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Planned Strategic Investments, Bank-Based Financing Constraint, and Capacity Utilization: Evidence from Thailand[1]

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Abstract

To finance their strategic investment projects that probably take years to complete, firms in emerging countries generally rely on commercial banks that prefer collateral-based lending. This paper primarily examines how a bank-based financing constraint in the form of collateral requirement affects firms' strategic investment outlook. Using cross-sectional data on manufacturing firms in Thailand from the World Bank's 2007 Productivity and Investment Climate survey, I find that the bank-based financing constraint is negatively related to firms' planned strategic investments. My finding corroborates prior literature documenting that financing constraints deter the emergence and growth of businesses in emerging countries. I also find that capacity utilization is positively associated with planned strategic investments. However, the bank-based financial constraint weakens the effect of capacity utilization on planned strategic investments. Overall, my findings suggest that financially constrained firms may have to rely on informal financing to increase capacity utilization and therefore will experience an even greater degree of financing constraints.

Keywords: Financing constraint, Planned strategic investment, Capacity utilization

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เงินลงทุนเชิงกลยุทธ์ในอนาคตที่วางแผนไว้ ข้อจำกัดในการจัดหาเงินทุนจากธนาคาร และการใช้กำลังการผลิต: หลักฐานจากประเทศไทย

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บทคัดย่อ

กิจการในประเทศตลาดเกิดใหม่มักพึ่งพาธนาคารซึ่งนิยมปล่อยสินเชื่อโดยอ้างอิงกับหลักประกัน เพื่อจัดหาเงินทุนสำหรับโครงการลงทุนเชิงกลยุทธ์ที่ใช้เวลายาวนานกว่าโครงการจะสิ้นสุด งานวิจัยฉบับนี้ศึกษาว่าข้อจำกัดในการจัดหาเงินทุนเนื่องจากการที่ธนาคารขอหลักประกันจากกิจการมีผลกระทบต่อแผนการลงทุนเชิงกลยุทธ์ในอนาคตของกิจการอย่างไร ข้าพเจ้าใช้ข้อมูลกิจการภาคการผลิตในประเทศไทยจากแบบสอบถามสถานการณ์การลงทุนและผลิตภาพซึ่งจัดทำโดยธนาคารโลกในปี 2007 สำหรับการศึกษาวิจัยและพบว่าข้อจำกัดในการจัดหาเงินทุนของกิจการลดเงินลงทุนเชิงกลยุทธ์ในอนาคตที่กิจการวางแผนไว้ลง ข้อค้นพบของข้าพเจ้าสนับสนุนงานวิจัยก่อนหน้านี้ที่รายงานว่าข้อจำกัดด้านการจัดหาเงินทุนเป็นอุปสรรคต่อการเกิดขึ้นและการเติบโตของธุรกิจในประเทศตลาดเกิดใหม่ นอกจากนั้นข้าพเจ้ายังพบว่าการใช้กำลังการผลิตมีความสัมพันธ์ทางบวกกับเงินลงทุนเชิงกลยุทธ์ที่กิจการวางแผนว่าจะใช้ในอนาคต อย่างไรก็ตาม ข้อจำกัดในการจัดหาเงินทุนลดผลกระทบของการใช้กำลังการผลิตต่อเงินลงทุนเชิงกลยุทธ์ในอนาคตที่กิจการวางแผนไว้ ข้อค้นพบเหล่านี้เสนอแนะว่ากิจการที่มีข้อจำกัดในการจัดหาเงินทุนอาจจำเป็นต้องพึ่งพาแหล่งเงินทุนนอกระบบเพื่อเพิ่มการใช้กำลังการผลิต ดังนั้น จึงเผชิญข้อจำกัดในการจัดหาเงินทุนที่สูงขึ้น

คำสำคัญ: ข้อจำกัดในการจัดหาเงินทุน เงินลงทุนเชิงกลยุทธ์ในอนาคตที่วางแผนไว้โดยกิจการ การใช้กำลังการผลิต

1. Introduction

Corporate investments are vital to creating and sustaining a firm's competitive advantage (Shaver, 2011), performance, market value (Modigliani and Miller, 1958), and long-term growth (Birhanu, Gambardella, and Valentini, 2016). This knowledge leads to two important questions: what affects a firm's ability or decision to invest and what moderates the effect. Using only the historical financial data, prior empirical studies document that financial factors—such as unavailability of internal cash—play a direct role in limiting *actual* investment (e.g., Almeida and Campello, 2007; Fazzari and Athey, 1987; Fazzari et al., 1988; Shaver, 2011) and that firms can alleviate the constraint through diversifying sales geographically (Shaver, 2011). I contribute to the literature by using novel perceptions-based data on planned strategic investments from the Productivity and Investment Climate survey to assess how a bank-based financing constraint affects *planned* strategic investments at the firm level. I also examine the association between capacity utilization and *planned* strategic investments and the moderation effect of the financing constraint.

Shaver (2011) stresses that strategic investment decisions—for example, developing capacity and capabilities by investing in manufacturing and information technology—are fundamental to establishing a firm's competitive advantage. Naturally, strategic investment projects take months or even years to complete. First, managers decide on a product that their firms will produce to generate revenue. They then list all possible future strategic investments, such as acquiring or researching and developing high-level production technology, necessary for facilitating the manufacturing of the product and leading to above-average performance. They also use the capital budgeting technique to evaluate what investment projects they should undertake. All accepted projects are included in the strategic investment plan of the firm. In materializing these projects, managers seek funds to finance each of the projects included in the plan. As a rule, managers should invariably accept all positive NPV (Net Present Value) projects to maximize shareholders' wealth. Yet, do managers always seek funds to finance all of these projects? The most realistic answer to this question is "No, they don't." Many firms lack financial resources to finance all the positive NPV projects, chiefly because they are encountering financing constraints (e.g., Jensen, 1994). To put it simply, their strategic investment decisions are conditional on, or are limited by, their access to sources of financial resources—including internally generated cash, debts, and equity.

