences (See Table 2).

Manufacturing companies have a mean debt-to-equity ratio of 46.39791, whereas non-manufacturing companies have 75.48753, revealing that non-manufacturing companies are more debt-reliant. The Kruskal-Walis test validates that the two sub-groups have distinct differences in debt-to-equity ratio with a chi2 of 86.992 and p-value of 0.0001. Likewise, I performed a T-test statistical analysis to reveal that the observed difference in means is 52.36511 with a 95% confidence interval of [45.27681, 59.45341], indicating that the true difference in population means is likely to fall within this range. Finally, I performed a Kolmogorov-Smirnov test statistics to support the significant differences and that non-manufacturing firms' distribution is not significantly different from the overall distribution. However, manufacturing companies have significantly differences from the overall distribution with lower debt-to-equity ratios. The combined test confirms that there is a significant difference in distributions between the two groups. These tests immediately answer my third hypothesis, subject to further analysis.

Interpretation of Results

My initial approach to the first hypothesis is to run a cross-section generalized least squares regression for all sampled Japanese companies with debt-to-equity as the dependent variable. Table 3 presents the results.

Table 2. *Descriptive Statistics*

Variable	Obs	Mean	Std. dev.	Min	Max
Year	1,045	2019	3.163792	2014	2024
Firm	1,045	48	27.43575	1	95
Manufacturing or non-manufacturing	1,045	0.7789474	0.4151545	0	1
Debt to equity	1,045	57.97336	53.08834	0	395.2208
Return on assets	1,045	4.384357	4.236175	-30.8453	26.3313
Employees	1,045	48569.49	70973.31	1085	434850
Intangibles	1,045	2039.895	6205.878	0	81171.98
Total assets	1,045	34604.73	73890.28	1650.927	624293
Fixed assets	1,045	16691.21	27218.76	158.4636	238386.5
Market capitalization	1,045	16756.3	28547.88	902.085	408845
Total asset growth	1,045	7.375274	40.49214	-34.1666	1269.487
Net fixed assets growth	1,045	5.079291	11.95812	-40.5755	148.1238
CAGR net sales	1,045	3.345447	5.978822	-20.8339	41.5274
EBIT CAGR	973	9.85059	21.7003	-61.0842	214.1732
Depreciation	1,045	973.6637	1869.519	28.5146	16224.97
GAAP R&D	1,045	683.8075	1389.497	0	10286.1

Table 3. *Determinants of Capital Structure, All Companies, 2014 to 2024, 95 Firms*

Dependent variable: Capital structure (debt-to-equity) ratio)						
	Coefficient	Std. Error	β (z)	P > |z|	95% confidence interval	
Tangibility						
Fixed assets	.0021594	.0001415	15.26	0.000	.001882	.0024368
Profitability						
Return on assets	-4.063355	.3762914	-10.80	0.000	-4.800873	-3.325838
Firm size						
No. of employees	-.0000844	.000267	-3.16	0.002	-.0001366	-.0000321
Market capitalization	-.000453	.0000829	-5.47	0.000	-.0006153	-.0002906
Non-debt tax shield						
Depreciation	-.0047548	.0024407	-1.95	0.051	-.0095385	.0000289
Growth						
CAGR net sales	.3195638	.2481679	1.29	0.198	-.1668363	.8059638
Total assets year-on-year	-.0418443	.0324933	-1.29	0.198	-.1055301	.0218415
Intangibles	.0018367	.0002554	7.19	0.000	.0013361	.0023373
Research & development	-.0219823	.0019621	-11.20	0.000	-.025828	-.0181366

All the determinants of financial performance significantly affect the capital structures of the sampled Japanese companies. The positive coefficient of tangibility (fixed assets) over debt-to-equity is supported by the trade-off theory. This is consistent with the expected results that tangible resources are easy collateral for debt financing. This confirms earlier findings by Frank and Goyal (2009) that tangible assets, such as property and equipment, can easily be assigned value by external financers compared to intangibles. However, I present a different and emergent view that while tangibility matters significantly, intangibles are equally valuable in determining capital structures. Frank and Goyal (2009) argued that firms with more intangible assets tend to have lower leverage because intangible assets are generally harder to collateralize than tangible assets. On the contrary, I present the positive relationship of intangibles with debt-to-equity and suggest that firms invest in goodwill, patents, copyrights, and other intellectual properties as a result of mergers and acquisitions (M&A). Goodwill arises from the excess of acquisition price over the tangible net worth of acquired companies. This increases debt over equity in the collateralization process of M&A strategies.

