An Exploratory Study of Firms' Bargaining Power and Cash Liquidity Performance during the Financial Crisis

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This study empirically examines the impact of the bargaining mechanism of a focal firm's power on additional costs incurred by its supply chain partners. The results show that a focal firm with greater power within an industry exerts its bargaining power over its suppliers and buyers to improve liquidity through increasing account payable days and reducing account receivable and inventory days. The upward pressure of bargaining power on a focal firm's account payable days has become more pronounced in the presence of financial crisis. Managerial implications of the findings are discussed.

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I. INTRODUCTION

Building strategic relationships with supply chain partners enhances a firm's competitive advantages. Collaboration across suppliers and buyers can become an effective mechanism to boost profitability for all supply chain partners. Throughout integrated processes and collaboration among partners along a supply chain, firms can efficiently monitor and control flow of goods, information and payments. As a result, firms may be able to reduce operational costs due to lowered inventory and decreased production cycle times. Also, firms can improve customer satisfaction due to faster innovation and on-time deliveries, and eventually have better financial performance (Flynn et al., 2010; Prajogo and Olhager, 2012; Vickery et al., 2003).

In order to integrate systems and coordinate processes across supply chain partners, a focal firm needs to take initiatives and call for collaboration. Without foreseeable gains from collaboration, however, each supply chain partner may be reluctant to collaborate through sharing information or committing resources since the ultimate goal of each partner is to maximize its own profits. Hence, a focal firm may need to exert its power and induce its supply chain partners to collaborate. In this case, power is considered as a strong inducement to promote collaborative activities that may boost the profits of all supply chain partners.

However, when a focal firm has a stronger power than its supply chain partners, it may employ its power to exploit more gains over its supply chain partners, which is called "bargaining" (Crook and Combs, 2007). For instance, a focal firm may coerce its partners to provide more favorable contract terms and provisions during negotiations. Coercive power leads to increased but less voluntary collaboration from supply chain partners, including extra resource contribution, more information sharing, greater integration of firm-specific systems, and extra monetary incentives. Using bargaining power, a focal firm may be able to increase its own share of the profits gained from supply chain collaboration at the expense of other supply chain partners who lack bargaining power over the focal firm (Ireland and Webb, 2007; van der Vaart and van Donk, 2008).

Extant studies have investigated the relationship between power and costs of supply chain partners (Crook and Combs, 2007; Ireland and Webb, 2007; Mol, 2003; Stank et al., 2005; Sucky, 2005; Yeung et al., 2009). However, most of these studies have suffered from various methodological limitations, including narrative approaches, mathematical models or limited empirical evidence (e.g., small sample sizes). In order to reveal the underlying bargaining mechanism of a focal firm's power over its supply chain partners, it is desirable to measure the true costs incurred to non-focal partners. However, few studies have been able to reveal the true bargaining mechanism due to the difficulty in obtaining true cost information for non-focal partners. Nevertheless, in this study we are adopting an innovative approach by measuring the costs for non-focal partners using three components of a focal firm's cash conversion cycle (CCC), directly resulting from the contract terms created by two supply chain partners. We have built a large-scale panel dataset of 990 manufacturing firms over 12 years for this study so that a stronger empirical validation may be provided.

The use of CCC is justified as follows. The amount of time for a firm to convert resource inputs into cash flows, CCC essentially measures how long each net input dollar is tied up in production and sales process (capital costs). CCC consists of three cash liquidity components: account payable days (APD), the maximum period it takes to pay suppliers without incurring penalties; account receivable days (ARD), the time it takes to collect cash from customers; and inventory days (IND), the time that cash is tied up in inventory. Mathematically put, CCC = ARD + IND – APD. By delaying payments to its suppliers (hence longer APD) or expediting collection from its buyers (hence shorter ARD), a focal firm is able to reduce CCC and maintain healthy cash flows with lower capital costs. However, longer APD and shorter ARD of a focal firm mean extra capital costs to suppliers and buyers, respectively. In a zero-sum game, gains at a focal firm naturally lead to losses at its suppliers and buyers.

Additionally, power enables a focal firm to minimize its own inventory level by pushing out raw material inventory toward upstream suppliers and finished goods inventory towards downstream customers. As a result, suppliers and buyers may have to hold extra inventory and incur additional inventory holding costs.