Dating back to the year 1958, Modigliani and Miller proposed Modigliani—Miller Proposition I, often referred to as "the irrelevance hypothesis," that investment decisions are independent of financing decisions. Their main assumptions are so ideal that scholars view this theorem as one in a perfect world without financial frictions (e.g., tax) or information asymmetry. Despite this, some literature endorses the theorem. For instance, Jorgensen (1971) argues that financial variables are not an important determinant of investment. Said differently, all desired investment projects can be financed, a theory that can be justified under the Modigliani and Miller perfect world. While the Modigliani and Miller theorem has been highly influential in corporate finance, subsequent empirical

studies challenge the theorem by arguing that the presence of contract enforcement and asymmetric information contributes to an association between financing decisions and investment decisions (e.g., Jensen and Meckling, 1976; Fazzari and Athey, 1987; Aivazian, 1998).

Finance and economics literature that documents the relationship between investment decisions and financing decisions is abundant. Most concentrates on developing identification strategies to examine the relation between corporate investment and internal cash flows. Fazzari et al. (1988) had been referred to as the standard identification strategy before Kaplan and Zingales (1997) criticized their approach and proposed a new approach that later became the new standard of the identification strategy. The former find that investment decisions of more financially constrained firms are more sensitive to cash flow and therefore the wedge between the cost of external funds and that of internal funds is large, whereas the latter report evidence that contradicts the finding of the former.

On the other hand, strategic management literature focused on corporate investments pays considerable attention to the effects of variables other than financial factors. For example, Birhanu et al. (2016) investigate the relation between bribery and corporate investments in Africa and Latin America by using the data from the Enterprise Survey and find that myopic firms tend to bribe rather than invest in fixed assets (i.e., bribery constrains corporate investments) whereas long-term oriented firms do the opposite. Only through Souder and Shaver (2010) and Shaver (2011) do I find that strategic management literature examines relations between financial variables and corporate investments. Souder and Shaver (2010) document that poor short-term performance and managers' holding of high level of exercisable stock options prevents firms from making long-horizon investments. Shaver (2011) finds that exporting mitigates the constraining influence of a shortage of internally generated cash on strategic investments of firms and therefore can be a strategy for creating and sustaining competitive advantage against non-exporting firms.

Recognizing that strategic management literature on financial variables and corporate investments is scarce but theoretically and managerially significant raises the question of how financial constraints other than a deficiency of internally generated cash, called liquidity constraint by Shaver (2011), affects strategic investments of firms. Shaver (2011) assume that firms that lack internally generated cash are financially constrained firms in his study. However, I contend in accordance with Myers & Majluf (1984) that when internally generated cash within a firm is insufficient, the firm can access external financing through issuance of debt instruments although the degree of access varies across firms. The most common debt transaction is to borrow money from commercial banks. Accordingly, this paper will advance the literature by examining the impact of a bank-based financing constraint on planned strategic investments of firms. An important bank-based financing constraint is whether firms are required by banks to pledge collateral when they apply for bank loans. Collateral imposes a limit on the amount of loans granted by banks (Paulson and Townsend, 2004). Planned strategic investment is firm-level investment in R&D projects or major capital expenditures (Woolridge and

Snow, 1990) that firm managers plan to make in the near future in accordance with their strategic investment plans.

I argue that collateral requirement constrains planned strategic investment decisions of firms. To test this argument, I use the cross-sectional data of manufacturing firms in Thailand from the Productivity and Investment Climate survey, conducted jointly by the World Bank and the Foundation for the Thailand Productivity Institute in 2007. I initially perform the coarsened exact matching, which produces 365 matched observations. I then use the matched observations to perform regression analysis. I find that collateral requirement is negatively associated with planned strategic investments of firms. My result suggests that investment decisions are not independent of financing decisions.

For firms in the manufacturing sector, capacity utilization is probably the most crucial factor. It measures firm performance in terms of potential output that is realized. It also assists firms in assessing whether they are running optimally and identifying where they are underperforming. Numerous manufacturing firms set capacity utilization as one of the primary goals they desire to achieve—as known as key performance indicator (KPI). Ideally, whenever there is greater demand, firms aim to increase capacity utilization to meet the demand; otherwise, competitors seize the opportunity and make above-average profit. An increase in capacity utilization is likely to result in improvements in productivity, economies of scale, profitability, and hence cash inflows. Cash inflows add to internal financing that firms could use for future investments.

While prior literature scarcely documents empirical associations between capacity utilization and investments, Berndt and Morrison (1981) document that capacity utilization accounts for changes in investments. I argue and find that capacity utilization is positively related to planned strategic investments. However, financing constraints pose a formidable challenge to increasing capacity utilization and planned strategic investments. Consequently, I argue and find that collateral requirement weakens the positive relationship between capacity utilization and planned strategic investments. My results suggest that while increased capacity utilization increases cash inflows that promote investments, financially constrained firms that opt to increase capacity utilization today reduce planned strategic investments.

This paper contributes to the literature on how financial factors influence managers' decisions and behaviors involving corporate investments (Souder and Shaver, 2010; Shaver, 2011) that are strategically important to long-term performance, demand a massive amount of financing, span a long period of time, and hence require a well-thought-out strategic plan. Historically, strategic management scholars have been particularly interested in exploring how variables, such as corporate social responsibility or corporate reputation, affect financial performance of firms (e.g., Awaysheh et al., 2020; Roberts and Dowling, 2002) or how firms' strategic investment decisions impact investors' reactions (e.g., Woolridge and Snow, 1990). Only through Souder and Shaver (2010) and Shaver (2011) do I find that strategic management literature studies the impacts of financial variables on managers' decisions and behaviors involving corporate investments. To advance this stream of literature, I

examine this scarcely-studied, yet important relationship by using the novel perceptions-based data of manufacturing firms in Thailand, which is largely unexplored. While extant literature uses only 'actual' corporate investments, I use firm-level 'planned' strategic investments to uncover the influence of a bank-based financing constraint on managers' decisions about planned strategic investments. Moreover, the paper contributes to the literature on firm capabilities, in that such a general-purpose capability as capacity utilization can be a potential source of competitive advantage (Pisano, 2017) through improving productivity, economies of scale, and stability of cash flows that will promote planned strategic investments of firms.

