Vertical Integration and Cost of Private Debt

Abstract:

I examine the relationship between a firm's degree of vertical integration (VI) and the cost of private debt. My study explores two channels: reduced dependence on the supply chain partners (Resource dependence theory) and decreased information friction. Using mediation analysis, I document that VI reduces customer/supplier concentration, reducing the focal firm's dependence on supply chain partners and leading to a decline in the cost of borrowing. Further, using proxies such as the bullwhip effect, social capital score, analyst following, and forecast, I find that this association is more pronounced in environments with high information friction. Additionally, the association between VI and borrowing cost is stronger for cash-rich and large-size firms. My study contributes to the VI and debt contracting literature by highlighting that savings in financing costs is a critical benefit that managers should incorporate before implementing the VI, and lenders should factor in organizational structure changes in their loan contract terms.

Keywords: vertical integration, transaction cost, resource dependence, information friction, loan spread, cost of debt.

Vertical Integration and Cost of Private Debt

1.0 Introduction

I examine the impact of vertical integration on the cost of borrowing. Vertical integration is the combination of various stages of production to gain increased control over the production process and improve coordination (Buzzell, 1983). It is a common strategic tool used by firms to gain a competitive edge or to overcome the contractual opportunism that is rampant in supply chain contracts[1] (Buzzell 1983; Harrigan 1984; Stuckey and White 1993; D'Aveni and Ravenscraft 1994). While prior studies have focused predominantly on the implications of vertical integration strategies on firm performance (Lahiri et al., 2016), there is little evidence of how capital providers of the firm view such a strategy. In this study, I address this gap and examine the consequence of vertical integration on the pricing of private debt[2], which is a significant source of external capital for a firm (Bhojraj & Sengupta, 2003).

Most firms pursue vertical integration to gain advantages over their rivals. Recently, BYD Co, a Chinese automobile manufacturer, has surpassed Tesla to be the world's biggest maker of electric vehicles. The company credits vertical integration strategy as a critical factor in its success story. Firms can choose to integrate in the forward or backward direction. A popular example of forward integration is Apple Inc., an industry leader in supply chain management (Devensoft 2023),

[1] Tesla is a successful automotive company that has implemented vertical integration. Tesla's vertically integrated business model has enabled it to create a unique customer experience and become one of the most innovative companies in the automotive industry. Tesla designs, manufactures, and distributes its own products, which enables it to control the entire production process (Devensoft 2023).

[2] My study focuses on private debt and not on public debt. For brevity, I use the term "cost of debt" to convey the cost of private debt hereafter throughout the paper.

with a major portion of its sales revenues channeling through its self-established stores[3]. Conversely, the integration strategy adopted by Pepsi, where it purchased its bottlers to attain better coordination over its distribution channel, is an ideal example of backward integration (Collier, 2009). Given the prevalent nature of vertical integration, academic research has documented the costs and benefits of this strategy for the integrating firm.

For instance, prior literature documents its impacts on various aspects of a firm's operations, such as the disclosure behavior of the firm (Bourveau et al., 2024) or the innovation outcomes (Frésard et al., 2020), inventory, and operating performance (Andreou et al., 2016), strategies, productivity levels, size, capital intensity levels (Atalay et al., 2014), etc. In this paper, I shed light on how capital providers, specifically private lenders, view the vertical integration strategy.

Private debt is a significant source of capital for a firm (Bharath et al., 2008; Qian, 2007; Sufi, 2007). Private lending transactions are governed by debt contracts that are incomplete, as lenders cannot be aware of all the future states of the borrower at the time of lending (Aghion & Bolton, 1992; Grossman & Hart, 1986). Lenders are primarily concerned about their interest payments and capital preservation. They are risk-averse in their behavior and react to any change in the firm environment that has a direct bearing on their risk exposure (Baylis et al., 2017; Kothari et al., 2010; Watts, 2003; Watts & Zimmerman, 1986)Since vertical integration leads to a change in a firm's supply chain dynamics and operational environment, lenders are likely to react to such strategic changes for multiple reasons.

First, when a firm integrates vertically with either its suppliers or customers, the dependence on such agents for the procurement of raw materials or disposal of finished goods is eliminated

[3] Other examples include European fashion giant Zara and Los Angeles-based apparel retailer American Apparel These companies manufacture and sell products through their retail channels (Lin & Swaminathan 2014)

(Bolton & Whinston, 1993; Ersahin et al., 2023; Williamson, 1971). This action inherently reduces the risk of hold-ups and the associated supply-chain disruptions common in the supply chain. With increased control over the production processes, the firms are better positioned to plan their production processes effectively and improve their operational efficiency. Such efficiencies will result in a reduction of the cash flow risks and default risk. Owing to reduced default risk, lenders should reduce the borrowing cost for firms that pursue the VI strategy.

Second, VI also affects the transaction and contracting costs of the focal firm (Williamson, 1975) by reducing the number of external agents for the firm. Supply chain contracts are incomplete like debt contracts (Grossman & Hart, 1986), suggesting that a firm cannot predict all the possible contingencies that could occur with its supplier or the customer firm (Klein et al., 1978). Therefore, a lower dependency on external agents in the supply chain mitigates the risk and uncertainties associated with supply chain contracting, thus reducing the contracting and transacting costs. Savings in transaction and contracting costs will reduce the cost of production (Lee et al., 1997), improve profitability, and improve the integrating firm's creditworthiness. Thus, I anticipate that lenders will incorporate this reduction in the borrower firm's transaction costs and risk exposure and reduce the borrowing cost.

Third, VI can potentially reduce information frictions rampant in the supply chain. Supply chain literature documents high information friction in the supply chain, making the exchange between customers and suppliers inconsistent and unreliable (Agarwal & Agarwal, 2024). The bullwhip effect and the deliberate overstatement of demand by supply chain agents amplify the information distortion at every node in the supply chain (Lee et al., 1997). Vertical integration helps mitigate this issue by reducing the supply chain nodes, thus decreasing the information friction (Arrow, 1975). The improved information environment reduces the cash flow and revenue risk

because the integrating firm can better plan its sales and production levels. Consequently, lenders should also perceive a lower risk and respond by reducing the cost of borrowing.

However, vertical integration is not without its downsides (Mahoney, 1992). By increasing the degree of vertical integration, a firm expands its operations, which could result in operational complexity and strain the managerial resources (Harrigan, 1984). Additionally, executing a vertical integration strategy requires significant capital investment, which can impact the firm's financial stability and limit its ability to invest in other strategic initiatives or respond to market opportunities (Baumol et al., 1983; Chandler, 1962; Rumelt, 1974). Moreover, firms pursuing vertical integration could suffer from increased bureaucratic costs (Coase, 1990; Cremer, 1980; Williamson, 1967), which in turn slows down their decision-making processes (Hill & Hoskisson, 1987; Williamson, 1985). Therefore, despite its benefits, vertical integration may not pay off immediately and hence may either increase or not result in any significant change in the cost of borrowings.

Given conflicting predictions ex-ante, I examine this relationship empirically. I begin the analyses with an examination of the relationship between the degree of vertical integration and loan spread, where loan spread is the interest rate paid by the borrowers over the London Interbank Offered Rate (LIBOR). My sample period spans from 1992 to 2020, with a baseline sample of 43,130 firm-year observations, and I use both within-firm (firm fixed effects) design and cross-sectional (industry fixed effects) design for the main results. The data on the degree of vertical integration is sourced from the publicly available dataset provided by Fesard & Hoberg (2020)[4]. I obtain the customer-supplier information from the Compustat segment files, the loan and loan terms data from the Loan Pricing Corporation (LPC) DealScan database, and the firm fundamentals from the WRDS Compustat database. I merge all the above-mentioned databases to obtain the final firm-

[4] I am grateful to the authors of Fesard et al. (2020) for making the data publicly available.

year observations with their respective degree of vertical integration. In line with prior literature, I control for firm-level and loan-level controls. The OLS regression analysis suggests that an increase in a firm's degree of vertical integration is associated with a 1.51 percent reduction in borrowing costs, where borrowing cost is indicated by loan spread. In economic terms, this represents a decline in the borrowing rate by 4.56 bps. In monetary terms, it translates to approximately 0.5 million dollars of savings in financing costs for every standard deviation increase in vertical integration. Considering that lenders are conservative, this reduction is quite significant.

Next, I explore the underlying channels driving the main results. My interpretation of the findings is that lenders charge a lower cost of debt from firms with higher VI due to either: (1) a reduced dependency on the external supply chain agents, (2) a reduction of information frictions between the focal firm and the supply chain partners or, (3) a reduction in transaction costs between the parties. In this study, I test the dependency and information friction channels and how they impact the relationship between vertical integration and the cost of borrowing. To document the resource dependency channel, I capture the indirect effect of vertical integration on the cost of borrowing via a reduction in customer and supplier concentration when a firm integrates vertically. To achieve this, I conduct a mediation test to examine whether a firm's customer/supplier concentration mediates the relationship between vertical integration and the cost of debt. Consistent with the prediction from the indirect channel, I find that a firm's customer/ supplier concentration significantly mediates the relationship between the degree of vertical integration and the cost of debt. Using the mediation tests proposed by Goodman (1960) and Sobel (1982) augmented by bootstrapped standard errors (Preacher & Hayes, 2008), I find that the total effect of vertical integration on the cost of debt is partially mediated by customer concentration by up to 10% and by supplier concentration by up to 24%. The partial mediation by customer/supplier concentration

lends credibility to the existence of the direct channel, shaping the link between the degree of vertical integration and the cost of borrowing.

Next, I examine the information friction channel, as another possible factor driving the association between the degree of vertical integration and the cost of debt. I argue that the intensity of information friction amplifies at every node in the supply chain. Thus, information friction will be reduced when the number of players is reduced due to vertical integration. If my conjecture is true, then there should be a negative association between the cost of debt and the degree of vertical integration in the subsamples where the information friction is relatively high, or the information environment is relatively worse off. To capture the information environment of a firm, I use four different proxies as follows: (1) the social capital score of the firm, (2) the bullwhip measure, (3) the number of analysts following the firm, and (4) the analyst forecast error. Consistent with my predictions, the results are more pronounced for firms with low social capital scores, high bullwhip effect, lower analyst following, and high forecast error.

I corroborate the main findings with further additional tests. First, I examine the effect of the degree of vertical integration on an alternate proxy of the cost of borrowings: Total Cost of Borrowings (TCB) (Berg and Saunders, 2016) and other loan terms. I find the association between the total cost of debt and the degree of vertical integration to be negative and significant. I also document that firms that integrate with their supply chain partners get favorable loan terms by way of reduced covenants and increased loan size[5]. In robustness tests, I argue that lenders perceive firms with ample buffer cash or large firms to be more capable of executing vertical integration strategies effectively. Accordingly, I observe a significant and negative association between vertical integration and the cost of debt for firms with high cash and large-sized firms.

[5] I do not find any impact of vertical integration on the loan maturity period.