Meanwhile, the negative coefficients of profitability, firm size, and non-debt tax shield are supported by the pecking-order theory. Profitable firms tend to raise capital internally by using retained earnings instead of debt, which is next in their options, before considering issuing new equity. The negative coefficient of profitability over debt-to-equity is supported by the findings of Kayhan and Titman (2007). As for my overall results in the cross-section analysis, growth initially appears to have an insignificant impact on capital structure. However, in the discussion below, I present a lagged effect in the dynamic panel model estimation.

Furthermore, the varying results for growth are two-pronged. Ideally, there should be a positive coefficient of CAGR net sales according to the pecking order theory. As firms compound revenues that lead to profitability, they opt for debt financing to further promote growth (Graham, 2000), considering that the typical source of funds in Japan is through banks. On the other hand, the negative coefficient of asset growth is likewise provided by the pecking order theory, suggesting that internal resources are first needed to sustain growth and confirm earlier findings by Cortez and Susanto (2012). However, the overall cross-section panel analysis for growth has been rendered insignificant for capital structure. Later in the discussion, I will consider the differences between manufacturing and non-manufacturing and any lagged effects.

Meanwhile, R&D appears to have a negative but significant relationship with capital structures. It is seen by its very nature of generally accepted accounting principles treatment of expensing outright in the absence of any feasible economic value. However, for every increase in R&D expenditure, debt-to-equity decreases, suggesting efficiency levels in consonance with profitability. This confirms the findings by Hoshi et al. (1991) and Aoki et al. (1994).

I pursue the following argument by looking closely into the negative coefficient of firm size over capital structure. This shows that the bigger the market capitalization and number of employees a firm has, the lower its debt-to-equity. This follows the findings of Cortez and Susanto (2012).

In the foregoing, the pecking order emerges as the predominant theory that frames how Japanese companies structure their capital. I partially accept Hypothesis 1, stating that tangibility and firm size have a positive impact on capital structure. I qualify the negative and significant coefficient of the number of employees, a variable that measures firm size, and elaborate in the next discussions on productivity and efficiency. I likewise accept the second part of Hypothesis 1, which states that profitability and non-debt tax shields negatively determine capital structure.

Furthermore, I accept Hypothesis 3, which states that intangibles and R&D significantly determine capital structures, but with conflicting coefficients. Due to generally accepted accounting principles treatment, intangibles may be capitalized, particularly goodwill, patents, enterprise systems, and intellectual and proprietary systems. These are assigned values in the process of M&A as a result of the excess of acquisition prices over the tangible worth of companies. Financing is necessary for business combinations. On the other hand, R&D negatively determines capital structure, suggesting that innovative firms rely more on equity financing to preserve financial flexibility and avoid the constraints of debt financing (Hoshi et al., 1991).

In the next discussion, I break down the cross-section analysis into manufacturing and non-manufacturing sectors and highlight their major differences.

The Case of Japanese Manufacturing Companies

The cross-section generalized least squares regression of 74 sampled manufacturing firms from the Nikkei 225 over a period of 11 years from 2014 to 2024 somehow mirrors the earlier results from all the sampled companies. However, there is a slight difference, which brings my discussion to the positive coefficient of the non-debt tax shield measured in terms of depreciation. Although it technically increases profitability as an expense and as a tax deduction, it still follows the heavy tangibility of manufacturing companies by its very nature. Being highly collateralized, the increase in depreciation expenses is explained by the trade-off theory, which states that firms opt for debt financing, considering that the Japanese economy is debt-oriented. However, as earlier discussed in the T-test statistics, manufacturing companies have lower debt-to-equity means than non-manufacturing companies.

My results support the trade-off theory but remain partial to pecking order considering all the signs of the mentioned significant relationships between determinants and capital structure shown in Table 4.

The Case of Japanese Non-Manufacturing Companies

Non-manufacturing companies present stark differences from manufacturing companies. The positive impact of its tangibility over capital structure is supported by the trade-off theory. However, profitability and growth did not show any significance. Firm size and non-debt tax shield have significant negative coefficients. Meanwhile, intangibles significantly and positively determine capital structures; R&D did not render any significance (see Table 5).