1.1 Planned Strategic Investments and Bank-Based Financing Constraint

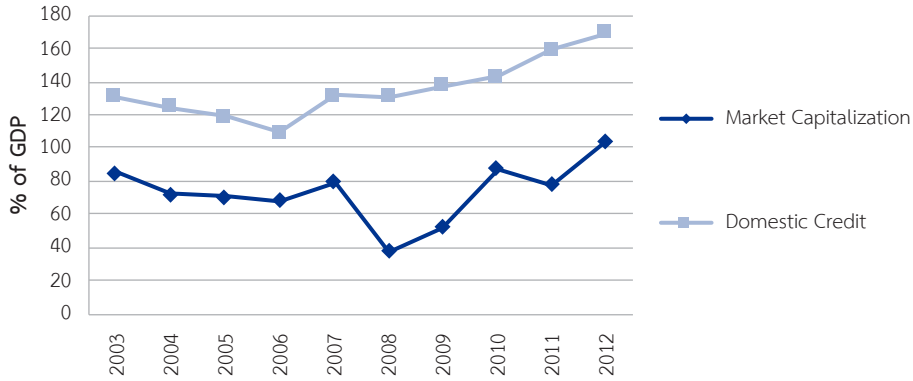
While Modigliani and Miller (1958) proposes the MM proposition I that investment decisions are independent of financing decisions, subsequent empirical studies show evidence contradicting the theorem. In particular, Jensen and Meckling (1976) introduce the 'risk-shifting' problem, in which managers anticipating high returns for shareholders take high-risk investment projects and, in turn, transfer the downside risk to creditors or lenders. Aware of this problem, lenders impose debt covenants. Debt covenants are an agreement in which the borrower is committed to abiding by the rules the lender establishes after receiving a loan. To protect themselves, the lender typically demands that the borrower maintain its debt-to-equity ratio at one, for example. Thus, after receiving the loan with debt covenants, managers can experience difficulty borrowing more from another lender. This evidence indicates an association between *ex post* financial constraints and managers' investment behaviors. Fazzari and Athey (1987) also find that financial variables, including interest expense and cash flow, are associated with investments, lending support to the conclusion that financing decisions impact investment decisions through information asymmetry in capital markets. In addition, recent empirical studies find that financial frictions affect investments at the firm level (e.g., Almeida and Campello, 2007; Kaplan and Zingales, 1997).

Similarly, strategic management literature investigates relations between financial variables and managers' investment decisions and behaviors. In the work of Souder and Shaver (2010) based on analysis of investments made by cable TV operators between 1972 and 1996, they examine why managers prefer quick but lower returns from short-horizon investments to prolonged but higher returns from long-horizon investments. They find that managers in low-performing firms or those holding many exercisable stock options are inclined to make short-horizon investments. This evidence suggests that short-term poor performance of firms discourages managers from making long-horizon investments, so do exercisable stock options being held by managers. Influenced by Fazzari et al (1998)'s finding that liquidity constraints limit corporate investments, Shaver (2011) attempts to identify a creative way to overcome the adverse impact of liquidity constraints encountered by firms. He finds that diversifying sales geographically or exporting eases the constraining effect of liquidity

constraints on firms' strategic investments. This finding suggests that this diversification strategy can be an approach to creating and sustaining competitive advantage.

In the context of Thailand, Paulson and Townsend (2004) uses their own socioeconomic surveys to study an association between financial constraints and small enterprises, which they call entrepreneurship, in Thailand in 1997. They define financial constraints as the unavailability of own wealth, the inability to borrow, or the ability to borrow a limited amount. To emphasize the importance of entrepreneurship in Thailand, they report that small firms represent nearly half of the country's GDP and hire 60% of the workforce. They find that financial constraints deter investments and therefore play a central role in shaping the patterns of entrepreneurship in this country. Their finding is reinforced when the Bank of Thailand declared Thailand as having a bank-based financial structure as financial institutions dominated the financial sector (Bank of Thailand, 2006). Figure 1 specifies that the share of bank loans to GDP was well above 100% throughout the period and peaked at 170% in 2012. Clearly, financial constraints prove to be critical to the emergence and growth of entrepreneurship in Thailand.

Figure 1 Percentage of domestic credit to GDP versus Percentage of market capitalization to GDP



The x-axis represents the year. The y-axis represents the percentage of domestic credit provided by the financial sector or the percentage of market capitalization to GDP.

Source: World Bank

After considering the prior literature thoroughly, I find that examining the relation between an *ex ante* bank-based financing constraint and *planned* strategic investments of firms will answer an unexplored question in the literature. Unlike ex post financing constraint, ex ante financing constraint is a constraint that affects the eligibility of obtaining loans and the amount of loans with which a lender provides its borrower. Given the definition of financial constraints by Paulson and Townsend (2004), collateral requirement is an appropriate proxy for the financing constraint of firms in Thailand, as it allows the borrower to apply for a loan (when the lender requires collateral pledging) and imposes a limit on the amount of loan that the lender will provide. Planned strategic

investment is investment in R&D projects or capital expenditures (Woolridge and Snow, 1990) that firms' managers aim to make in the near future according to their investment plans. When required to pledge collateral, firms obtain the amount of loan usually capped at the market value of the collateral (hereafter, financially constrained firms). As a result, I predict that financially constrained firms will plan to make a smaller amount of strategic investment than unconstrained firms. Figure 2 exhibits the framework for Hypothesis 1. My first hypothesis, H1, is stated as follows.

Hypothesis 1. Firms that are required to pledge collateral when applying for loans will plan to invest less, ceteris paribus.