Along with other financial performance indicators (profitability, stock market performance, etc.), cash liquidity is a critical performance indicator for a firm's business continuity (Garcia-Appendini and Montoriol-Garriga, 2013) and thus, a firm aggressively manages its cash cycle. For example, a firm may grow out of business simply because of lack of liquidity. Therefore, healthy and sustainable cash flows are generally considered an assurance for long-term growth. It is no surprise that firms may be tempted to improve their cash cycles by taking advantage of their supply chain partners. It is worth noting that greater environmental uncertainty and tighter credit control due to the recent economic volatilities have increased the cost of borrowing and decreased the levels of cash holdings at a firm level (Aghion et al., 2010). During a financial crisis, firms have become more aggressive in their efforts to reduce CCC, consequently adding extra costs to its supply chain partners.

In this study, we set out to address two research questions: 1) how does a focal firm's power impact its cash liquidity via bargaining mechanism? and 2) how does the economic uncertainty moderate the bargaining mechanism? A focal firm with greater power within an industry is assumed to be able to exert its bargaining power over its suppliers and buyers. Our study also includes empirical analysis of the potential moderating effects of the financial crisis on the relationship between a focal firm's power and the costs of its supply chain partners.

Our panel data set includes manufacturing firms across 21 different industries of three-digit NAICS code over 12 years (2000-2011). The power of a focal firm is measured by its relative position within a specific industry (an industry-firm specific variable). We test the impact of firm power on the three components of a focal firm's CCC, including ARD, APD and IND. Using the recent financial crisis (2008-2009), we also show the varying impacts of a focal firm's power across different levels of economic uncertainties.

In this study, we attempt to reveal the bargaining mechanism that is exerted upon supply chain partners by showing the costs incurred to non-focal supply chain partners, hence providing direct empirical support for the argument proposed in the extant supply chain management literature that bargaining power may influence a firm's competitiveness. Although the literature often assumes a positive relationship between power and advantages, there is a lack of empirical support for such a relationship in the supply chain context. This study is designed to fill the gap between the theoretical argument and empirical testing. Using a large sample of over 5,159 firm-year observations, our study also estimates both industry and firm effects on a firm's cash cycle performance.

The remainder of the paper is organized as follows: Section 2 surveys the extant supply chain management literature on both power and cash-conversion cycle. Section 3 develops research hypotheses. Section 4 introduces research methodology and data collection. Section 5 presents regression results and Section 6 discusses empirical findings. Lastly, Section 7 concludes the study with a summary of theoretical and managerial contributions,

research limitations and future research steps.

II. LITERATURE REVIEW

2.1 Bargaining Mechanism of Power

The different capabilities of organizations to possess or create unique resources promote dependence among organizations. This dependence shows how seriously other organizations may be taken into consideration in an organization's decision making (Cox, 2001, 2004). Asymmetric dependence between organizations leads to power imparity, by which one organization can control the other organization to achieve desirable outcomes (Emerson, 1962; Pfeffer and Salancik, 2003). A firm with stronger power induces or coerces its business partners to do what they are less willing to do otherwise. In the supply chain management literature, power is noted as a significant inducement for two mechanisms: cooperative and bargaining (Flynn et al., 2010; Klein et al., 2007; Yeung et al., 2009). When power is considered a significant inducement for cooperative mechanism, studies show its positive impacts on the overall supply chain performance. In contrast, the impacts of power via bargaining mechanism are highlighted to explain how achieved gains are distributed among supply chain members (Crook and Combs, 2007). Here we provide a detailed survey of literature on both mechanisms.

First, using power over non-focal supply chain partners, a focal firm induces and promotes cooperative practices such as relation commitment (Zhao et al., 2008), supplier integration (Yeung et al., 2009), and supplier satisfaction (Benton and Maloni, 2005). For example, a manufacturer is more willing to be cooperative if a buyer possesses more power due to unique resources it possesses such as market intelligence, expected to benefit the manufacturer (Zhao et al., 2008). Indeed, motivation or attitude of supply chain partners is a major factor for successful collaboration for the supply chain (Croom et al., 2007). Throughout cooperative collaboration and integrated processes among supply chain partners, firms can efficiently monitor and control flows of goods, information and payments (Min et al., 2005). For example, a cooperative supply chain helps lower inventory and shorten production cycle time, leading to cost reduction. A cooperative supply chain also improves quality for end consumers by expediting product development and improving on-time delivery. Therefore, it is generally agreed in the literature that cooperative mechanism of power is positively associated with a firm's financial performance (Flynn et al., 2010; Prajogo and Olhager, 2012; Vickery et al., 2003).