In reference to the t-test, non-manufacturing companies are more heavily indebted, and I trace the positive coefficients toward tangibility and intangibility. It can be argued that in contrast to Frank and Goyal (2009), the aggregate tangible and intangible assets both have value for debt financing. In this age of M&A, firm valuation is significantly determined by its goodwill. New constructs could be explored, such as human capital and proprietary technologies, that bring new levels of operational efficiencies.

The negative coefficient of market capitalization over debt-to-equity suggests the precedence of the pecking order theory. It suggests that a higher market capitalization brings lower reliance on debt while highlighting shareholder pressure to lower debt-to-equity ratios (see Tables 2,3,4).

Table 4. *Determinants of Capital Structure, Manufacturing Companies, 2014 to 2024, 74 Firms*

Dependent variable: Capital structure (debt-to-equity) ratio)

	Coefficient	Std. Error	β (z)	P > |z|	95% confidence interval	
Tangibility						
Fixed assets	.0008773	.0001253	7.00	0.000	.0006318	.0011228
Profitability						
Return on assets	-4.057968	.2838507	-14.30	0.000	-4.614305	-3.50163
Firm size						
No. of employees	-.0001349	.0000254	-5.31	0.000	-.0001366	-.0000851
Market capitalization	-.0005303	.0000599	-8.85	0.000	-.0006478	-.0004128
Non-debt tax shield						
Depreciation	.0060912	.0018977	3.21	.001	.0023717	.0098108
Growth						
CAGR net sales	.6354801	.2315685	2.74	0.006	.1816141	1.089346
Total assets year-on-year	-.0418443	.0324933	-1.29	0.198	-.1055301	.0218415
Intangibles	.0004895	.0001932	2.53	0.011	.0001108	.0008682
Research & development	-.0055099	.0016028	-3.44	0.001	-.0086512	-.0023685

Considering that we only have 21 non-manufacturing firms sampled from the Nikkei 225 companies in Japan, I performed further analysis of capturing firm-specific effects in a cross-section generalized least squares. From this perspective, tangibility turned out to have a negative effect on capital structure, as supported by the pecking order theory. As firms increase their fixed assets, they consider internal sources of funds first, thereby decreasing the debt-to-equity ratio. Likewise, an increase in firm size measured in terms of the number of employees significantly determines an increase in debt financing. Also, R&D appears to significantly and positively determine capital structure decisions. These contrasting results suggest further analysis at the firm level, industry-specific (like telecoms and banking), and not at the panel or group of companies.

Exploring Lagged Effects

I performed generalized methods of moments (GMM) Arellano-Bond dynamic panel estimation to explore any time-lagged effects of determinants of capital structure. Notably, the debt-to-equity ratio lagged by one year, suggesting that the previous year's capital structure significantly and positively determines its current capital structure. This holds true for all companies sampled and for the sub-groups of manufacturing and non-manufacturing companies. At the operational level, this presents that capital structuring is a conscious balancing act by management to satisfy varying stakeholders' concerns—creditors and shareholders.

Although all the determinants of capital structure in the dynamic panel mirror the results in the cross-section

Table 5. *Determinants of Capital Structure, Non-Manufacturing Companies, 2014 to 2024, 21 Firms*

Dependent variable: Capital structure (debt-to-equity) ratio)

	Coefficient	Std. Error	β (z)	P > |z|	95% confidence interval	
Tangibility						
Fixed assets	.0036681	.0003961	9.26	0.000	0.0028917	.0044444
Profitability						
Firm size						
No. of employees	-.0000455	.0000745	-0.61	0.541	-.0001915	.0001005
Market capitalization	-.0013954	.0004085	-3.42	0.001	-.0021961	-.0005947
Non-debt tax shield						
Depreciation	-.0379405	.0157642	-2.41	0.016	-.0688377	-.0070433
Growth						
CAGR net sales	-.6004413	.5597566	-1.07	0.283	-1.697544	.4966614
Total assets year-on-year	-.0302239	.0507943	-0.60	0.552	-.1297789	.0693312
Intangibles	.0164496	.0047884	3.44	0.001	.0070644	.0258348
Research & development	.0208701	.0340975	0.61	0.540	-.0459597	.0876998