Figure 2 Framework for Hypothesis 1

To show that this hypothesis is non-mechanistic, I argue that financially constrained firms will *not necessarily* plan to invest less. Since the setting in this study allows for a difference in timing between the date of knowing the financing constraint and the date of making investments, they can possibly access alternative sources of funds—whether with higher or with lower costs—any time before the date of making investments. For instance, in making an investment, financially constrained firms can supplement a limited amount of bank loan with money from shareholders (equity financing that theoretically assumes a higher cost than debt financing) or with money that firms will collect from their customers in the near future prior to the date of making investments (internal financing that theoretically assumes a lower cost than debt financing).

1.2 Planned Strategic Investments, Capacity Utilization, and Financing Constraint

As much literature on the manufacturing sector focuses on capacity utilization (e.g., Bresnahan and Ramey, 1993; Caves, Christensen, and Swanson, 1981), capacity utilization is unquestionably the most important key performance indicator of manufacturing firms. Capacity utilization is the extent to which a firm uses its productive capacity to manufacture goods. It measures the amount of output a firm uses its equipment and machinery to actually produce relative to the potential amount of output that could be produced at full capacity. Ideally, the higher the capacity utilization, the better for a firm as long as there is customer demand. Higher capacity utilization reflects expected future higher demand (Winker, 1999) and contributes to higher units of output, decreasing fixed costs per unit of output and generating a higher amount of cash inflows. Cash inflows will materialize firms' strategic investment plans. Since capacity utilization is a source of productivity, economies of scale, profitability, and future cash flows (Winker, 1999), I predict that firms with higher capacity utilization

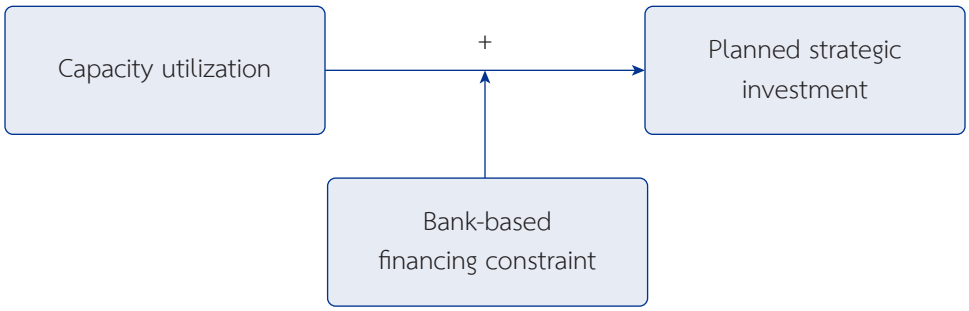
plan to invest more than those with lower capacity utilization. My second hypothesis, H2, is stated as follows.

Hypothesis 2. Capacity utilization is positively related to planned strategic investments, ceteris paribus.

However, all cash inflows from improved capacity utilization may not be used for financing planned strategic investments if firms are financially constrained by banks. For example, financially constrained firms may need to finance their operating activities largely through cash inflows arising from improved capacity utilization, potentially limiting funds for planned strategic investments. That is, the relationship between capacity utilization and planned strategic investments may depend on whether firms are financially constrained by banks. Consequently, I argue that the bank-based financing constraint in the form of collateral requirement attenuates the positive relation between capacity utilization and planned strategic investments. Figure 3 exhibits the framework for Hypotheses 2 and 3. Accordingly, I state my second hypothesis, H3, as follows.

Hypothesis 3. Collateral requirement weakens the positive association between capacity utilization and planned strategic investments, ceteris paribus.

Figure 3 Framework for Hypotheses 2 and 3



2. Sample and Descriptive Statistics

2.1 Sample and Additional Qualitative Data

I obtain the sample from the Productivity and Investment Climate survey (PICs), conducted jointly by the World Bank and the Foundation for the Thailand Productivity Institute. Most of the survey questions concern Thailand's business environment and firm-specific information, such as general information, financial information, and corporate governance. The remaining questions inquire about the survey respondents' opinions on obstacles to firm performance and growth and on the amount of strategic investments that their firms plan to make toward 2008. The survey includes 1,043 firms across nine industries in the manufacturing sector in 2006. After I eliminate observations with missing values and perform coarsened exact matching, the number of observations is reduced to 365 across

nine industries, as shown in Table 1. In addition to the survey data, I collect qualitative data about collateral requirement by interviewing a credit specialist who has been working at an established commercial bank in Thailand for fifteen years.

Thailand is particularly interesting and relevant to my research questions because manufacturing firms are the backbone of its economy, its financial structure is based on commercial banks, and collateral-based lending is more common in such an emerging economy as Thailand than in advanced economies. More than half of the companies in Thailand are in the manufacturing sector that is capital-intensive and therefore needs capital to continuously make strategic investments for expansion and improvement in productivity, as opposed to the service sector. When companies need capital or financing, most of them depend on loans from financial institutions rather than on stock markets. Recognizing the financing behavior, the Bank of Thailand (2006) categorizes the country's financial structure as bank-dominated, rather than market-based. Hence, financial institutions or commercial banks play a principal role in providing capital for fueling growth of corporate investments across companies in the country. To monitor aggregate non-performing loans, the central bank has enforced many stringent regulations on lending activities of commercial banks. Complicating the matter, the legal infrastructure in Thailand is not sufficiently developed to effectively protect creditor rights (Menkhoff et al., 2006). Not surprisingly, these factors cause commercial banks to implement collateral-based lending in order to reduce credit risk due to adverse selection and moral hazard problems. However, the popularity of collateral-based lending does not constrain corporate strategic investments automatically. For this reason, I test the first hypothesis.