However, bargaining mechanism is distinguished from cooperative mechanism (Essabbar et al., 2016; Thorelli, 1986). Bargaining mechanism is more of a negative relationship often employed in a zero-sum game, while cooperative mechanism is more of a positive relationship commonly used in a win-win frame where mutual benefits are met as agreed upon. In line with the logic for bargaining mechanism in a zero-sum game, organizational studies argue that a generator of competitive advantages may not necessarily become a beneficiary of those competitive advantages because gains in firm performance are determined not only by how large a pie is created but also by how a pie is appropriated (Barney, 1991; Coff, 1999).

Similarly, management studies found that bargaining practices are used at an inter-organizational level. Firms exercise

bargaining power to gain more from transactions (Hicks, 1963). Notably, the resource dependency perspective contends that unique resources that a firm possesses, but its transaction partners lack are the source of bargaining power (Pfeffer and Salancik, 2003). In other words, resources that are rare, valuable, non-substitutable, and difficult to imitate are viewed as competitive advantages over competing transactional partners (Barney, 1991; Dyer and Singh, 1998). Yan and Gray (1994) showed the impact of bargaining power on performance via control mechanism while Lavie (2006) argued that the impact of resource attributes might be smaller than the impact of relationship attributes depending on environments.

Industrial organization literature further develops a helpful framework that may be used to explain how the bargaining power grows. According to Porter's Five Forces framework (Porter, 1979), two vertical forces are related to power imbalance possibly existing among organizations: bargaining power of suppliers and bargaining power of buyers. The dependency of a firm tends to increase if the number of buyers decreases or buyers can find alternative suppliers. Similarly, a smaller number of suppliers will increase the bargaining power of suppliers such as higher price of goods and services because the focal firms in the industry do not have many alternative suppliers to procure from. In short, the size of the bargaining power toward its supply chain partners is significantly driven by how valuable each firm is in an industry.

A firm with stronger power not only benefits from increased gains of the overall supply chain but also take advantage of its supply chain partners and hence obtain a greater share of the gain (Crook and Combs, 2007). Some studies have discussed the impact of bargaining power on practical gains and reported that bargaining of powerful firms leads to more involuntary actions of weaker firms. (Klein et al., 2007; Zhao et al., 2008). For example, sharing information between two supply chain partners requires long-term but relationship-specific IT investments at both parties. However, one party's willingness to make more changes to its IT system to accommodate the other firm's IT system will create an imbalance in sharing the cost burden (Klein et al., 2007). A buyer's power also influences supplier commitment that rarely generates mutual benefits. In the Chinese manufacturing context, for instance, a buyer uses power to coerce its supply chain partners to be more compliant with the buyer's obligations (Zhao et al., 2008). In order to obtain favorable order quantities from a buyer, a supplier may induce the buyer to deviate from its own optimal order quantity (i.e., EOQ) by using bargaining power or extra monetary incentives in case of the lack of power because deviating from EOQ incurs extra costs to buyers (Sucky, 2005). Through involuntary actions, weaker firms may have to sacrifice certain gains to benefit the more powerful firms.

However, what is missing in these studies is the lack of strong empirical support for their arguments due to the use of small samples or modeling approaches employed in the studies (Cox, 2004; Crook and Combs, 2007; Stank et al., 2005; Sucky, 2005; Zhao et al., 2008). There is little empirical evidence revealing bargaining mechanism among supply chain partners. Using a zero-sum performance indicator, in this study we show that the costs of supply chain partners have increased due to the decreased CCC of a more powerful focal firm.