Table 6. *Summary of Results vs. Apriori Expectations*

			All Companies		Manufacturing		Non-manufacturing	
Independent variables	Trade off theory	Pecking order theory	Cross section	Dynamic panel	Cross section	Dynamic panel	Cross section	Dynamic panel
Tangibility	+	-	+		+		+	
Profitability	+	-	-	-	-	-	-	
Firm size	+	-	-		-		-	
Growth	-	+	insignificant	+	+	+	insignificant	-
Non-debt tax shield	-		-	-	+		-	
Intangibles & innovation	-		+-		+-		+	

generalized least square, profitability appears to have a lingering effect on debt-to-equity. Consistent with the pecking order theory, return on assets significantly and negatively affects capital structure for a lag of one and two years. On the other hand, the trade-off theory explains why depreciation and CAGR sales significantly and negatively affect capital structure for a lag of two years. These results are consistent with Cortez and Susanto (2012).

Manufacturing companies have different lagged determinants of capital structure. Profitability (return on assets) negatively determines debt-to-equity with a lag of one and two years. Growth (CAGR net sales and total asset growth) has significant and positive lagged effects of one year. Moreover, tangibility has a positive lag effect of two years. On the other hand, non-manufacturing companies have a negative but moderate lag effect on capital structures. Growth (CAGR net sales) has a negative and significant lag effect.

The foregoing results lead to the importance of capital structure decisions in the mid-term, particularly for profitability and growth constructs. However, intangibles and R&D did not appear to significantly determine capital structure in this dynamic panel modeling, suggesting that the earlier established relationships in cross-section analysis are static and immediate in their corresponding years.

Conclusion and Recommendations

In conclusion, I posit that the pecking order theory takes dominance over the trade-off theory in framing capital structure decisions of Nikkei 225 companies. Although the business environment has evolved, manufacturing companies tend to be lower leveraged than non-manufacturing companies.

The traditional determinants of capital structures, namely tangibility, profitability, firm size, growth, and non-debt tax shield, have rendered significant in this study. The cross-section analysis of all companies sampled from the Nikkei 225 validates these results. Although the manufacturing companies mirror the overall results, non-manufacturing companies show their distinct industry effects.

The low leverage of manufacturing companies as compared to non-manufacturing companies highlights tangibility as its main collateral, but the emergence of intangible assets in the process of M&A points to the recognition of this variable for further research as a distinct determinant of capital structures.

The high leverage of non-manufacturing companies is mostly determined by tangibility and intangibles. Again, it brings up the importance of M&A strategies for non-manufacturing companies sampled in this study, particularly banks and telecoms. Meanwhile, a higher market capitalization leads to a decreased debt-to-equity, suggesting the reshaping of capital markets for non-manufacturing companies. Considering that it is heavily indebted, as firm size increases, shareholders have emerging influential stakes with decreasing debt-to-equity ratios. This means corporate Japan is slowly moving towards a more equity-oriented market with earlier shifts by the manufacturing sector.

Finally, intangibles and R&D prove to be significant in the cross-section analysis in its current period, but no time lags were observed, which are mostly relevant to profitability, growth potentials, and how capital structures of firms are determined. These suggest that the value of intangibles and innovations are imperatively significant to the current period. On the other hand, the lagged effect of profitability and growth exhibits the sustainable impact of these corporate strategies in the medium term.

This investigation contrasts two critical sectors of the Japanese economy: manufacturing and non-manufacturing. The increasing stakes of external shareholders from around the globe are a result of the transition from traditional sources of funding in Japan for manufacturing companies. Japan is gradually transitioning from a debt-oriented economy to one that is more equity-oriented. This implies that the transparency of financial reporting for investment decision-making should increase. However, the current era of mergers and acquisitions presents opportunities to redefine the structure and financing of non-manufacturing companies in order to ensure long-term sustainability. Despite this, debt-oriented companies continue to exist but are challenged to adapt in the changing times.

I conclude this research by proposing a framework that incorporates intangibles and innovation to assess the value and risk profiles of firms in the context of intangible-driven growth. Firms that capitalize on their innovations and intangible assets are well-positioned to confront the challenge of transitioning to equity-oriented economies.

Endnote

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