Table 1 Number of Firms by Industry

Industry	Frequency	Percent
Auto components	58	15.89
Electrical appliances	8	2.19
Electronic components	25	6.85
Food processing	42	11.51
Furniture and wood products	26	7.12
Garments	49	13.42
Machinery and equipment	27	7.40
Rubber and plastics	100	27.40
Textiles	30	8.22
Total	**365**	**100**

2.2 Descriptive Statistics and Variables

Before performing regression analysis, I conduct the coarsened exact matching using collateral requirement as treatment, and public company, young company, debt ratio, and interest coverage ratio as pre-treatment covariates. The matching produces 365 matched observations. I choose these variables as the pre-treatment covariates, according to qualitative information obtained from a credit specialist who works at one of the largest commercial banks in Thailand. From the perspective of experienced practitioners, credit scoring is the most powerful tool to screen and judge whether a borrower will be requested to pledge collateral in order to obtain a loan. Credit scoring related to collateral places a strong emphasis on the corporate borrower's key characteristics—including financial position (specifically, debt ratio and interest coverage ratio), age of establishment (age of 10 years or less tends to be almost always requested collateral pledging), credit history, and type of companies (public or private companies), the first two of which are also substantiated by Menkhoff et al. (2006). Since it is impossible to obtain the credit history of the sample, I argue that interest coverage ratio can be its reasonable proxy. For instance, negative interest coverage ratio signals poor credit history. On the contrary, the personal features of CEOs, CFOs and large shareholders (e.g., nationality, age, or experience) are of minor importance.

Collateral requirement is a proxy for the bank-based financing constraint that I will discuss in detail in the following paragraph. Public company is a dummy variable that denotes one if it is a public company and zero otherwise. Not only are public companies regulated and monitored by the public and the Securities and Exchange Commission, but they are more established and trustworthy particularly in terms of governance, contracting and loan repayment than are private companies. Young company is a dummy variable that denotes one if firm age is less than the median firm age and zero otherwise. Given intense competition and market uncertainty, the early years of starting a business are likely to be extremely vulnerable to cash flow problems. Lending to young, private companies exposes banks to high credit risk, so collateral is what can compensate for that risk. Debt ratio or leverage is the ratio of total liabilities at year-end 2006 to total assets at year-end 2006. This ratio indicates the capital structure of a company—or the 'source of fund' side of the company's balance sheets—and implies the capacity of a company to issue additional debts. For example, the debt ratio of 0.69 means that 69% of total assets (the 'use of fund' side of the company's balance sheets) are financed by liabilities while 31% of total assets are financed by equity. While debt financing gives a tax benefit, called "tax shield," which arises from interest expense, excessive debt financing can cause the cost of financial distress and lead the firm towards bankruptcy if the firm fails to make interest payment. Debt ratio should be comparatively interpreted. To illustrate, a firm with the debt ratio of 0.35 has the greater capacity to obtain additional bank loans than that with the debt ratio of 0.69. There can be firms with a high debt ratio and a high ability to pay interests. Hence, debt ratio alone may not suffice to assess whether a firm can assume more debts. As a consequence, the ability to pay interest expense should also be considered. Interest

coverage ratio is the ratio of earnings before interest and tax (EBIT or operating profit) for the year 2006 to interest expense for the same year. The interest coverage ratio of 100 means that the firm's operating income is 100 times higher than its interest expense on outstanding bank loans. Therefore, the higher the ratio, the higher the ability to assume more debts.

Table 2 presents the descriptive statistics for 365 firms. The mean value of the natural logarithm of planned strategic investments is 9.118. The mean value of financing constraint is 0.86, meaning that 86% of firms in my sample are required to pledge collateral when obtaining loans from banks. The mean value of capacity utilization if 0.800, denoting that firms, on average, realize 80% of their potential output.

Table 2 Descriptive Statistics

	N	Mean	SD	p25	Median	p75
Planned strategic investments	365	9.118	1.724	8.006	9.210	10.127
Financing constraint	365	0.860	0.347	1.000	1.000	1.000
Capital utilization	365	0.800	0.178	0.700	0.800	1.000
Recent investment	365	0.588	8.874	0.005	0.035	0.099
Firm age	365	14.77	9.729	8.000	13.000	19.000
Total asset turnover	365	1.778	1.339	0.971	1.437	2.107
Plan to introduce new product	365	0.690	0.463	0.000	1.000	1.000
Export status	365	0.573	0.495	0.000	1.000	1.000

Table 2 reports the descriptive statistics of my sample. Planned strategic investment is the natural logarithm of planned strategic investment. Financing constraint is a dummy variable denoting one if the firm is required to pledge collateral and zero otherwise. Recent investment is investment for year-end 2006, deflated by total assets at year-end 2006. Total asset turnover is the ratio of total sales at year-end 2006 to total assets at year-end 2006.

In the regression analysis, I use the natural logarithm of strategic investments that firms plan to make in the year 2008 as the dependent variable. Strategic investment is firm-level investment in R&D projects or major capital expenditures (Woolridge and Snow, 1990). I use collateral requirement as the measure of my focal independent variable bank-based financing constraint, which is a dummy variable denoting one if firms are required to pledge collateral when they apply for a bank loan and zero otherwise. By requesting borrowers to pledge collateral, commercial banks impose a significant constraint on borrowers' eligibility for loan applications and on the amount of loans that borrowers will be granted (Paulson and Townsend, 2004; Kinda, 2013). This latter constraint will be more severe if the ratio of loan value to collateral value is lower. One may argue that companies may choose to pledge collateral voluntarily to gain certain benefits, such as a reduction in the interest

rate, triggering self-selection bias. To respond to this concern, I interviewed a credit specialist. Over her fifteen years in the banking industry, no borrowers voluntarily pledged collateral unless lenders requested them to do so. Why is this the case? First and foremost, borrowers must transfer legal or official certificates showing their ownership of collateral, e.g., land title deeds, to lenders until the loan is settled, forbidding them to sell the asset used as collateral. Additionally, borrowers must disclose the pledging of collateral in the notes to financial statements, constraining their ability to borrow more. Another independent variable of interest is capacity utilization, which measures the amount of output a firm uses its equipment and machinery to actually produce relative to the potential amount of output that could be produced at full capacity.