2.2 CCC as a Supply Chain Performance Measure

The cash-to-cash cycle performance is an important measure to represent supply chain performance of a firm as it shows how efficiently and effectively flow of goods, information and payments are managed across a supplier, a focal firm and a buyer. Despite subtle differences in definitions across previous studies, the generally agreed upon idea is that CCC comprehensively represents the cash liquidity of a firm because CCC essentially captures how fast a firm can convert account payables, account receivable and inventory holdings into cash - the speed of payment, collection and inventory turnover (Chu, 2009; II and Hutchison, 2003; Lancaster and Stevens, 2011; Soenen, 1993; Stewart, 1995). Below are the methods used to compute each component of CCC on an annual basis (Randall and Theodore Farris, 2009):

ARD = (Account Receivables ($) / Net Sales ($)) X 365

APD = (Account Payables ($) / Cost of Goods Sold ($)) X 365

IND = (Inventory ($) / Cost of Goods Sold ($)) X 365

Previous studies examining the relationship of CCC with various firm-specific characteristics such as firm size (Moss and Stine, 1993), profitability (Soenen, 1993), cash flow (Lancaster et al., 1998) have suggested that CCC is a significant performance indicator for firm performance. Since CCC is often positively associated with a firm's operational risk (Kroes and Manikas, 2014) and financing cost (Tsai, 2008), some studies suggest advanced payments and cash discounts may be employed to improve ARD and APD (Hofmann and Kotzab, 2010) while others highlight collaboration for shorter inventory cycle time (Lind et al., 2012; Viskari and Kärri, 2012). There appears to be a consensus in these studies that CCC is influenced by inter-organizational relationships between a supplier and a buyer.

Notably, a number of studies consider CCC as costs incurred to supply chain partners (Hofmann and Kotzab, 2010; Pohlen and Goldsby, 2003). A focal firm's delayed payments and expedited collection often result in capital costs and increased risks to supply chain partners. For instance, in order to achieve shorter inventory days, lowering inventory level by transferring inventory to its supply chain partners is costly to supply chain partners. Therefore, CCC captures the transfer of risks and capital costs to its supply chain partners (Vázquez et al., 2016). Literature also points out that a weaker partner may be coerced to bear more risks and capital costs by using external financing (Munson et al., 1999). In our study, we focus on the impact of a coercive (bargaining) mechanism of a focal firm's power on additional costs incurred to supply chain partners.

III. Hypothesis Development

3.1 The Impact of Bargaining Mechanism on Costs of Suppliers and Buyers

Unique resources of a firm that creates competitiveness may increase inter-firm dependence among supply chain partners. Asymmetric dependences often result in imbalanced power (Pfeffer and Salancik, 2003) and unequal gains (Crook and Combs, 2007), which is called bargaining mechanism. Bargaining power among supply chain partners significantly influences a firm's competitiveness (Porter, 1979) because a firm with stronger power has the ability to coerce its supply chain partners to take actions that they would not otherwise in order to achieve outcomes that

it desires (Essabbar et al., 2016; Ireland and Webb, 2007). Such outcomes may include supply chain practices, including integration, contract type, etc. (Han et al., 2012; Stank et al., 2005). Our hypotheses are formulated to test whether a focal firm with stronger bargaining power may create favorable contract terms that would increase its own gains, particularly, in a zero-sum paradigm where gains of a focal firm are often realized at the expense of its supply chain partners (Chu, 2009; Theodore Farris and Hutchison, 2002).

The benefits that a supplier can provide to its buyers include volume flexibility, cost effectiveness, exclusive quality, brand power, and stable material supply. A supplier may gain more power if other suppliers in the same industry are not able to sufficiently provide the same benefits. For instance, since a buyer greatly appreciates exclusive know-how for product quality and competitive prices of raw materials that suppliers possess (Pfeffer and Salancik, 2003), these benefits may likely become unique resources for the supplier and hence create dependency and imbalanced power between the two parties.

As argued by Porter (1979), an exclusive value of a supply chain partner is determined by competitiveness within an industry where it operates. For example, the size of these benefits tends to increase as the relative size of a supplier increase. A larger supplier tends to have more capacity and, thus, better responds to unexpected demand changes. Due to economies of scale, bulk procurement is cheaper and the production cost per unit for a larger supplier may be lower. More resources for research and development (R&D) help produce more advanced and competitive products. The strong brand power of a large supplier also helps improve the brand images of a buyer firm (Spekman, 1988). The financial stability of a larger supplier guarantees more stable supply of raw materials. These benefits may be viewed as unique resources that would create dependency. The size of these benefits is significantly driven by a supplier's relative size within an industry where it operates and differentiates competitiveness among peer suppliers. Based on these competitive benefits, a larger supplier is considered more valuable than a smaller supplier and, accordingly, has stronger bargaining power over its buyers.