My study contributes to both the vertical integration and debt contracting streams of literature. It highlights how a VI strategy implementation could significantly reduce financing costs. Managers should consider this reduction in borrowing costs as one of the key benefits alongside the existing determinants, such as transaction costs, dependence on supply chain agents, competition, etc, when evaluating VI implementation decisions. Therefore, my study complements the existing literature on the benefits of VI implementation.

Second, my study discusses the impact of the VI strategy on external stakeholders, in this case, the lenders. Prior studies on VI have focused on either the determinants (Perry, 1989) or firm-level outcomes of VI such as innovation (Fan & Goyal, 2006; Frésard et al., 2020) or the extent of disclosures (Bourveau et al., 2024) etc. Through my study, I aim to extend the literature by documenting how external stakeholders, specifically lenders, view the VI strategy. My findings suggest that lenders view such changes favorably, as VI enables a firm to gain greater control over the supply chain and enhances its stability.

Third, my study contributes to the debt contracting literature by studying the impact of Vertical integration, a form of M&A activity, on the cost of borrowing. Extant literature documents that banks evaluate a firm's creditworthiness based on financial parameters, such as cash flows, profitability levels, leverage ratios, etc. However, my study suggests that banks should also incorporate the organizational structure of the borrower firm into the loan terms. VI decreases the dependence of the focal firm on external supply chain partners and lowers the information friction in the supply chain, thereby enhancing the firm's operational control and stability. Such changes in the operational structure improve the credibility of the borrowing firm, leading the lenders to lower the borrowing costs.

2.0 Literature review and hypothesis development

2.1 Vertical Integration (VI)

Vertical Integration (VI) is defined as the combination of two or more separate stages of production under a single ownership (Buzzell, 1983). It involves the elimination of contractual or market exchanges and a deliberate shift to the internal exchange of input and output units(Perry, 1989). A vertically integrated firm has complete flexibility to make decisions regarding investment, production, employment, and distribution across all the stages of production within its control (M K Perry 1989). VI can take the form of backward integration, where a firm acquires or merges with its suppliers, or forward integration, where it acquires or merges with its distributors or customers (Harrigan, 1984).

Extant studies provide evidence that vertical integration offers several advantages, including reduced costs, improved coordination, and increased profits due to lower contracting and transaction costs (Coase, 1937; Williamson, 1985). Organizational theory and strategy literature suggest that integrated firms have better opportunities to evaluate and audit their departments than external contracting parties (Williamson, 1975). This capability results in an improved information environment and efficient resource allocation. Close collaboration with internal departments fosters human solidarity, positively impacting production capabilities (Ouchi, 1979). In summary, vertical integration leads to changes in ownership, governance, and incentives (Mahoney, 1992), which are streamlined internally, potentially resulting in economic benefits for the firm.

The decision to integrate two or more stages of production is primarily based on two theoretical concepts: Transaction Cost Economics (TCE) and Resource Dependence Theory (RDT). TCE posits that market transactions involve contracting costs, information costs, bargaining, and

decision costs, which can impact the efficiency of economic exchanges (Coase, 1937; Williamson, 1985). According to TCE, vertical integration is justifiable if the cost of internalizing activities is lower than the cost of transactions in the market (Williamson, 1975; Williamson, 1985). Lafontaine and Slade (2007) highlight that asset specificity, uncertain market conditions, and the frequency of transactions are critical components in determining transaction costs between a supplier and a customer, thus influencing vertical integration decisions[6].

Resource Dependence Theory (RDT), introduced by (Pfeffer and Salancik, 2006), is also closely associated with vertical integration decisions. According to RDT, firms do not function in isolation; they rely on external parties to procure inputs and dispose of outputs. While such dependencies could foster collaborations and reduce uncertainty regarding inputs and outputs (Crook & Combs, 2007), they can also create complex relationships between transacting parties, often leading to power imbalances when one party possesses more critical and scarce resources (Emerson, 1964). Such imbalances can lead to opportunistic behaviors', where the dominant party exploits its position to extract favorable terms, renegotiate contracts, or impose additional costs on the dependent party (Casciaro & Piskorski, 2005; Cheng et al., 2021). These behaviors can increase transaction costs and uncertainty for the dependent firm, adversely affecting its performance and stability. Thus, by bringing critical stages of production or distribution in-house, firms can secure a more stable supply of essential inputs and gain greater control over product quality and their output markets.

[6] For example, the vertical integration of Fisher Body by General Motors is a classic example of transaction-cost theory (Klein et al., 1978). General Motors integrated Fisher Body to mitigate the high costs and inefficiencies associated with long-term contracts for automobile body supplies. This move was driven by the high asset specificity and the need to safeguard against opportunistic behaviour by Fisher Body.

However, vertical integration is not without its drawbacks. It involves significant implementation costs and requires substantial capital investment. The disadvantages can be broadly classified into (1) bureaucratic costs, (2) strategic costs, (3) production costs, and (4) long-run dynamic costs (Mahoney, 1990).

Bureaucratic costs increase when a firm expands its organization and adds hierarchical levels, leading to information distortion within departments (Calvo & Wellisz, 1978; Coase, 1937; Cremer, 1980; Williamson, 1967). Additionally, it increases slack resources due to a lack of competitive pressure, thereby reducing profitability (Cyert & March, 1963). Additionally, strategic costs arise when synergies expected from vertical integration are undermined by inexperience (Harrigan, 1984). Firms tend to lose the information advantage they previously had from learning through supply chain partners, leaving them less informed about current market dynamics (Harrigan, 1984; Mahoney, 1992). Production costs can escalate due to capacity imbalances, adversely affecting profitability (Hayes & Wheelwright, 1984). Finally, the substantial capital required for vertical integration can strain a firm's financial health (Williamson, 1975).

In conclusion, while vertical integration offers significant benefits, it is crucial for firms to carefully consider and manage these potential drawbacks to ensure long-term success and stability.

2.2 *Debt Contracting*

Debt finance is one of the major sources of funds for any business (Chava et al., 2009; Graham et al., 2008), and firms raise more capital from private lending than from equity markets and public debt combined (Ferreira & Matos, 2012; Sufi, 2007). However, banks face a heavy risk of default (Freixas & Rochet, 1997) and protect themselves by executing debt contracts. These contracts contain details such as loan spread, maturity, collateral requirements, and covenants. Notably, debt contracts are incomplete, as lenders cannot anticipate every possible future event at

the time of contracting (Aghion & Bolton, 1992; Hart & Moore, 1988). Lenders are highly cautious about default risk as they have an unlimited downside and limited upside potential (Florou & Kosi, 2015; Hasan et al., 2014). They constantly monitor and update the borrower's creditworthiness based on the changes in the information environment and financial performance and adjust the loan pricing accordingly (Dhaliwal et al., 2011; Roberts & Sufi, 2009; Smith & Warner, 1979).

Prior literature documents that lenders focus on the quality and readability of financial reports (Bharath et al., 2008; Ertugrul et al., 2017). The ambiguous tone in 10K reports leads to a rise in the lenders' information risk and monitoring efforts, thus increasing the cost of debt. (Ertugrul 2017). The audit report is also an important source of information for lenders to assess the borrower's risk profile (Asare & Wright, 2012). For example, (Porumb et al., 2021) document that when the disclosure of the risk of material misstatement in audit reports was mandated, it significantly impacted debt contracts and loan spreads. Lenders also perceive accounting conservatism favorably as it gives them an early signal of impending default risks (Zhang, 2008). Supply chain risks and supply chain relationships of the focal firm also impact the cost of borrowing and other loan terms (Campello & Gao, 2017; Cen & Dasgupta, 2021). These studies indicate that lenders are highly attentive to changes in a firm's circumstances that could affect its risk profile, underscoring the dynamic nature of debt contracting.

3. Hypothesis Development

As discussed previously, private debtholders' risk is partially a function of evolving conditions within the borrowing firm. Since vertical integration (VI) is a strategic decision that impacts the operational structure of a firm, I examine its impact on the firm's borrowing costs. I expect the decision to vertically integrate with the supply chain partners to affect the borrowing cost in multiple ways.

First, a firm's dependency on external parties to procure raw materials or distribute finished goods entails the risk of supply chain disruptions and hold-ups by the supplier or customer firms (Cen & Dasgupta, 2021). VI mitigates this risk by reducing the firm's dependence on external parties through a decrease in the number of external agents in the supply chain (Bolton & Whinston, 1993; Ersahin et al., 2023; Williamson, 1971). As a result, a firm can plan its production processes effectively, improving its operational efficiency and financial decision-making(Lin et al., 2014). Profit margins improve due to a reduction in cost due to the elimination of the middlemen. Consequently, the cash flow risk, and hence the firm's default risk, will reduce because of VI.

Second, VI reduces the transaction and contracting costs of the focal firm (Williamson, 1975) by reducing the number of external agents for the firm. Supply chain contracts, like debt contracts, are incomplete in nature (Aghion & Bolton, 1992; Grossman & Hart, 1986). A focal firm cannot predict all the possible contingencies that could occur with the supplier or the customer firm. Vertical integration strategy has a direct bearing on the transaction costs, including negotiating, adapting, monitoring, and enforcing buyer-supplier relationships (Jensen & Meckling, 1976). Reduction in the number of contracting parties leads to lower dependency on external agents and mitigates the risk and contingencies associated with supply chain contracting, thus reducing the contracting and transacting costs (Coase, 1937). This can lead to a more efficient and predictable cost structure and, hence, improved profitability. Therefore, I anticipate lenders will incorporate this reduction in the borrower firm's transaction costs and risk exposure in their loan terms.

Third, the literature suggests that the supply chain is prone to high information friction and that the information exchange between customers and suppliers is not always reliable (Agarwal & Agarwal, 2024; Cen & Dasgupta, 2021) . A substantial body of research documents that the information generated in a supply chain is not reliable due to the bullwhip effect or the deliberate

overstatement of demand by supply chain partners (Cachon & Lariviere, 2001; Chen & Samroengraja, 2000). The distortion amplifies with every additional node in the supply chain, leading to investment inefficiencies (Cachon & Lariviere, 2001). When such nodes are eliminated through VI, there is bound to be a reduction in the level of information distortions and, thus, an improvement in the quality of information. With an improved information environment, firms will do better investment planning and have a better forecast of their revenues and cash flows. Such efficiencies will reduce the risk of default by the focal firms. Therefore, the above arguments lead me to the following hypothesis.

H0: Vertical integration by a firm leads to a reduction in its cost of debt.

Alternatively, while vertical integration can offer several benefits, it also has potential drawbacks that firms must consider. These drawbacks can impact a firm's flexibility, financial health, and overall strategic position. Vertical integration can lead to increased operational complexity as the firm expands its activities to include multiple stages of the production process. Managing these diverse operations requires significant coordination and oversight, which can strain managerial resources and complicate decision-making processes (Harrigan, 1985). Expanding operations to include upstream suppliers or downstream distributors often requires substantial capital investment. This increase in capital requirements can strain a firm's financial resources, limiting its ability to invest in other strategic initiatives or respond to market opportunities(Mahoney, 1992). Moreover, vertical integration often introduces bureaucratic costs associated with managing a larger organization. As a firm grows through vertical integration, it may encounter inefficiencies stemming from these bureaucratic processes, which can slow decision-making and reduce overall agility (Hill & Hoskisson, 1987; Williamson, 1985). Though strategically beneficial, vertical integration may not always lead to immediate financial benefits.