Prior literature (e.g., Harris et al., 1994; Schiantarelli, 1996) also suggests other variables that may affect firms' investment decisions. Following this literature, I control for firm age, firm age squared, recent investments, total asset turnover, plan to introduce new products, and export status. I control for firm age squared to allow for a quadratic relationship. I control for the total asset turnover—the ratio of sales revenue for the year 2006 to total assets at the end of the year 2006 (in times). This ratio explains the amount of planned strategic investment better than do the amount of revenue or the amount of total assets on its own, because rational firms should devise strategic investment plans according to how efficiently firms have used their assets, or past investments, to generate revenue. In addition, I include as control variables the recent amount of investment that firms made in 2006, deflated by total assets at year-end 2006, and plans to introduce new products in the very near future (a dummy variable denoting one if firms plan to introduce at least one new product and zero otherwise). I also include the export status of firms (a dummy variable denoting one if firms diversify their sales geographically and zero otherwise) in accordance with Shaver (2011).

Table 3 presents correlations among the variables used in the regression analysis. None of these variables are highly correlated, thereby mitigating the problem of multicollinearity.

Table 3 Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Planned strategic investments	1.00							
(2) Financing constraint	**–0.17**	1.00						
(3) Capital utilization	**0.11**	**–0.13**	1.00					
(4) Recent investment	**0.09**	0.02	0.03	1.00				
(5) Firm age	**0.21**	0.07	**–0.10**	–0.02	1.00			
(6) Total asset turnover	–0.05	–0.02	0.05	–0.04	–0.07	1.00		
(7) Plan to introduce new product	0.04	0.02	0.07	0.04	0.04	**–0.13**	1.00	
(8) Export status	**0.20**	–0.06	**0.14**	0.04	**0.15**	**–0.10**	**0.19**	1.00

Table 3 reports correlation matrix. In bold are all correlations that are statistically significant at the 0.10 level or better (two-tailed).

3. Empirical specification

In the first place, I perform the coarsened exact matching (cem) to reduce imbalance between the treated and control groups through decreasing dissimilarities in the empirical distributions of the covariates in the group (Blackwell et al., 2010). The treated group is firms with financing constraint. The control group is firms without financing constraint. Iacus et al. (2008) indicates additional advantages of this matching method—it conforms to the congruence principle, it limits the matched data to areas of common empirical support, its computation can be efficiently executed, and its matched data are less model-dependent and less biased. Blackwell et al. (2010) also argue that a casual effect (SATT: Sample Average Treatment Effect on the Treated) can be estimated with a simple difference in means on the matched data, because controlling further for the covariates is redundant. By contrast, traditional matching techniques, namely exact matching or approximate matching, have some serious drawbacks. Exact matching usually produces a few matches, while approximate matching (e.g., the propensity score) is time consuming and somewhat subjective, as it involves a repeating process of setting the matching solution ex ante, checking balance ex post, re-specifying the matching model, rechecking balance, and so on.

In performing the coarsened exact matching, I set collateral requirement as treatment, and public company, young company, debt ratio and interest coverage ratio as pre-treatment covariates. By removing observations whose pre-treatment covariates in both the treated and the control groups have no close matches, the matching eliminates 14 observations, and results in 2 matched strata and 365 matched observations (314 in the treated group and 51 in the control group). I then use these matched observations to conduct regression analysis.

Exploiting the matched data, I perform a logarithm-linear regression research design to test whether and how firms' bank-based financing constraints, proxied by collateral requirement, affect planned strategic investments (H1). My regression model is specified as follows:

$$Planned\ strategic\ investments = \beta_0 + \beta_1 Financing\ constraint + \beta_j Control_j + \varepsilon \quad (1)$$

where $Planned\ strategic\ investments$ represents the natural logarithm of planned strategic investments, $Financing\ constraint$ represents the financing constraint proxied by collateral requirement, and $Control$ represents a vector of control variables. I control for industry dummies and the following characteristics—i.e., recent investments, firm age, firm age squared, total asset turnover ratio, plan to introduce new product, and export status. I use robust standard errors. My parameter of interest is the coefficient on $Financing\ constraint$, β_1, which captures the percentage change in planned strategic investments when collateral is required upon obtaining a bank loan. A positive (negative) coefficient of β_1 indicates a percentage increase (decrease) in planned strategic investments when collateral is required. I expect β_1 to be negative, consistent with my Hypothesis 1.

Next, I test whether capacity utilization is related to planned strategic investments (H2). In testing my second hypothesis, I perform the following regression.

$$\begin{aligned} Planned\ strategic\ investments = {} & \beta_0 + \beta_1 Financing\ constraint + \beta_2 Capacity\ utilization \\ & + \beta_j Control_j + \varepsilon \end{aligned} \quad (2)$$

where $Capacity\ utilization$ represents the actual output over the potential output, and all the other variables have been described in the previous model. I use robust standard errors. My first parameter of interest is the coefficient on capacity utilization, β_2, which captures the percentage change in planned strategic investments when the rates of capacity utilization change. A positive (negative) coefficient of β_2 denotes a percentage increase (decrease) in planned strategic investments when capacity utilization increases. I expect β_2 to be positive, consistent with my Hypothesis 2. Another parameter of interest is the coefficient on $Financing\ constraint$, β_1, which captures the percentage change in planned strategic investments when collateral is required upon obtaining a bank loan. I expect β_1 to remain negative.