Hence, a focal firm with higher power (higher relative share within an industry) may negotiate a more favorable contract by expediting cash collection from buyers. The hypothesis is developed as follows.

***Hypothesis 1a**: Increased power of a focal firm leads to shorter account receivable days (ARD)*

Similarly, unique resources that supply chain partners have as buyers may create bargaining power over their suppliers. Buyer's unique resources are inherited from their position along the supply chain. Closeness to end customers means better access to market information (McCarthy and Golicic, 2002) and the benefits of these resources are often amplified as the size of buyers grows. The benefits that buyers can provide to their suppliers include quality market information, size and stable order quality and reputations.

A larger buyer tends to possess higher quality market information (e.g., order quantity and time) because it has more resources for market research and can leverage its larger market share to acquire more accurate demand information from its customers. This information for segmented markets is critical to improving responsiveness to market demands and inventory planning (McCarthy and Golicic, 2002; Stank et al., 2001). Further, bulk order

from a larger buyer may help a supplier realize economies of scale in purchasing, production and delivery. Stability in order size reduces operational fluctuations and increases predictability in production volume, leading to cost reduction. For instance, a supplier may be able to lower its purchasing costs through large quantities and a long-term contract. Additionally, a supplier may also leverage the reputation of its buyers so that the supplier is recognized as a strategic partner of a larger manufacturer. The halo effect is tremendously beneficial for a supplier to negotiate with other business partners.

In addition, the source of dependency is not limited to better market access but includes investment, supply chain financing, knowledge transfer, etc. Larger manufacturers tend to have more financial resources that can be used to support a supplier's sustained production as a long-term investment and a third-party financing mechanism backed by larger buyers. Larger manufactures also tend to possess more resources for knowledge transfer due to their R&D resources. Higher financial stability of a larger manufacturer also lowers a supplier's risk of bad debt and, accordingly, cost of debt collection. In short, the competitive benefits obtained from a larger manufacturer is greater compared to those from a smaller manufacturer. If the relative size of a focal firm is larger within an industry, it is considered more beneficial to suppliers, leading to the manufacturer's stronger bargaining power over its supplier, *ceteris paribus*.

Hence, a focal firm (buyer) with higher power may exercise its braining power and negotiate more favorable contract terms such as delaying its cash payments to suppliers. The hypothesis is developed as follows.

***Hypothesis 1b**: Increased power of a focal firm leads to longer account payable days (APD)*

Supply chain literature discusses inventory performance in both a cooperative setting and a bargaining setting. When a buyer and a seller coordinate (e.g., sharing information), the global profit is more likely to be maximized by choosing the system optimal inventory level, but it may not be the locally maximized profit for each firm (Li et al., 1996). Further studies support that despite some losses of efficiency in a non-cooperative (bargaining) setting, a firm has a strong motivation and tendency to deviate from the system optimal inventory level to maximize its own profit (Cachon, 2004).

Each firm tries to reduce its inventory since lower inventory level leads to lower costs and lower risk. But, the dilemma is that low inventory often results in lower service level (e.g., slower replenishment, frequent stock- outs, etc.). One way to realize lower inventory, while not compromising service level, is to allocate inventory along the supply chain. By so doing, at least one of the supply chain partners may want to maintain lower inventory *competitively* while it knows that cooperative mechanism helps the overall system reach an optimum inventory point (Cachon and Zipkin, 1999).