Therefore, it is likely that there might be an increase or no observable change in the cost of borrowings. Accordingly, the null hypothesis is as follows:

H1: When a firm integrates vertically, there could be no change (or increase) in the cost of borrowing.

4. Measure of VI, Research Design, and Sample Selection

4.1 Measure of Vertical Integration

In my paper, I use the measure of vertical integration developed by Frésard et al., (2020) using the data from 10K and Bureau of Economic Analysis Input/Output tables. They employ a comprehensive study of firm-to-commodity relationships to compute the degree of vertical integration within a firm. To measure VI, they utilize detailed business descriptions[7] from firms' annual reports (10-Ks) and compare them to the descriptions of commodities from the Bureau of Economic Analysis (BEA) input-output tables[8].

The BEA input-output tables list various commodities and their economic relationships[9]. They extract specific and proper nouns from the firm's 10-K descriptions to map the words in business descriptions to BEA commodity descriptions. This process involves identifying key terms that describe what the firm produces or uses and aligning them with the relevant BEA commodity codes. Further, the firm's business and BEA commodity descriptions are represented as vectors, and cosine similarity between these two is calculated[10]. With the cosine similarity score, they build a

[7] 10 K reports provide detailed information about each firm's products and services, as Item 101 of Regulation S-K requires business descriptions to be reported and updated each year.
[8] The 2002 BEA input-output (IO) tables provide detailed information on the dollar flows between producers and purchasers in the U.S. economy, including households, government, and foreign buyers of U.S. exports
[9] The "Detailed Item Output" table, which Fesard et al. (2020) use, provides verbal descriptions of each commodity and its sub-commodities, along with the dollar value of each sub-commodity's total production.
[10] Cosine similarity measures how closely related the firm's activities are to each commodity, considering the economic importance of each word.

correspondence matrix indicating the similarity between a firm's business activities and various BEA commodities. Next, they measure vertical relatedness within a firm using the triple product formula:

$$UP_{i,i} = [B \,.\, V \,.\, B^T]_{i,i}$$

In the above equation, UP_{ii} is a diagonal entry of the UP_{ij} matrix, measuring the extent to which a firm's business description contains vertically related words. B is the firm-to-commodity correspondence matrix. V is the vertical relatedness matrix between commodities, and B^T is the transpose of B.

For example, consider Firm A, which manufactures photocopiers. Firm A's 10-K report describes it as manufacturing "photocopiers" and "printers." The words "photocopiers" and "printers" are mapped to the BEA commodity "photographic and photocopying equipment." Vectors for Firm A's description and the BEA commodity description are created. If the descriptions are very similar, the cosine similarity score will be high, indicating a strong relationship. By calculating the cosine similarity for each word and building the correspondence matrix, they determine how vertically integrated Firm A is within its operations. A high $UP_{i,i}$ value indicates that Firm A's business description contains many vertically related words, suggesting a high degree of vertical integration.

The above measure of vertical integration is validated by (Bourveau et al., 2024), who demonstrate that a one standard deviation increase in vertical integration is associated with a 6.57 percent within-firm increase in intersegment sales. This finding indicates that the measure effectively captures the internalization of production processes along the supply chain rather than merely the exchange of intangible capital, as suggested by (Atalay et al., 2014).

4.2 Research Design

I examine the relationship between the cost of debt and the degree of vertical integration using the following model:

$$Cost\ of\ Debt_{i,t} = \beta_0 + \beta_1 VI_{i,t} + \sum \beta_n\ Controls_{i,t} + Fixed\ effects + \varepsilon \quad (1)$$

In the above equation, the dependent variable cost of debt is the natural logarithm of the all-in-drawn loan spread: LnSpread[11]. This measure represents the interest rate paid by the borrowing firms in excess of LIBOR for each dollar drawn (in bps). The subscripts *i* and *t* represent firm and year, respectively.

The independent variable VI represents the degree of vertical integration for a firm *i* in the year *t*. I control several loan-level and firm-level variables to mitigate omitted variable bias in my inferences. I include loan maturity (LnMATURITY) and size (LnLOANSIZE) as an increase (decrease) in the cost of borrowing could be due to longer (shorter) maturity or bigger (smaller) loan size. I further control for firm characteristics such as return on assets (ROA), firm size (SIZE), leverage (LEV), and tangibility (TANG). I also control liquidation risks of the firm in the form of bankruptcy risk as measured by ZSCORE and operational risk (OPRISK). Lastly, I control firm complexity based on the number of business segments (NBSEG) and geographic segments (NGSEG) in which the firm operates. All specifications include firm and year-fixed effects, and errors are clustered at the firm-year level. All variables are defined in Appendix 1.

4.3 Sample Selection

[11] I use the logarithm of loan spread instead of the raw spread to alleviate the skewness in the spread variable (Houston et al., 2016).

The sample selection process is outlined in Appendix XX. I first begin with the raw sample of the Compustat database from 1992 to 2020[12]. I merge this database with the Compustat Customer Segment file. The observations obtained at this stage are further merged with the LPC Deal Scan database based on GVKEY and FYEAR. The final merge is with the dataset provided by Fesard et al (2020) which provides the degree of vertical integration for a given firm in a given year. Next, I drop the observations with missing controls or missing values. This leaves me with a final sample of 43,130 loans.

5. Empirical Results

5.1 Descriptive Statistics

Table 1 displays the descriptive statistics for the main variables used in the empirical analyses. Panel A shows the distribution of these variables, while Panel B provides the Pearson correlations among a subset of them. As seen in previous studies (Albring et al., 2016), the logged loan spread variable has a mean of 5.033 and a median of 5.170, equivalent to 201.480 basis points (bps) and 175 bps, respectively. The average loan size (LOANSIZE) in the sample is 933.420 million USD, and the average loan maturity (MATURITY) is about 43 months. The variable VERTINT has a mean of 0.016 and a standard deviation of 0.015, aligning with findings in the literature (Bourveau et al., 2024).

An examination of the correlations in Table 1 Panel B shows that loan spread (LnSPREAD) is negatively correlated with loan size (LnLOANSIZE) and positively correlated with loan maturity (LnMATURITY). These correlations and descriptive statistics align with previous research (e.g., Botosan & Plumlee, 2005; Chen et al., 2016). Additionally, the variable VERTINT is significantly

[12] Our sample period spans from 1992 to 2020 as the data for the LPC Dealscan data is not available for years beyond the given sample period.

negatively correlated with LnSPREAD, providing univariate support for the association between the degree of vertical integration and the cost of debt.

5.2 Main Results

I begin the analysis by estimating the model in equation (1), and the results are exhibited in columns (1) and (2) of Table 2. In column (1), I estimate equation (1) by including the firm and year-fixed effects. The results indicate a negative association between the degree of vertical integration and the cost of debt. The coefficient of interest (β_1) on VI is -1.51 (t = -2.63) and is statistically significant at a 1% level. In terms of economic significance, the findings in Table 2 indicate that an increase in the degree of vertical integration by one standard deviation decreases the cost of debt by -4.56 basis points (-1.51*.015* 201.480). In dollar terms, it leads to an average saving of interest expense of $425,000 per loan. I find similar results in column (2), wherein Equation (1) is estimated by including the industry[13] and year-fixed effects. This main finding aligns with the prediction that vertical integration leads to a decline in the cost of debt.***5.3 Cross-sectional Analyses***

In this section, I explore the channels that could drive the relationship between the degree of vertical integration and the cost of debt. First, I examine the mediation effect of customer and supplier concentration as vertical integration can influence the cost of debt through its impact on customer and supplier concentration. Next, I examine the effect of VI on the cost of debt in those pockets of the sample where the information frictions are higher. I discuss the tests in detail in the sections below.

[13] Industry is defined at the Fama–French 12 level

5.3.1 Mediation Effect of Customer Concentration

In the mediation tests, I examine the indirect channel that drives the relationship between vertical integration and the cost of borrowing. Prior literature suggests that firms that are not integrated vertically depend more on external agents for their supply chain management (Cen & Dasgupta, 2021; Ersahin et al., 2023). This dependence is further amplified when the customer base of the focal firm is concentrated. A concentrated customer base, though lucrative, gives the customers higher bargaining power, which they can misuse to exploit the supplier firms by delaying payments and demanding unfavorable terms, leading to financial constraints for the supplier firms (Bhattacharyya & Nain, 2011; Fee & Thomas, 2004). Additionally, heavy reliance on a few major customers for a significant portion of its revenues compels a firm to make high relationship-specific investments (Allen & Phillips, 2000; Titman & Wessels, 1988) which in turn leads to higher concentrated credit risk and cost of debt (Cai & Zhu, 2020). Implicitly, if a firm decides to make a forward vertical integration, there will be a decline in the concentration of the customer base and, hence, a reduction in dependence, thus leading to a positive change in the creditworthiness of the borrower firm.

I posit that vertical integration potentially influences the cost of debt through the mediation of customer concentration[14]. To test this hypothesis, I examine the mediating effect of customer concentration on the relationship between vertical integration and the cost of debt. I use two proxies for customer concentration, one based on sales ratio and the other based on customer size. Using

[14] Based on prior literature, I have created two proxies to capture customer concentration (Campbell et al., 2003). The first proxy is based on sales revenue, which measures the proportion of a firm's total sales attributed to its largest customers. The second proxy is based on the size of the customer, which considers the economic significance of each major customer relative to the firm. Definitions and the methodology used to calculate these measures are provided in Appendix 1.

the methodology proposed by Goodman (1960) and Sobel (1982), I run the following set of estimation models:

Model (A): dependent variable regressed on independent variable (path c)

$$Lnspread_{it} = c_0 + c_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + \epsilon \qquad (2)$$

Model (B): mediator regressed on independent variable (path a)

$$custconc1_{it} = a_0 + a_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + \epsilon \qquad (3)$$

Model (C): dependent variable regressed on mediator and independent variable (paths b & c)

$$lnspread_{it} = b_0 + b_1 custconc1_{it} + b_2 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + \epsilon \qquad (4)$$

Figure 1 shows the mediation effect based on the first proxy of customer concentration (revenue-based)[15]. Path b_2 is the direct effect of vertical integration on the cost of debt and is captured by coefficient b_2 in Equation (4). Paths a_1 and b_1 define the indirect effect of vertical integration on the cost of debt via customer concentration. Thus, product a_1b_1 captures the effect of vertical integration on the cost of debt through the customer concentration channel. The total effect of vertical integration is the sum of the direct and indirect effects, that is, $a_1b_1 + b_2$ or simply coefficient c_1 in Equation (2).