I test whether financing constraint moderates the association between capacity utilization and planned strategic investments (H3) by adding an interaction term to the regression. Alternatively, I examine whether the effect of financing constraint on planned strategic investments depends on the level of capacity utilization. To test H3, my model is specified as follows:

$$\begin{aligned} Planned\ strategic\ investments = {} & \beta_0 + \beta_1 Financing\ constraint + \beta_2 Capacity\ utilization \\ & + \beta_3 (Financing\ constraint \times Capacity\ utilization) \\ & + \beta_j Control_j + \varepsilon \end{aligned} \quad (3)$$

where all the variables have been described in the previous models. I use robust standard errors. My parameter of interest is the coefficient on Financing constraint, β_1, which captures the percentage change in planned strategic investments when collateral is required upon obtaining a bank loan. I expect this coefficient to turn insignificant, meaning that financing constraint alone does not affect planned strategic investments. My other parameters of interest are the coefficients on $Capacity\ utilization$, β_2, and on $Financing\ constraint \times Capacity\ utilization$, β_3. β_2 captures the percentage change in planned strategic investments when the rates of capacity utilization change. β_3 captures the differential effect of financing constraint by the level of capacity utilization on planned strategic investments. In particular, I consider a summation of β_2 and β_3 for interpreting my results. A positive (negative) coefficient of β_2 and β_3 combined indicates a percentage increase (decrease) in planned strategic investments of firms that face the financing constraint when capacity utilization rises by one percent. I expect a summation of β_2 and β_3 to be positive.

4. Results

4.1 Summary Statistics

Figure 4 Planned Strategic Investments by Financing Constraint

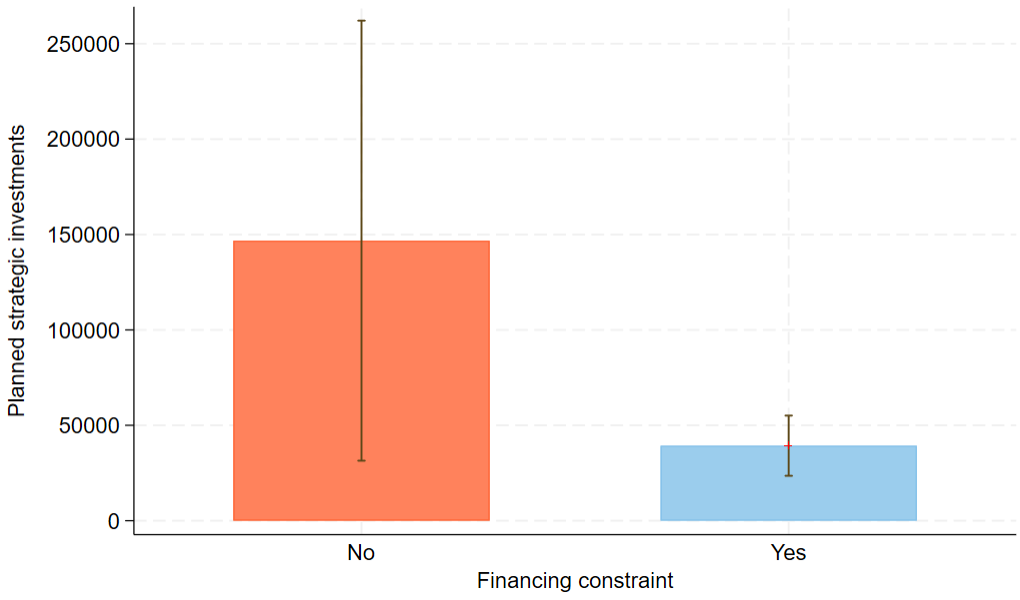


Figure 4 reports planned strategic investments by whether firms experience a bank-based financing constraint in the form of collateral requirement. The y-axis represents planned strategic investments (thousand Baht). The x-axis represents financing constraint.

Figure 5 Planned Strategic Investments by Capacity Utilization and Financing Constraint

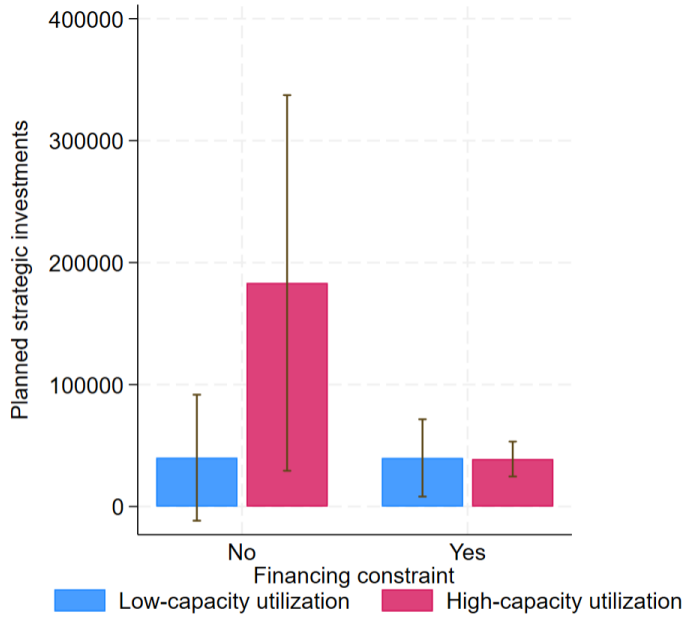


Figure 5 reports planned strategic investments by the level of capacity utilization and whether firms experience a bank-based financing constraint in the form of collateral requirement. The y-axis represents planned strategic investments (thousand Baht). The x-axis represents financing constraint.

The bar chart in Figure 4 shows that the mean value of financially constrained firms' planned strategic investments (mean = 39,305; the light blue bar) is lower than that of financially unconstrained firms' planned strategic investments (mean = 146,767; the orange bar). This preliminary evidence supports my first hypothesis.

The bar chart in Figure 5 exhibits the mean values of planned strategic investments of financially unconstrained and constrained firms with high or low-capacity utilization. In this chart, capacity utilization that is greater than or equal to the median capacity utilization of the sample is classified as high whereas capacity utilization that is less than the median is classified as low. For financially unconstrained firms, the mean value of planned strategic investments when capacity utilization is high (mean = 183,281; the pink bar) is materially higher than that of planned strategic investments when capacity utilization is low (mean = 40,030; the blue bar). This preliminary evidence largely supports my second hypothesis. For financially constrained firms, the mean value of planned strategic investments when capacity utilization is high (mean = 38,902; the pink bar) is marginally lower than that of planned strategic investments when capacity utilization is low (mean = 39,838; the blue bar). Patently, this preliminary evidence largely supports the third hypothesis.