A firm may be able to allocate its inventory burdens among its supply chain partners using various types of supply chain contracts. A mathematical model was built to show that a firm may be able to lower inventory costs based on various contract types (push or pull contract, advance-purchase, etc.) (Cachon, 2004). For instance, a buyer may take all inventory costs and risk of unsold products with a push contract while a seller can avoid paying any inventory cost (vice versa with a pull contract). Particularly, Cachon (2004)

highlighted that bargain mechanism is embedded as a major driver for contract types although the bargaining mechanism is not always efficient. Due to this embedded bargaining mechanism, other studies suggest that sellers and buyers are more encouraged to choose the global optimum inventory level for each echelon while cooperative contract mechanism (e.g., revenue-sharing, buy-back, volume discounts, etc.) supplements any potential loss in profits for each partner (Cachon and Lariviere, 2005). Otherwise, using bargaining power or extra monetary incentives (in case of the lack of power), a supplier may try to induce the buyer to deviate from its own optimal order quantity (i.e., EOQ), because the order quantity at the buyer's EOQ may be costlier to the supplier. These modeling studies provide evidence that bargaining mechanism contract terms are widely used practices for inventory management among supply chain partners.

Based on our theorizing above, bargaining power that a focal firm has enjoyed over its supply chain partners (both suppliers and buyers) can be applied to inventory management. As we explained in the development of Hypotheses 1a and 1b, the unique resources of a focal firm (as a buyer and a supplier) create dependency and imbalanced powers between a supplier and a buyer. Using this unbalanced power (bargaining), a focal firm with more power tends to push out its inventory to its suppliers and buyers so as to minimize its own inventory holdings and inventory days. The hypothesis is therefore developed as follows.

***Hypothesis 1c**: Increased power of a focal firm leads to shorter inventory days (IND)*

3.2 Moderating Effects of the Financial Crisis

Cash liquidity is an important performance indicator regardless of economic situations because cash flow is highly influential to a firm's ability to pay debts, taxes, wages, purchasing expenses, etc., which are critical for a firm's business continuity (Garcia-Appendini and Montoriol-Garriga, 2013). However, the relative importance of cash liquidity may vary with changes in risks such as the unprecedented financial crisis during 2008-2009. During an economic crisis, the motivation of a firm to improve CCC may be amplified due to two major concerns (Aghion et al., 2010). First, the capital cost of borrowing significantly increases because financial institutions become more conservative and exercise tighter credit control. For instance, in order to preserve cash holdings, financial institutions reduce the overall amount of lending (Ivashina and Scharfstein, 2010). During the financial crisis, increased cost of capital also weakens production activities (Chor and Manova, 2012) and is blamed for decreased business revenues.

Additionally, environmental uncertainty dramatically increases during the financial crisis. Market risks associated with uncertainty are as follow: consumer wealth shrinks because household incomes decline and, purchasing power becomes weaker, resulting in reduced market demand and slower sales. Declining sales subsequently lead to severe cost reduction practices. Further, delayed payment collection or defaults of vulnerable supply chain partners add extra risks to a firm's operations and financial management. Therefore, conservative cash flow management by maintaining shorter CCC has become more appealing during the financial crisis.

Due to these two major concerns, the CCC performance has become more critical for a focal firm during the financial crisis.

Since CCC is largely determined by supply chain management practices, a firm may use its powers over its supply chain partners more aggressively during the financial crisis to minimize any risks. Thus, we argue that the financial crisis passively moderates the impacts of power on the costs of supply chain partners and the focal firm's inventory holding costs.

Hypothesis 2a*: The effect of power on account receivable days is stronger in the presence of financial crisis than without financial crisis*
Hypothesis 2b*: The effect of power on account payable days is stronger in the presence of financial crisis than without financial crisis*
Hypothesis 2c*: The effect of power on inventory days is stronger in the presence of financial crisis than without financial crisis*

IV. MODEL AND DATA

4.1 Model Specification

To test our hypotheses, we propose that a firm's bargaining power, supply chain complexity, capital structure, and other firm-specific characteristics influence ARD, APD, and IND, respectively.

ARD, APD or IND = *f* (bargaining power, supply chain complexity, capital structure, other control variables)

We estimate three separate models for ARD, APD and IND accordingly. A firm's bargaining power is a focal firm's relative power in an industry that can be exercised over its suppliers and buyers during negotiations, resulting in favorable contract terms. We use the ratio of a firm's revenue over the revenue of the industry leader, who has the highest revenue in the industry based on the four-digit NAICS industry code, as a proxy for the relative power size of the focal firm. Thus, our variable is a firm-industry specific variable. As mentioned in Section 3.1, we hypothesize that a firm's power has a positive impact on APD and a negative impact on ARD and IND.