I present the results of this test in Panel A of Table 3. As Preacher and Hayes (2008) suggest, I bootstrap the standard errors in this test. The indirect effect of vertical integration on the cost of debt is the product of a_1b_1, which is -0.131 (p-value < 0.001). This result confirms that vertical integration lowers customer concentration, reducing the loan spread for debts. The magnitude of the

[15] I have tabulated the results for the second proxy for customer concentration in the appendix. The results remain significant and robust.

mediation effect is obtained by the ratio of the indirect effect of vertical integration to the total effect of vertical integration; here, the latter is the coefficient c_1 in Equation (2) and equals -0.875 (p-value < 0.05). This indicates that the magnitude of the mediation effect of customer concentration on the relationship between vertical integration and the cost of debt is -0.131/-0.875= 14.97%. The direct effect of vertical integration on the cost of debt is captured by coefficient b_2 in Equation (4), which is -0.744 and statistically significant.

5.3.2 Mediation Effect for Supplier Concentration

Changes in supplier concentration in an indirect channel through vertical integration can affect the cost of debt. Such an effect is likely when the firms go for backward vertical integration. When a focal firm integrates in the backward direction with the supplier firms, dependency on the supplier firms is reduced. With a more concentrated supplier base, firms become more susceptible to risks associated with delayed procurements and opportunistic behavior by their suppliers (Banerjee et al., 2008; Cen et al., 2016). Sensing a firm's dependency on them, supplier firms may exploit their bargaining power through exorbitant prices, reduced quality, or delayed deliveries, leaving the disadvantaged party—typically the buyer—exposed to financial distress (Hoehn-Weiss et al., 2017; Lawler & Bacharach, 1987). Such risks could be mitigated through integration with suppliers.

Therefore, I examine the impact of vertical integration on the cost of debt through supplier concentration. To test this hypothesis, I examine the mediating effect of supplier concentration on the relationship between vertical integration and the cost of debt. I use two proxies for supplier concentration, one based on the number of suppliers and the other based on the purchase ratio. Using the methodology proposed by Goodman (1960) and Sobel (1982), I run the following set of estimation models:

Model (A): dependent variable regressed on independent variable (path c)

$$Lnspread_{it} = c_0 + c_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + \epsilon \qquad (5)$$

Model (B): mediator regressed on independent variable (path a)

$$suppconc1_{it} = a_0 + a_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + \epsilon \qquad (6)$$

Model (C): dependent variable regressed on mediator and independent variable (paths b & c)

$$lnspread_{it} = b_0 + b_1 suppconc1_{it} + b_2 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + \epsilon \qquad (7)$$

[Insert figure 2 here]

Figure 2 shows the mediation effect based on the first proxy of supplier concentration (number of suppliers)[16]. Path b_2 is the direct effect of vertical integration on the cost of debt and is captured by coefficient b_2 in Equation (7). Paths a_1 and b_1 define the indirect effect of vertical integration on the cost of debt via supplier concentration. Thus, product a_1b_1 captures the effect of vertical integration on the cost of debt through the supplier concentration channel. The total effect of vertical integration is the sum of the direct and indirect effects, that is, $a_1b_1 + b_2$ or simply coefficient c_1 in Equation (5).

I present the results of this test in Panel A of Table 4. Following Preacher and Hayes (2008), I bootstrap the standard errors in this test as well. The indirect effect of vertical integration on the cost of debt is the product of a_1b_1, which is -0.215 (p-value < 0.01). These findings confirm that vertical integration lowers supplier concentration, reducing the loan spread for debts. The

[16] I have tabulated the results for the second proxy for supplier concentration in the appendix. The results remain significant and robust.

magnitude of the mediation effect is computed as the ratio of the indirect effect of vertical integration to its total effect with the latter represented by coefficient c_1 in Equation (5) and equals -0.932 (p-value < 0.05). This indicates that the magnitude of the mediation effect of customer concentration on the relationship between vertical integration and the cost of debt is -0.215/-0.932= 23.07%. The direct effect of vertical integration on the cost of debt is captured by coefficient b_2 in Equation (7), which is -0.717 and statistically significant.

Collectively, these findings support the predictions from the indirect channel that vertical integration affects the cost of debt by mitigating the transaction costs and reducing the dependence on supply chain partners not only directly but also indirectly via reduced customer and supplier concentration.

5.3.3 Information Friction Channel

Information frictions persisting in the supply chain represent one of the channels that I predict will influence the relationship between the cost of debt and the degree of vertical integration. The information friction amplifies at every node in the supply chain (L. Chen & Lee, 2017a; Lee et al., 1997). When a firm opts for a vertical integration strategy, the number of supply chain partners inherently decreases, thus reducing the information friction in the supply chain. This reduction in friction can mitigate lenders' risk exposure, making vertical integration a beneficial strategy for firms with high information friction. If my conjecture is true, then I should find the effect to be more pronounced in those pockets of the sample where the information frictions are high. I use four proxies to capture a firm's information environment. These are (1) the social capital score of a firm, (2) the bullwhip measure, (3) the number of analysts following the firm, and (4) the analyst forecast error.

5.3.3.1 Social Capital Score

First, I use the social capital score of the focal firm as a proxy to capture the quality of its information environment. Studies suggest that firms headquartered in high social capital areas are less likely to engage in opportunistic behavior (Hasan et al., 2017a, 2017b; Hoi et al., 2018). Such firms are said to be cooperative and have a superior information environment (Knack & Keefer, 1997; Guan et al. 2023). Moreover, firms with high social capital experience positive reciprocity from various stakeholders and thus exhibit steady financial performance over a long period (Lins et al., 2017). Since I argue that firms with a less favorable information environment would benefit relatively more from a vertical integration strategy, I posit that firms with low social capital would gain more from a vertical integration strategy. Accordingly, firms with low social capital scores, unable to create an environment of trust for their stakeholders, would benefit from the increased control and coordination that vertical integration provides. To test the hypothesis, I create an indicator variable LOW_SOC such that firms with low social capital are designated as LOW_SOC = 1, and firms with high social capital are designated as LOW_SOC = 0. Community social capital data is obtained from (Hartlieb et al., 2020). The LOW_SOC variable is interacted with VERTINT to examine the differential impact of vertical integration on firms with a less conducive information environment. The results are documented in Table 5, Column 1, wherein the dependent variable is LnSPREAD. The coefficient of VERTINT * LOW_SOC is significantly negative at -2.32 (t= -1.99) for firms that fall under the low social capital category. The results indicate that lenders react positively when firms with low social capital integrate vertically with their supply chain partners, and this strategy reduces their risk exposure.

5.3.3.2 The Bullwhip Effect

The second proxy that I use to capture the information friction in the supply chain is the bullwhip effect, which amplifies the demand variations as the information moves upstream in the supply chain (Chen & Lee, 2017). This effect occurs because rational managers overestimate demand during periods of temporary sales increases. Supplier firms do not have clarity of the demand levels at their customers' end, leading to an overestimation of the demand. This phenomenon replicates at each node of the supply chain, leading to a significant discrepancy in the demand estimate between the supply chain partners. I use the demand variability at the customer's end to capture the bullwhip effect empirically ((Agarwal & Agarwal, 2024) .I create an indicator variable HIGH_B equal to 1 for firms where the standard deviation of sales revenue of the key customer is above the median value in a given year, and HIGH_B equal to 0 for firms where the standard deviation of sales revenue of the key customer is below the median. If my conjecture is true, then the cost of debt should be significantly lower when firms with high bullwhip effect integrate vertically. The results are tabulated in column (2) of Table 5. As predicted, the coefficient of the interaction variable VERTINT* HIGH_B is -2.84 (t = -4.37), thus representing a significant reduction in the cost of debt for firms experiencing a high bullwhip effect and increasing the degree of vertical integration. This finding corroborates my argument that lenders react positively to vertical integration as it reduces their default risk.

5.3.3.4 Analyst following and forecast error

I use the number of analysts following a firm and the analyst forecast error as proxies for the quality of the information environment. Based on the previous discussion, if a vertical integration strategy is more beneficial for firms in less conducive information environments, then firms with lower analyst coverage and higher forecast errors should experience greater reductions in loan interest rates following a vertical merger. For these tests, I create an indicator variable,

LOW_ANALYST, which equals 1 for firms with below-median analyst coverage and 0 for firms with above-median analyst coverage. I then interact LOW_ANALYST with VERTINT. The results tabulated in Table 6 column (1) confirm the prediction, showing a significant decrease in borrowing costs, with a coefficient of -2.58 (t = -2.23).

Next, using analyst forecast error as a proxy for the information environment, I examine the impact of vertical integration on the cost of borrowing. If vertical integration is more advantageous for firms in poor information environments, then firms with higher forecast errors should benefit more from lower interest rates on loans after a vertical merger. For this analysis, I create an indicator variable, HIGH_F_ERROR, set to 1 for firms with above-median forecast errors and 0 for those with below-median forecast errors. I then interact HIGH_F_ERROR with VERTINT. Consistent with expectations, the results indicated in Table 6, column (2) show a significant decrease in borrowing costs, with a coefficient of -1.14 (t = -2.01).

6. Additional Tests

I conduct multiple additional tests to ensure the robustness of the main results. First, I repeat the baseline analysis using Total Cost of Borrowing (TCB) and an alternative proxy for the cost of debt. TCB[17] is a measure created by Berg, Saunders, and Steffen (2016) that incorporates not only the loan spread but also other embedded options that are complementary to a debt contract, including the probability of repayment. I first run this test with firm and year fixed effects, and in the second specification, I employ the industry and year fixed effects. The results are negative and

[17] This measure of the cost of borrowing is proposed by Berg, Saunders, and Steffen (2016) as an alternative to the all-in-drawn-spread measure. Berg et al. (2016) argue that the pricing structure of loans is complex; instead of a single price value, a better measure is based on the embedded options in the loan contract and the probability of repayment.

significant in both the specifications at -1.63 (t = -2.06) and -1.06 (t= -2.25), respectively. Next, I repeat the main analysis using other measures of loan terms, including (a) the number of covenants in the loan, (b) loan size, and (c) the maturity length of the loan. I find that as firms increase the degree of vertical integration, the number of covenants is reduced in the loan terms. The size of the loans initiated also increases relatively for firms that integrate vertically with their supply chain partners. However, there is no significant change in the maturity length of the loans.

Finally, I examine the relationship between the degree of vertical integration and the cost of borrowing in those cross-sections of the sample firms that have high cash levels and large sizes. For this test, I divide the sample firms based on the level of cash. I create an indicator variable HIGH CASH =1 for firms with cash levels above the median and HIGH CASH = 0 when the cash levels are below the median. The variable of interest is the interaction variable HIGH CASH x VERTINT, which is negative and significant at -1.71 (t = -2.42). These results convey that lenders perceive firms with higher levels of buffer cash as deriving more benefits from a vertical integration strategy and, hence, reducing the cost of lending. I also examine the relation between the degree of vertical integration and the cost of debt based on the size of the firms. For this test, I divide the sample firms based on size by creating an indicator variable, HIGH SIZE. Accordingly, HIGH SIZE = 1 for firms with size above the median size and HIGH SIZE = 0 for firms below the median size. The coefficient of HIGH SIZE * VERTINT is negative and significant at -2.27 (t = -2.85). These results indicate that lenders are more favorable towards large-sized firms engaging in vertical integration as they are believed to be better equipped to manage the complexities of such operations.