4.2 Empirical Results

Table 4 reports the results of my regression analysis. Column 1 presents the result of Model (1). I find that financing constraint is negatively related to planned strategic investments (coefficient = –0.613; t-statistics = –2.165). Firms experiencing financing constraint plan to invest 61.30% less than their counterparts not experiencing financing constraint. My result supports my first hypothesis.

Column 2 of Table 4 presents the result of Model (2). I find that the coefficient on financing constraint remains negative (coefficient = –0.566; t-statistics = –2.021), consistent with my results of Model (1) in Column 1. My variable of interest is capacity utilization. I find that capacity utilization is positively related to planned strategic investments (coefficient = 0.967; t-statistics = 1.979). If firms raise their capacity utilization by 1%, they will increase planned strategic investments by 0.967%. My result supports my second hypothesis.

Column 3 of Table 4 presents the result of Model (3). I find that the coefficient on financing constraint becomes insignificant whereas the coefficient on capacity utilization remains significant (coefficient = 4.059; t-statistics = 2.387). My variable of interest is the interaction term, financing constraint × capacity utilization. I find that the coefficient on financing constraint × capacity utilization is negative (coefficient = –3.462; t-statistics = –1.963). That is, financing constraint weakens the positive relationship between capacity utilization and planned strategic investments. My result supports my third hypothesis.

To understand the whole picture, I will interpret my results as follows. Financing constraint alone does not affect planned strategic investments, yet the effect of financing constraint on planned strategic investments depends on capacity utilization. Following this interpretation, I will consider the coefficients on capacity utilization and on financing constraint × capacity utilization in combination. That is, if firms experiencing financing constraint increase capacity utilization by 1%, they will increase their planned strategic investments just by 0.597% (= 4.059 – 3.462). Overall, my results suggest that financially constrained firms that increase capacity utilization may have to obtain more funds from informal channels that charge higher interests. Informal financing potentially exposes them to a greater degree of financing constraint, thereby limiting growth in their planned strategic investments.

Table 4 Regression Analysis

Dependent variable	(1) Planned strategic investments	(2) Planned strategic investments	(3) Planned strategic investments
Financing constraint	−0.613** (−2.165)	−0.566** (−2.021)	2.363 (1.547)
Capacity utilization		0.967** (1.979)	4.059** (2.387)
Capacity utilization × Financing constraint			−3.462* (−1.963)
Recent investment	0.019*** (13.309)	0.018*** (13.008)	0.018*** (13.849)
Firm age	−0.006 (−0.204)	−0.010 (−0.354)	−0.006 (−0.228)
Firm age^2	0.001 (1.154)	0.001 (1.384)	0.001 (1.239)
Total asset turnover	0.009 (0.143)	0.001 (0.015)	0.014 (0.258)
Plan to introduce new product	0.113 (0.631)	0.089 (0.495)	0.085 (0.477)
Export status	0.534*** (3.069)	0.482*** (2.782)	0.482*** (2.790)
Constant	9.073*** (25.115)	8.339*** (15.890)	5.660*** (3.863)
Observations	365	365	365
Adjusted R-squared	0.180	0.187	0.196
Industry dummies	Yes	Yes	Yes

Table 4 reports the results for testing Hypotheses 1, 2, and 3. The t-statistics reported in parentheses are based on standard errors robust to heteroscedasticity.

***, **, and * denote statistical significance at the two-tailed 1 percent, 5 percent, and 10 percent levels, respectively.

5. Discussion and Concluding Remarks

Because corporate investments are critical to firms' competitive advantage, what affects planned strategic investments is a research question that requires empirical investigation. First, I document that a bank-based financing constraint in the form of collateral requirement reduces planned strategic investments of manufacturing firms in Thailand. I also document that the higher the capacity utilization, the greater the planned strategic investments. However, such a positive relationship is moderated by financing constraint that firms are encountering. My results are theoretically and managerially important.

On the one hand, my results extend the management literature on financial variables and corporate investments (Souder and Shaver, 2010; Shaver, 2011) by showing empirically that current collateral requirement constrains firms' decisions to make future investments. Moreover, my results contribute to the growing literature on firm capability by demonstrating that such a general-purpose capability (Pisano, 2017) as capacity utilization can assist firms in sustaining competitive advantage through more stable cash inflows that will drive growth in strategic investments. A caveat is that this paper does not test the 'firm-specific' and 'foundational for market-specific capabilities' characteristics of general-purpose capabilities that Pisano (2017) claim to be necessary for operational effectiveness to be considered 'a source of competitive advantage'. However, those concepts are tautological and may never be empirically tested.

On the other hand, the constraining effect of the financing constraint on planned strategic investments substantiates the phenomenon that financial constraints are central to the emergence and growth of businesses in an emerging country. Financial consultants can play a fundamental role in educating or advising how to raise funds through alternative sources (e.g., bond issuance, venture capital, or initial coin offering), so that firms can depend less on commercial banks and significantly less on informal sources of financing.

This paper has two limitations. First, cross-sectional data limits the application of many other methods to test the hypotheses or check robustness. Second, the results may not be generalizable to developed countries whose institutional factors differ almost entirely from those of Thailand. Future researchers are therefore encouraged to replicate this study using panel data, different samples or different methods to corroborate or disprove my results. Future researchers may also explore innovative solutions to financing constraint plaguing small and medium-sized enterprises (SMEs) in emerging countries to help them improve investment capacity and consequently create and sustain competitive advantage. I firmly believe that this study will have a crucial impact on the economic growth of emerging nations where SMEs account for 45% of total employment and 33% of the GDP (OECD, 2017).

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