With respect to the control variables, we include geographic diversification and capital intensity in all models. Geographic diversification, measured by the number of foreign countries in which a focal firm has operations, or so called the breadth of multi-nationality in the international business literature (Allen and Pantzalis, 1996), is a proxy for supply chain complexity. We believe that a higher degree of supply chain complexity leads to longer periods of debt collection and higher inventory levels (Han et al., 2012). In addition, following Gaur et al. (2005), this study includes capital intensity, measured by the ratio of fixed assets including property, plant and equipment (PPE) to total assets. Higher capital intensity is expected to be associated with shorter cash cycle.

For each model, we include one unique control variable for each dependent variable respectively. In the APD model, this study includes the debt-to-equity ratio (D/E ratio) to control for a focal firm's ability to meet financing obligations. Because suppliers tend to require firms with poor financial conditions to pay earlier, the D/E ratio is expected to have a negative impact on APD. In the ARD model, this study includes the customer concentration ratio, measured by the percentage of a focal firm's revenue contributed by major customers with more than 10 percent of its total sales. A higher customer concentration ratio implies simpler customer mix and hence a focal firm can better manage its ARD. Hence, customer concentration ratio may have a negative impact on ARD. In the IND model, we include advertising ratio,

measured by the ratio of advertising expense to revenue, as a proxy for the brand awareness of a focal firm. A firm's higher advertising spending is expected to increase sales through product differentiation (Aaker et al., 1992), leading to higher inventory turnovers and shorter inventory days.

To test the moderating effects of the global financial crisis during 2008-2009 triggered by a liquidity crisis in late 2007, we create a dummy variable, Crisis, for years 2008-2009 and include the interaction terms of power and the global financial crisis. According to the Aruoba-Diebold-Scotti Business Conditions Index produced by the U.S. Federal Reserve Bank of Philadelphia (2015), 2008 and 2009 are considered financial-crisis years.

Lastly, we add year dummies to capture any time-specific effects that are not captured by the model for particular years, including the global financial crisis years of 2008 and 2009, such as varying interest rates or faster payment collections due to increased use and advancement of information technology. We also include industry dummies based on the three-digit NAICS codes, which may control for the effects of different industries on bargaining power. Note that these common control variables are included in all three models.

Because the distribution of ARD, APD, and IND appears to be highly right-skewed, we have transformed all dependent variables using logarithmic terms and employed log-linear models to estimate the relationships between the dependent variables and the independent variables. Three estimation models are presented as follows:

Model 1: ARD Model

$\ln(ARD_{ij}) = a_0 + a_1 Power_{ij} + a_2 Year08 + a_3 Year09 + a_4 Power_{ij} * Crisis + a_5 Customer\ Concentration_{ij} + a_6 Geographic\ Diversification_{ij} + a_7 Capital\ Intensity_{ij} + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon_{ij}$ (Equation 1)

whereas i represents year i and j represents firm j

Model 2: APD Model

$\ln(APD_{ij}) = b_0 + b_1 Power_{ij} + b_2 Year08 + b_3 Year09 + b_4 Power_{ij} * Crisis + b_5 Debt\text{-}to\text{-}Equity\ Ratio_{ij} + b_6 Geographic\ Diversification_{ij} + b_7 Capital\ Intensity_{ij} + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon_{ij}$ (Equation 2)

Model 3: IND Model

$\ln(IND_{ij}) = c_0 + c_1 Power_{ij} + c_2 Year08 + c_3 Year09 + c_4 Power_{ij} * Crisis + c_5 Advertising\ Ratio_{ij} + c_6 Geographic\ Diversification_{ij} + c_7 Capital\ Intensity_{ij} + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon_{ij}$ (Equation 3)

We summarize the measurements of all variables in Table 1.

4.2 Data Collection and Sample

This study collects annual financial data from the Compustat databases over the period 2000-2011. The observations with a missing value in any variable are dropped from the final analysis. As a result, this study is able to include 5,159 firm-year observations, which consist of 990 firms across 21 manufacturing industries based on three-digit NAICS codes. From the Compustat's annual database, we are able to collect and calculate variables such as ARD, APD, IND, power, the debt-to-equity ratio, advertising ratio, and capital intensity. According to the Business Information Files of the Compustat database, a firm reports the amount of capital investment in global operating regions and the sales volumes of major customers. Hence, we are able to calculate the geographic diversification and customer concentration ratio accordingly.