7. Conclusion

Vertical mergers empower the acquiring firms to gain control and ownership over upstream or downstream stages of production, enabling them to facilitate the substitution of external procurements with internal exchanges (Fan & Goyal, 2006). Prior studies have focused on the performance implications of vertical integration strategy (Lahiri, 2016), innovation strategy (Frésard et al., 2020), disclosure behavior (Bourveau et al., 2024) etc. In my study, I focus on the relationship between the degree of vertical of a firm and its cost of borrowing and find a negative association between them.

When a firm integrates vertically, whether in the forward or backward direction, there will be a reduction in the number of external agents in the supply chain. Such a reduction will reduce the dependence of the focal firm on external supply chain agents. When the number of nodes in the supply chain decreases due to VI, there will also be a decline in the transaction costs of the focal firm and a reduction in the information friction that is prevalent in the supply chain. I posit that lenders observe this reduction in resource dependencies, transaction costs, and mitigation of information friction and react positively by reducing the cost of borrowing. Lenders are cautious of the supply chain risks and uncertainties, and vertical integration is one of the strategic moves through which these risks can be mitigated, thus reducing the risk exposure of the lenders. Lenders, being conservative, react to the slightest change in the environment of the borrower and accordingly will incorporate this change too when deciding upon the loan terms of a borrowing firm.

My study contributes to both the vertical integration and debt contracting streams of literature. It highlights how a VI strategy implementation could significantly reduce financing costs. Managers should consider this reduction in borrowing costs as one of the key benefits alongside the existing determinants, such as transaction costs, dependence on supply chain agents, competition,

etc, when evaluating VI implementation decisions. Therefore, my study complements the existing literature on the benefits of VI implementation.

Second, my study discusses the impact of the VI strategy on external stakeholders, in this case, the lenders. Prior studies on VI have focused on either the determinants (Perry, 1989) or firm-level outcomes of VI such as innovation (Fan & Goyal, 2006; Frésard et al., 2020) or the extent of disclosures (Bourveau et al., 2024) etc. Through my study, I aim to extend the literature by documenting how external stakeholders, specifically lenders, view the VI strategy. My findings suggest that lenders view such changes favorably, as VI enables a firm to gain greater control over the supply chain and enhances its stability.

Third, my study contributes to the debt contracting literature by studying the impact of Vertical integration, a form of M&A activity, on the cost of borrowing. Extant literature documents that banks evaluate a firm's creditworthiness based on financial parameters, such as cash flows, profitability levels, leverage ratios, etc. However, my study suggests that banks should also incorporate the organizational structure of the borrower firm into the loan terms. VI decreases the dependence of the focal firm on external supply chain partners and lowers the information friction in the supply chain thereby enhancing the firm's operational control and stability. Such changes in the operational structure improve the credibility of the borrowing firm, leading the lenders to lower the borrowing costs.

Appendix 1: Variable Descriptions

Variable	Description	Source
Main Variables		
SPREAD	The variable *all_in_spread_drawn_bps*, which represents the interest rate paid by borrowers for each dollar drawn down (in bps)	DealScan
LnSPREAD	Natural log of the variable SPREAD	DealScan
TCB	The total cost of corporate borrowing	shared by Tobias Berg: https://sites.google.com/view/tobias-berg/startseite/data-and-code
VI	The degree of vertical integration constructed by Frésard et al., (2020)	Shared by (Frésard et al., 2020)
Control Variables		
ROA	Return on Assets, calculated as the ratio of income before extraordinary items (*ib*) and total assets (*at*)	Compustat
SIZE	Firm size, calculated as the natural logarithm of total assets (*at*)	Compustat
LEV	Leverage, calculated as the summation of Long-term debt (*dltt*) and Total debt in current liabilities (*dlc*), scaled by total assets (*at*)	Compustat
TOT_COV	Total number of covenants on the loan package.	DealScan
MATURITY	The variable tenor_maturity, which represents the duration of the loan facility (in months)	DealScan
LnMATURITY	The natural logarithm of MATURITY	DealScan
LOANSIZE	The variable *deal_amount*, which represents the loan amount (in $M)	
LnLOANSIZE	The natural logarithm of LOANSIZE	DealScan

TANG	Tangibility, calculated as gross property, plant, and equipment (*ppegt*) scaled by total assets (*at*)	Compustat
ZSCORE	Modified Z Score:(1.2 * wcap + 1.4 * re + 3.3 * ib + 0.999 * sale) / at, where *wcap* is the working capital (*act – lct*), *re* is retained earnings, *ib* is the income before extraordinary items, *sale* is sales revenue, and *at* is total assets	Compustat
OPRISK	Operational risk, calculated as the five-year rolling standard deviation of cash flows from operations (*oancf*) scaled by total assets (*at*)	Compustat
NBSEG	Number of business segments of the firm	Compustat Segments
NGSEG	Number of geographic segments of the firm	Compustat Segments
Other Variables		
Custconc1	Proxy for customer concentration based on total percentage sales to major customers as per (Campello & Gao, 2017)	Customer segment files and Compustat
Costconc2	Proxy for customer concentration based on firm's percentage sales to major customers weighted by the size of the customer. (Campello & Gao, 2017)	Customer segment files and Compustat
Suppconc1	Proxy for supplier concentration based on the number of suppliers. Calculated as Log (1 + number of suppliers).(Rahaman et al., 2020)	Customer segment files and Compustat
Suppconc2	Proxy for supplier concentration based on the total percentage of purchases made from suppliers.	Customer segment files and Compustat
Social Capital	Based on Social Capital Score data constructed by (Hartlieb et al., 2020)	
Bullwhip Effect		Hand Collected
Analyst Following	Based on the number of analysts following a firm in a given year. I create an indicator variable LOW_ANALYST, which equals 1 for firms with below-median analyst coverage and 0 for firms with above-median analyst coverage.	(I/B/E/S)
Analyst Forecast Error		(I/B/E/S)
HIGHSIZE	An indicator variable equal to 1 for firms with size above the median size and equal to 0 for firms below the median size.	Compustat
HIGHCASH	An indicator variable equal to 1 for firms with cash levels above the median and equal to 0 when the cash levels are below the median.	Compustat

Appendix 2: Sample Selection

	Dropped	**Sample Size**
Unique firm-year observations from Compustat (1992-2020)		332,027
Merge with LPC DealScan	(263,998)	68,029
Merge with VI measure (computed separately)	(19,583)	48,446
Drop observations with other missing main and control variables (See Appendix 1)	(5,316)	43,130
Final Loan-level Sample		**43,130**

TABLE 1
Descriptive Statistics

This table presents summary statistics and a correlation matrix for the sample firms. The sample spans the period 1992-2021 (N=43,130). All variables are described in Appendix 1. Panel A reports summary statistics for key borrower variables. Panel B presents the correlation coefficients for key regression variables. Values in bold indicate statistical significance at 1 percent or better.

Panel A: Summary Statistics

Variable	Mean	Std. Dev.	p25	Median	p75
SPREAD (bps)	201.480	139.381	100.000	175.000	275.000
lnspread	5.033	0.821	4.615	5.170	5.620
Tenor_Maturity	43.257	27.144	20.000	45.000	60.000
lnmaturity	3.471	1.023	3.045	3.829	4.111
Deal_Amount	933.420	7,459.733	70.000	230.000	732.500
lnloansize	5.366	1.735	4.263	5.442	6.598
vertinteg	0.016	0.015	0.005	0.011	0.022
roa	0.008	0.295	0.003	0.035	0.069
size1	6.653	2.224	5.112	6.713	8.261
lev	0.328	0.911	0.155	0.298	0.441
tang	0.551	0.411	0.223	0.473	0.814
zscore	0.952	35.395	0.565	1.326	2.131
oprisk	0.033	0.084	0.008	0.024	0.039
nbseg	2.183	1.841	1.000	1.000	3.000

Panel B: Correlation Matrix

	(1)	(2)	(3)	(4)
LnSPREAD				
LnMATURITY	**0.078*****			
LnLOANSIZE	**-0.350*****	**0.227*****		
VERTINT	**-0.101*****	**0.048*****	**0.086*****	

TABLE 2

Main Results

This table reports the results from estimating Equation (1) using an OLS specification. The sample comprises 43,130 firm years spanning the period 1992-2021. Robust t-stats based on standard errors clustered at the firm and year level are included in parentheses. Two-tailed p-values are indicated: *** p < 0.01, ** p < 0.05, * p < 0.10. All variables are described in Appendix 1.

Variables	(1) LnSPREAD	(2) LnSPREAD
VERINT	-1.51***	-0.72**
	(-2.63)	(-2.33)
ROA	-0.10***	-0.07*
	(-2.97)	(-1.83)
SIZE	-0.17***	-0.21***
	(-31.19)	(-63.44)
TOT_COV	0.02***	0.03***
	(18.14)	(26.33)
LEV	0.21***	0.02
	(7.98)	(0.88)
LnMATURITY	0.02***	0.03***
	(5.88)	(9.02)
LnLOANSIZE	-0.09***	-0.06***
	(-19.22)	(-13.37)
TANG	-0.28***	-0.11***
	(-12.29)	(-9.59)
ZSCORE	0.01***	0.00*
	(8.60)	(1.92)
OPRISK	0.07	0.01
	(0.72)	(0.27)
NBSEG	-0.00	-0.01***
	(-1.21)	(-5.49)
NGSEG	0.01***	0.01***
	(2.58)	(5.41)
Observations	43,130	43,130
R-squared	0.747	0.515
Year F.E.	Y	
Firm F.E.	Y	Y
Industry F.E.		Y

Table 3. Mediation Results for Customer Concentration

Panel A: Mediation effect for customer concentration based on sales ratio.

Panel A of Table 3 reports the results from estimating Sobel and Goodman mediation tests on models A, B, and C. The sample is comprised of 8,209 firm-years spanning the period 1993-2018. Two-tailed p-values are indicated: *** p < 0.01, ** p < 0.05, * p < 0.10. All variables are described in Appendix.

Model (A): dv regressed on iv (path c)

$$Lnspread_{it} = c_0 + c_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

Model (B): mediator regressed on iv (path a)

$$custconc1_{it} = a_0 + a_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

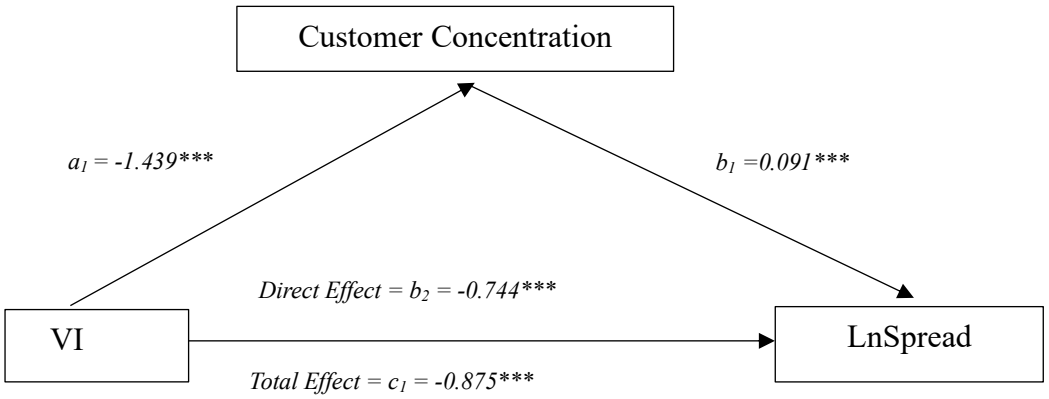
Model (C): dv regressed on mediator and iv – paths b and c`

$$lnspread_{it} = b_0 + b_1 custconc1_{it} + b_2 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

	Coefficient	*Bootstrap Std Err*	*Z*	*P>Z*
Indirect Effect (a_1b_1)	-0.131***	0.033	-3.933	0.000
Direct Effect (b_2)	-0.744**	0.322	-2.309	0.021
Total Effect (c_1) = ($a_1b_1 + b_2$)	-0.875***	0.321	-2.724	0.006

Proportion of total effect that is mediated:	**15.00%**
Ratio of indirect to direct effect:	17.60%
Ratio of total to direct effect:	117.60%

Figure 1. Mediation Analysis



Parameter Estimates of Mediation:

*Indirect Effect = a_1b_1 = -0.131 (0.033) ****

*Direct Effect = b_2 = -0.744 (0.322) ****

*Total Effect = $a_1b_1 + b_2$ = -0.875 (0.321) ****

Percentage Mediation = $a_1b_1 / (a_1b_1 + b_2)$ = 14.97%

Table 3. Mediation Results for Customer Concentration

Panel B: Mediation effect for customer concentration based on customer size.

Panel B of Table 3 reports the results from estimating Sobel and Goodman mediation tests on models A, B, and C. The sample is comprised of 8,303 firm-years spanning the period 1993-2018. Two-tailed p-values are indicated: *** p < 0.01, ** p < 0.05, * p < 0.10. All variables are described in Appendix.

Model (A): dv regressed on iv (path c)

$$Lnspread_{it} = c_0 + c_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

Model (B): mediator regressed on iv (path a)

$$custconc2_{it} = a_0 + a_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

Model (C): dv regressed on mediator and iv – paths b and c`

$$lnspread_{it} = b_0 + b_1 custconc2_{it} + b_2 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

	Coefficient	*Bootstrap Std Err*	*Z*	*P>Z*
Indirect Effect (a_1b_1)	-0.130***	0.035	-3.749	0.000
Direct Effect (b_2)	-1.180***	0.309	-3.818	0.000
Total Effect (c_1) = ($a_1b_1 + b_2$)	-1.310***	0.308	-4.258	0.000

Proportion of total effect that is mediated: **09.90%**
Ratio of indirect to direct effect: 11.00%
Ratio of total to direct effect: 111.00%

Table 4. Mediation Results for Supplier Concentration

Panel A: Mediation effect for supplier concentration based on number of suppliers.

Panel A of Table 4 reports the results from estimating Sobel and Goodman mediation tests on models A, B, and C. The sample is comprised of 10,684 firm-years spanning the period 1993-2018. Two-tailed p-values are indicated: *** p < 0.01, ** p < 0.05, * p < 0.10. All variables are described in Appendix.

Model (A): dv regressed on iv (path c)

$$Lnspread_{it} = c_0 + c_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

Model (B): mediator regressed on iv (path a)

$$suppconc1_{it} = a_0 + a_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

Model (C): dv regressed on mediator and iv – paths b and c`

$$lnspread_{it} = b_0 + b_1 suppconc1_{it} + b_2 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

	Coefficient	*Bootstrap Std Err*	*Z*	*P>Z*
Indirect Effect (a_1b_1)	-0.215***	0.082	-2.611	0.009
Direct Effect (b_2)	-0.717**	0.303	-2.362	0.018
Total Effect (c_1) = ($a_1b_1 + b_2$)	-0.932***	0.292	-3.188	0.001

Proportion of total effect that is mediated:	**23.10%**
Ratio of indirect to direct effect:	30.00%
Ratio of total to direct effect:	130.00%

Table 4. **Mediation Results for Supplier Concentration**

Panel B: Mediation effect for supplier concentration based on purchase ratio.

Panel B of Table 4 reports the results from estimating Sobel and Goodman mediation tests on models A, B, and C. The sample is comprised of 10,056 firm-years spanning the period 1993-2018. Two-tailed p-values are indicated: *** p < 0.01, ** p < 0.05, * p < 0.10. All variables are described in Appendix.

Model (A): dv regressed on iv (path c)

$$Lnspread_{it} = c_0 + c_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

Model (B): mediator regressed on iv (path a)

$$suppconc2_{it} = a_0 + a_1 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

Model (C): dv regressed on mediator and iv – paths b and c`

$$lnspread_{it} = b_0 + b_1 suppconc2_{it} + b_2 verting_{it} + \sum_{i=2}^{11} \beta_i Control_{it} + Fixed\ Effects + \epsilon$$

	Coefficient	*Bootstrap Std Err*	*Z*	*P>Z*
Indirect Effect (a_1b_1)	-0.219*	0.127	-1.728	0.084
Direct Effect (b_2)	-0.692**	0.336	-2.060	0.039
Total Effect (c_1) = ($a_1b_1 + b_2$)	-0.911***	0.311	-2.929	0.003

Proportion of total effect that is mediated:	**24.10%**
Ratio of indirect to direct effect:	31.70%
Ratio of total to direct effect:	131.70%

TABLE 5
Social Capital and Bullwhip Effect

This table reports the results from estimating Equation (2) using OLS on the main sample partitioned based on supply chain information frictions. In Column (1) the sample is partitioned based on whether the Social Capital (SOC) is above or below the yearly median value. In column (2) the sample is partitioned based on whether the Bullwhip Effect (HIGH_B) is above or below the yearly median. Robust t-stats based on standard errors clustered at the firm and year level are included in parentheses. Two-tailed p-values are indicated: *** p < 0.01, ** p < 0.05, * p < 0.10. All variables are described in Appendix 1.

	Social Capital	**Bullwhip Effect**
Variables	lnSPREAD (1)	lnSPREAD (2)
VERTINT × LOW_SOC	**-2.32**** **(-1.99)**	
VERTINT × HIGH_B		**-2.84***** **(-4.37)**
VERTINT	-1.57*	0.34
	(-1.82)	(0.47)
ROA	-0.20***	-0.12***
	(-2.75)	(-2.92)
SIZE	-0.10***	-0.16***
	(-9.79)	(-27.61)
TOT_COV	0.02***	0.02***
	(15.48)	(18.10)
LEV	0.39***	0.22***
	(11.17)	(7.62)
LnMATURITY	0.01**	0.02***
	(2.06)	(6.62)
LnLOANSIZE	-0.11***	-0.10***
	(-16.67)	(-19.11)
TANG	-0.16***	-0.31***
	(-5.72)	(-11.85)
ZSCORE	-0.00	0.01***
	(-0.63)	(7.95)
OPRISK	-0.38***	-0.27***
	(-3.48)	(-3.06)
NBSEG	0.00	-0.00
	(0.39)	(-1.06)
NGSEG	0.00	0.01**
	(0.18)	(2.33)
Observations	32,818	39,028
R-squared	0.706	0.749
Year F.E.	Y	Y
Firm F.E.	Y	Y

TABLE 6
Analyst Following and Forecast Error

This table reports the results from estimating Equation (2) using OLS on the main sample partitioned based on information environment of the focal firm. In Columns (1) the sample is partitioned on whether the number of analysts following (ANALYST) the focal firm are above or below the yearly median value. In Column (2) the sample is partitioned based on whether the analyst forecast error (F_ERR) is above or below the yearly median values . Robust t-stats based on standard errors clustered at the firm and year level are included in parentheses. Two-tailed p-values are indicated: *** p < 0.01, ** p < 0.05, * p < 0.10. All variables are described in Appendix 1.

	Analyst Following	**Analyst Forecast Error**
Variables	LnSPREAD (1)	LnSPREAD (2)
VERTING × LOW_ANALYST	**-2.58**** **(-2.23)**	
VERTINT × HIGH_F_ERROR		**-1.14**** **(-2.01)**
VERTINT	-2.20* (-1.70)	0.04 (0.05)
ROA	-0.45*** (-5.42)	-0.37*** (-4.09)
SIZE	0.10*** (6.64)	-0.16*** (-18.39)
TOT_COV	0.02*** (11.13)	0.02*** (21.64)
LEV	0.38*** (5.93)	0.38*** (11.50)
LnMATURITY	0.03*** (5.65)	0.02*** (6.53)
LnLOANSIZE	-0.11*** (-13.64)	-0.09*** (-18.82)
TANG	0.06 (1.15)	-0.21*** (-8.28)
ZSCORE	0.02*** (8.67)	-0.02*** (-2.88)
OPRISK	0.64*** (5.13)	-0.06 (-0.67)
NBSEG	0.00 (0.44)	-0.01** (-2.31)
NGSEG	0.03*** (6.44)	0.01*** (2.70)
Observations	18,038	26,293
R-squared	0.735	0.797
Year F.E.	Y	Y
Firm F.E.	Y	Y

TABLE 7
Alternate Measures of Cost of Debt

This table reports the results from estimating Equation (2) using OLS specification to test the association between the degree of vertical integration and the cost of debt using an alternative proxy for the cost of borrowings. In Column (1), I use firm fixed effects, and in Column (2), I use the industry fixed effects. Robust t-stats based on standard errors clustered at the firm and year level are included in parentheses. Two-tailed p-values are indicated: *** p < 0.01, ** p < 0.05, * p < 0.10. All variables are described in Appendix 1.

Variables	(1) LnTCB	(2) LnTCB
VERINT	-1.63**	-1.06**
	(-2.06)	(-2.25)
ROA	0.07	0.01
	(0.83)	(0.06)
SIZE	-0.21***	-0.25***
	(-24.77)	(-44.77)
TOT_COV	0.02***	0.04***
	(13.96)	(24.67)
LEV	0.31***	0.58***
	(6.78)	(11.46)
LnMATURITY	-0.03***	0.03***
	(-4.90)	(4.29)
LnLOANSIZE	0.00	0.03***
	(0.20)	(4.06)
TANG	-0.14***	-0.15***
	(-4.12)	(-9.66)
ZSCORE	-0.03**	-0.05***
	(-2.43)	(-3.25)
OPRISK	-0.33**	-0.28**
	(-2.00)	(-2.10)
NBSEG	-0.00	-0.02***
	(-0.99)	(-5.63)
NGSEG	0.01***	0.01***
	(2.94)	(4.04)
Observations	18,462	18,462
R-squared	0.736	0.530
Firm Fixed Effects	Yes	
Year Fixed Effects	Yes	Yes
Industry Fixed Effects		Yes

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

TABLE 8
Other Loan Terms

This table reports the results from estimating Equation (2) using OLS specification to test the association between the degree of vertical integration and loan contract terms. Robust t-stats based on standard errors clustered at the firm and year level are included in parentheses. Two-tailed p-values are indicated: *** p < 0.01, ** p < 0.05, * p < 0.10. All variables are described in Appendix 1.

Variables	(1) TOT COV	(2) LnLOANSIZE	(3) LnMATURITY
VERINT	**-8.03****	**2.16****	**-0.37**
	(-2.02)	**(1.99)**	**(-0.40)**
ROA	0.29*	-0.02	0.07*
	(1.65)	(-0.42)	(1.77)
SIZE	-0.49***	0.28***	0.01
	(-12.04)	(27.11)	(1.31)
LEV	-0.11	0.36***	-0.12**
	(-0.49)	(6.57)	(-2.57)
LnMATURITY	0.55***	0.06***	
	(21.71)	(9.13)	
LnLOANSIZE	0.85***		0.07***
	(29.50)		(9.08)
TANG	0.08	-0.05	-0.01
	(0.46)	(-1.21)	(-0.32)
ZSCORE	-0.01	0.01***	-0.00**
	(-1.29)	(5.01)	(-2.37)
OPRISK	0.12	0.01	-0.31***
	(0.31)	(0.10)	(-3.50)
NBSEG	-0.02	0.02***	-0.01
	(-0.75)	(2.86)	(-1.01)
NGSEG	0.04**	-0.00	-0.01**
	(2.11)	(-0.13)	(-2.31)
TOT_COV		0.06***	0.04***
		(29.40)	(20.59)
Observations	43,130	43,130	43,130
R-squared	0.546	0.802	0.359
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes

TABLE 9
Robustness Checks

This table reports the results from estimating Equation (2) using OLS specification when the sample is partitioned based on the size of the firms in Column (1) and cash levels in Column (2). Robust t-stats based on standard errors clustered at the firm and year level are included in parentheses. Two-tailed p-values are indicated: *** p < 0.01, ** p < 0.05, * p < 0.10. All variables are described in Appendix 1.

Variables	(1) LnSPREAD	(2) LnSPREAD
VERINT	-0.65	-0.38
	(-1.05)	(-0.60)
HIGH CASH	0.03**	
	(2.16)	
HIGH CASH x VERTINT	-1.71**	
	(-2.42)	
HIGH		0.00
		(0.17)
HIGH SIZE x VERTINT		-2.27***
		(-2.85)
ROA	-0.09***	-0.10***
	(-3.04)	(-2.98)
SIZE	-0.17***	-0.16***
	(-30.66)	(-26.67)
TOT_COV	0.02***	0.02***
	(17.82)	(18.12)
LEV	0.21***	0.21***
	(7.84)	(8.00)
LnMATURITY	0.02***	0.02***
	(5.61)	(5.96)
LnLOAN SIZE	-0.09***	-0.09***
	(-18.82)	(-19.21)
TANG	-0.27***	-0.28***
	(-11.83)	(-12.26)
ZSCORE	0.01***	0.01***
	(8.50)	(8.61)
OPRISK	0.07	0.08
	(0.67)	(0.76)
NBSEG	-0.00	-0.00
	(-1.19)	(-1.22)
NGSEG	0.01*	0.01**
	(1.95)	(2.57)
Observations	42,304	43,130
R-squared	0.749	0.747
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

References:

Agarwal, N., & Agarwal, S. (2024). Cost decisions of supplier firms: A study based on the customer-supplier link. *Management Accounting Research*, *62*, 100856. https://doi.org/10.1016/j.mar.2023.100856

Aghion, P., & Bolton, P. (1992). An Incomplete Contracts Approach to Financial Contracting. *The Review of Economic Studies*, *59*(3), 473–494. https://doi.org/10.2307/2297860

Albring, S., Banyi, M., Dhaliwal, D., & Pereira, R. (2016). Does the Firm Information Environment Influence Financing Decisions? A Test Using Disclosure Regulation. *Management Science*, *62*(2), 456–478. https://doi.org/10.1287/mnsc.2014.2123

Allen, J. W., & Phillips, G. M. (2000). Corporate Equity Ownership, Strategic Alliances, and Product Market Relationships. *The Journal of Finance*, *55*(6), 2791–2815. https://doi.org/10.1111/0022-1082.00307

Andreou, P. C., Louca, C., & Panayides, P. M. (2016). The impact of vertical integration on inventory turnover and operating performance. *International Journal of Logistics Research and Applications*, *19*(3), 218–238. https://doi.org/10.1080/13675567.2015.1070815

Arrow, K. J. (1975). Vertical Integration and Communication. *The Bell Journal of Economics*, *6*(1), 173–183. https://doi.org/10.2307/3003220

Asare, S. K., & Wright, A. M. (2012). Investors', auditors', and lenders' understanding of the message conveyed by the standard audit report on the financial statements. *Accounting Horizons*, *26*(2), 193–217.

Atalay, E., Hortaçsu, A., & Syverson, C. (2014). Vertical Integration and Input Flows. *American Economic Review*, *104*(4), 1120–1148. https://doi.org/10.1257/aer.104.4.1120

Banerjee, S., Dasgupta, S., & Kim, Y. (2008). Buyer–Supplier Relationships and the Stakeholder Theory of Capital Structure. *The Journal of Finance*, *63*(5), 2507–2552. https://doi.org/10.1111/j.1540-6261.2008.01403.x

Baumol, W. J., Panzar, J. C., & Willig, R. D. (1983). Contestable Markets: An Uprising in the Theory of Industry Structure: Reply. *The American Economic Review*, *73*(3), 491–496.

Baylis, R. M., Burnap, P., Clatworthy, M. A., Gad, M., & Pong, C. K. M. (2017). Private lenders' demand for audit. *Journal of Accounting & Economics*, *64*(1), 78–97. https://doi.org/10.1016/j.jacceco.2017.06.001

Bharath, S. T., Sunder, J., & Sunder, S. V. (2008). Accounting Quality and Debt Contracting. *The Accounting Review*, *83*(1), 1–28.

Bhattacharyya, S., & Nain, A. (2011). Horizontal acquisitions and buying power: A product market analysis. *Journal of Financial Economics*, *99*(1), 97–115. https://doi.org/10.1016/j.jfineco.2010.08.007

Bolton, P., & Whinston, M. D. (1993). Incomplete Contracts, Vertical Integration, and Supply Assurance. *The Review of Economic Studies*, *60*(1), 121–148. https://doi.org/10.2307/2297815

Botosan, C. A., & Plumlee, M. A. (2005). Assessing Alternative Proxies for the Expected Risk Premium. *The Accounting Review*, *80*(1), 21–53. https://doi.org/10.2308/accr.2005.80.1.21

Bourveau, T., Kepler, J. D., She, G., & Wang, L. L. (2024). Firm Boundaries and Voluntary Disclosure. *The Accounting Review*, *99*(4), 111–141. https://doi.org/10.2308/TAR-2022-0182

Buzzell, R. D. (1983). Is vertical integration profitable. *Harv. Bus. Rev.; (United States)*, *61:1*. https://www.osti.gov/biblio/6116775

Cachon, G. P., & Lariviere, M. A. (2001). Contracting to Assure Supply: How to Share Demand Forecasts in a Supply Chain. *Management Science*, *47*(5), 629–646. https://doi.org/10.1287/mnsc.47.5.629.10486

Cai, K., & Zhu, H. (2020). Customer-Supplier relationships and the cost of debt. *Journal of Banking & Finance*, *110*, 105686. https://doi.org/10.1016/j.jbankfin.2019.105686

Calvo, G. A., & Wellisz, S. (1978). Supervision, Loss of Control, and the Optimum Size of the Firm. *Journal of Political Economy*, *86*(5), 943–952. https://doi.org/10.1086/260719

Campbell, K., Gordon, L., Loeb, M., & Zhou, L. (2003). The Economic Cost of Publicly Announced Information Security Breaches: Empirical Evidence from the Stock Market. *Journal of Computer Security*, *11*, 431–448. https://doi.org/10.3233/JCS-2003-11308

Campello, M., & Gao, J. (2017). Customer concentration and loan contract terms. *Journal of Financial Economics*, *123*(1), 108–136. https://doi.org/10.1016/j.jfineco.2016.03.010

Casciaro, T., & Piskorski, M. J. (2005). Power Imbalance, Mutual Dependence, and Constraint Absorption: A Closer Look at Resource Dependence Theory. *Administrative Science Quarterly*, *50*(2), 167–199. https://doi.org/10.2189/asqu.2005.50.2.167

Cen, L., & Dasgupta, S. (2021). *The Economics and Finance of Customer-Supplier Relationships* (SSRN Scholarly Paper 3832460). https://papers.ssrn.com/abstract=3832460

Cen, L., Dasgupta, S., Elkamhi, R., & Pungaliya, R. S. (2016). Reputation and Loan Contract Terms: The Role of Principal Customers *. *Review of Finance*, *20*(2), 501–533. https://doi.org/10.1093/rof/rfv014

Chandler, A. D. (1962). *STRATEGY AND STRUCTURE: CHAPTERS IN THE HISTORY OF THE INDUSTRIAL EMPIRE*.

Chava, S., Livdan, D., & Purnanandam, A. (2009). Do Shareholder Rights Affect the Cost of Bank Loans? *The Review of Financial Studies*, *22*(8), 2973–3004. https://doi.org/10.1093/rfs/hhn111

Chen, F., & Samroengraja, R. (2000). THE STATIONARY BEER GAME. *Production and Operations Management*, *9*(1), 19–30. https://doi.org/10.1111/j.1937-5956.2000.tb00320.x

Chen, L., & Lee, H. L. (2017a). Modeling and Measuring the Bullwhip Effect. In A. Y. Ha & C. S. Tang (Eds.), *Handbook of Information Exchange in Supply Chain Management* (pp. 3–25). Springer International Publishing. https://doi.org/10.1007/978-3-319-32441-8_1

Chen, L., & Lee, H. L. (2017b). Modeling and Measuring the Bullwhip Effect. In A. Y. Ha & C. S. Tang (Eds.), *Handbook of Information Exchange in Supply Chain Management* (pp. 3–25). Springer International Publishing. https://doi.org/10.1007/978-3-319-32441-8_1

Chen, P. F., He, S., Ma, Z., & Stice, D. (2016). The information role of audit opinions in debt contracting. *Journal of Accounting and Economics*, *61*(1), 121–144. https://doi.org/10.1016/j.jacceco.2015.04.002

Cheng, L., Craighead, C. W., Crook, T. R., & Eckerd, S. (2021). Leaving it on the table? An examination of unrealized bargaining power in multimarket buyer–supplier exchanges. *Journal of Operations Management*, *67*(3), 382–406. https://doi.org/10.1002/joom.1121

Coase, R. H. (1937). *The Nature of the Firm—Coase—1937—Economica—Wiley Online Library*. https://onlinelibrary.wiley.com/doi/10.1111/j.1468-0335.1937.tb00002.x

Collier, J. (2009). Will Coke follow suit? Pepsi Co wants to buy its two largest bottlers. *The Atlanta Journal Constitution*, 5A.

Cremer, J. (1980). A Partial Theory of the Optimal Organization of a Bureaucracy. *The Bell Journal of Economics*, *11*(2), 683–693. https://doi.org/10.2307/3003387

Crook, T. R., & Combs, J. G. (2007). Sources and consequences of bargaining power in supply chains. *Journal of Operations Management*, *25*(2), 546–555. https://doi.org/10.1016/j.jom.2006.05.008

Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm* (p. 322). Prentice Hall/Pearson Education.

dev_digitalsilk. (2023, June 8). Case Studies: Successful Companies that Have Implemented Vertical Integration. *Devensoft*. https://www.devensoft.com/articles/vertically-integrated-companies-case-studies/

Dhaliwal, D., Hogan, C., Trezevant, R., & Wilkins, M. (2011). Internal Control Disclosures, Monitoring, and the Cost of Debt. *The Accounting Review*, *86*(4), 1131–1156. https://doi.org/10.2308/accr-10043

Emerson, R. M. (1964). Power-Dependence Relations: Two Experiments. *Sociometry*, *27*(3), 282–298. https://doi.org/10.2307/2785619

Ersahin, N., Giannetti, M., & Huang, R. (2023). *Supply Chain Risk: Changes in Supplier Composition and Vertical Integration* (Working Paper 31134). National Bureau of Economic Research. https://doi.org/10.3386/w31134

Ertugrul, M., Lei, J., Qiu, J., & Wan, C. (2017). Annual Report Readability, Tone Ambiguity, and the Cost of Borrowing. *The Journal of Financial and Quantitative Analysis*, *52*(2), 811–836.

Fan, J. P. H., & Goyal, V. K. (2006). On the Patterns and Wealth Effects of Vertical Mergers. *The Journal of Business*, *79*(2), 877–902. https://doi.org/10.1086/499141

Fee, C. E., & Thomas, S. (2004). Sources of gains in horizontal mergers: Evidence from customer, supplier, and rival firms. *Journal of Financial Economics*, *74*(3), 423–460. https://doi.org/10.1016/j.jfineco.2003.10.002

Ferreira, M. A., & Matos, P. (2012). Universal Banks and Corporate Control: Evidence from the Global Syndicated Loan Market. *The Review of Financial Studies*, *25*(9), 2703–2744. https://doi.org/10.1093/rfs/hhs076

Florou, A., & Kosi, U. (2015). Does mandatory IFRS adoption facilitate debt financing? *Review of Accounting Studies*, *20*(4), 1407–1456. https://doi.org/10.1007/s11142-015-9325-z

Frésard, L., Hoberg, G., & Phillips, G. M. (2020). Innovation Activities and Integration through Vertical Acquisitions. *The Review of Financial Studies*, *33*(7), 2937–2976. https://doi.org/10.1093/rfs/hhz106

Furfine, C. H., & Rosen, R. J. (2011). Mergers increase default risk. *Journal of Corporate Finance*, *17*(4), 832–849. https://doi.org/10.1016/j.jcorpfin.2011.03.003

Goodman, L. A. (1960). On the Exact Variance of Products. *Journal of the American Statistical Association*, *55*(292), 708–713. https://doi.org/10.1080/01621459.1960.10483369

Graham, J. R., Li, S., & Qiu, J. (2008). Corporate misreporting and bank loan contracting$. *Journal of Financial Economics*.

Grossman, S. J., & Hart, O. D. (1986). The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration. *Journal of Political Economy*, *94*(4), 691–719. https://doi.org/10.1086/261404

Harrigan, K. R. (1984). Formulating Vertical Integration Strategies. *Academy of Management Review*, *9*(4), 638–652. https://doi.org/10.5465/amr.1984.4277387

Harrigan, K. R. (1985). *Vertical integration and corporate strategy*.

Hart, O., & Moore, J. (1988). Incomplete Contracts and Renegotiation. *Econometrica*, *56*(4), 755–785. https://doi.org/10.2307/1912698

Hartlieb, S., Loy, T. R., & Eierle, B. (2020). Does community social capital affect asymmetric cost behaviour? *Management Accounting Research*, *46*, 100640. https://doi.org/10.1016/j.mar.2019.02.002

Hasan, I., Hoi, C. K. (Stan), Wu, Q., & Zhang, H. (2014). Beauty is in the eye of the beholder: The effect of corporate tax avoidance on the cost of bank loans. *Journal of Financial Economics*, *113*(1), 109–130. https://doi.org/10.1016/j.jfineco.2014.03.004

Hasan, I., Hoi, C. K., Wu, Q., & Zhang, H. (2017a). Social Capital and Debt Contracting: Evidence from Bank Loans and Public Bonds. *Journal of Financial and Quantitative Analysis*, *52*(3), 1017–1047. https://doi.org/10.1017/S0022109017000205

Hasan, I., Hoi, C.-K. (stan), Wu, Q., & Zhang, H. (2017b). Does Social Capital Matter in Corporate Decisions? Evidence from Corporate Tax Avoidance. *Journal of Accounting Research*, *55*(3), 629–668. https://doi.org/10.1111/1475-679X.12159

Hayes, R. H., & Wheelwright, S. C. (1984). Restoring our competitive edge: Competing through manufacturing. *New York : John Wiley & Sons*. https://cir.nii.ac.jp/crid/1130000798253560448

Hill, C. W. L., & Hoskisson, R. E. (1987). Strategy and Structure in the Multiproduct Firm. *The Academy of Management Review*, *12*(2), 331. https://doi.org/10.2307/258539

Hoi, C. K., Wu, Q., & Zhang, H. (2018). Community Social Capital and Corporate Social Responsibility. *Journal of Business Ethics*, *152*(3), 647–665. https://doi.org/10.1007/s10551-016-3335-z

Houston, J. F., Lin, C., & Zhu, Z. (2016). The Financial Implications of Supply Chain Changes. *Management Science*, *62*(9), 2520–2542. https://doi.org/10.1287/mnsc.2015.2159

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305–360. https://doi.org/10.1016/0304-405X(76)90026-X

Klein, B., Crawford, R. G., & Alchian, A. A. (1978). Vertical Integration, Appropriable Rents, and the Competitive Contracting Process. *The Journal of Law and Economics*, *21*(2), 297–326. https://doi.org/10.1086/466922

Kothari, S. P., Ramanna, K., & Skinner, D. J. (2010). Implications for GAAP from an analysis of positive research in accounting. *Journal of Accounting and Economics*, *50*(2–3), 246–286.

Lahiri, S. (2016). Does Outsourcing Really Improve Firm Performance? Empirical Evidence and Research Agenda. *International Journal of Management Reviews*, *18*(4), 464–497. https://doi.org/10.1111/ijmr.12075

Lee, H. L., Padmanabhan, V., & Whang, S. (1997). Information Distortion in a Supply Chain: The Bullwhip Effect. *Management Science*, *43*(4), 546–558. https://doi.org/10.1287/mnsc.43.4.546

Lin, Y., Parlaktürk, A. K., & Swaminathan, J. M. (2014). Vertical Integration under Competition: Forward, Backward, or No Integration? *Production and Operations Management*, *23*(1), 19–35. https://doi.org/10.1111/poms.12030

Lins, K. V., Servaes, H., & Tamayo, A. (2017). Social Capital, Trust, and Firm Performance: The Value of Corporate Social Responsibility during the Financial Crisis. *The Journal of Finance*, *72*(4), 1785–1824. https://doi.org/10.1111/jofi.12505

Mahoney, J. T. (1992). The choice of organizational form: Vertical financial ownership versus other methods of vertical integration. *Strategic Management Journal*, *13*(8), 559–584. https://doi.org/10.1002/smj.4250130802

Perry, M. K. (1989). Chapter 4 Vertical integration: Determinants and effects. In *Handbook of Industrial Organization* (Vol. 1, pp. 183–255). Elsevier. https://doi.org/10.1016/S1573-448X(89)01007-1

Pfeffer, J., & Salancik, G. (2006). External Control of Organizations—Resource Dependence Perspective. In *Organizational Behavior 2*. Routledge.

Porumb, V.-A., Zengin-Karaibrahimoglu, Y., Lobo, G. J., Hooghiemstra, R., & de Waard, D. (2021). Expanded Auditor's Report Disclosures and Loan Contracting*. *Contemporary Accounting Research*, *38*(4), 3214–3253. https://doi.org/10.1111/1911-3846.12697

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891. https://doi.org/10.3758/BRM.40.3.879

Qian. (2007). *How Laws and Institutions Shape Financial Contracts: The Case of Bank Loans The Journal of Finance—Wiley Online Library*.

Rahaman, M. M., Rau, P. R., & Zaman, A. A. (2020). The effect of supply chain power on bank financing. *Journal of Banking & Finance*, *114*, 105801. https://doi.org/10.1016/j.jbankfin.2020.105801

Roberts, M. R., & Sufi, A. (2009). Financial Contracting: A Survey of Empirical Research and Future Directions. *Annual Review of Financial Economics*, *1*(1), 207–226. https://doi.org/10.1146/annurev-financial-071808-145241

Rumelt, R. P. (1974). Strategy, structure, and economic performance. *(No Title)*. https://cir.nii.ac.jp/crid/1130000797596165760

Smith, C. W., & Warner, J. B. (1979). On financial contracting: An analysis of bond covenants. *Journal of Financial Economics*, *7*(2), 117–161. https://doi.org/10.1016/0304-405X(79)90011-4

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology*. https://scholar.google.com/scholar?cluster=10411153877864841364&hl=en&oi=scholarr

Sufi, A. (2007). Information Asymmetry and Financing Arrangements: Evidence from Syndicated Loans. *The Journal of Finance*, *62*(2), 629–668. https://doi.org/10.1111/j.1540-6261.2007.01219.x

Titman, S., & Wessels, R. (1988). The Determinants of Capital Structure Choice. *The Journal of Finance*, *43*(1), 1–19. https://doi.org/10.1111/j.1540-6261.1988.tb02585.x

Watts, R. L. (2003). Conservatism in Accounting Part I: Explanations and Implications. *Accounting Horizons*, *17*(3), 207–221. https://doi.org/10.2308/acch.2003.17.3.207

Watts, R. L., & Zimmerman, J. L. (1986). Positive Accounting Theory: A Ten Year Perspective. *The Accounting Review*, *65*(1), 131–156.

Williamson, O. E. (1967). Hierarchical Control and Optimum Firm Size. *Journal of Political Economy*, *75*(2), 123–138. https://doi.org/10.1086/259258

Williamson, O. E. (1971). The Vertical Integration of Production: Market Failure Considerations. *The American Economic Review*, *61*(2), 112–123.

Williamson, O. E. (1975). *Markets and Hierarchies: Analysis and Antitrust Implications: A Study in the Economics of Internal Organization* (SSRN Scholarly Paper 1496220). https://papers.ssrn.com/abstract=1496220

Williamson, O. E. (1985). *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting* (SSRN Scholarly Paper 1496720). https://papers.ssrn.com/abstract=1496720

Zhang, J. (2008). The contracting benefits of accounting conservatism to lenders and borrowers. *Journal of Accounting and Economics*, *45*(1), 27–54. https://doi.org/10.1016/j.jacceco.2007.06.002