TABLE 1. MEASUREMENTS OF VARIABLES.

Variables	Measurements
Account Receivable Days (ARD)	ARD = 365/ Accounts Receivable Turns = 365 /(Total Sales/Average AR Value)
Account Payable Days (APD)	ARD = 365/ Accounts Payable Turns = 365 /(Cost of Goods Sold/Average AP Value)
Inventory Days (IND)	ARD = 365/ Annual Inventory Turns = 365 /(Cost of Goods Sold/Average Inventory Value)
Power	Ratio of a firm's revenue over the revenue of the industry leader, who has the highest revenue in the industry based on the four-digit NAICS industry code
Crisis	Dummy variable; 1 for years 2008 and 2009 and 0 elsewhere
Customer Concentration	Percentage of a focal firm's revenue contributed by major customers with more than 10 percent of a focal firm's sales
Debt-to-Equity Ratio	Ratio of total liabilities over stockholders' equities
Geographic Diversification	Number of global regions where a focal firm operates and has capital investment
Capital Intensity	Ratio of property, plant and equipment (PPE) over total assets
Advertising	Ratio of advertising expenses over total sales

V. REGRESSION RESULTS

5.1 Summary Statistics

Table 2 reports the descriptive statistics of the variables used in the regression models. On average, the accounts receivable days and the accounts payable days are 65.83 days and 65.26 days, respectively, and the inventory holding period is 113.19 days. Thus, the average CCC is 113.77 days (=65.83+113.19-65.26). Table 3 presents the statistics by industry. It shows that the electrical equipment, appliance, and component manufacturing industries have the longest accounts receivable days at 78.24 days, while the chemical manufacturing industry has the longest accounts payable days and inventory holding days at 107.68 days and 165.72 days, respectively. Overall, the wood product manufacturing industry has the shortest cash cycle at 55.17 days while the machinery manufacturing industry has the longest cash cycle at 147.88 days.

TABLE 2. DESCRIPTIVE STATISTICS.

Variable	Mean	Std. Dev.	Min	Max
ARD	65.83	69.57	0.41	2,560.37
APD	65.26	154.65	0.78	5,885.72
IND	113.19	149.58	0.69	4,896.48
ln(ARD)	4.06	0.47	-0.89	7.85
ln(APD)	3.91	0.61	-0.24	8.68
ln(IND)	4.46	0.72	-0.37	8.50
Power	0.08	0.20	0.00	1.00
Crisis	0.17	0.38	0.00	1.00
Customer Concentration	0.37	0.29	0.00	2.97
Geographic Diversification	4.22	2.60	1.00	29.00
Debt-to-Equity Ratio	0.00	51.61	-2,556.42	653.50
Advertising Ratio	0.01	0.07	0.00	4.72
Capital Intensity	0.48	0.52	0.00	17.51

TABLE 3. COMPONENTS OF CASH CYCLE – BY INDUSTRY.

NAICS / Description	ARD	APD	IND	CCC
311 Food Mfg.	36.49	41.63	78.92	73.78
312 Beverage and Tobacco Product Mfg.	61.07	45.67	130.43	145.82
313 Textile Mills	58.12	21.98	79.17	115.31
314 Textile Product Mills	44.95	43.86	72.58	73.66
315 Apparel Mfg.	50.19	40.19	106.31	116.31
316 Leather and Allied Product Mfg.	60.50	67.61	86.77	79.66
321 Wood Product Mfg.	29.41	17.44	43.21	55.17
322 Paper Mfg.	52.07	39.62	71.35	83.80
323 Printing and Related Support Activities	60.85	33.99	55.99	82.85
324 Petroleum and Coal Products Mfg.	55.40	47.16	51.53	59.77
325 Chemical Mfg.	71.63	107.68	165.72	129.67
326 Plastics and Rubber Products Mfg.	51.70	36.19	62.56	78.06
327 Nonmetallic Mineral Product Mfg.	44.18	36.31	62.43	70.29
331 Primary Metal Mfg.	66.88	53.75	112.84	125.97
332 Fabricated Metal Product Mfg.	56.37	44.97	102.18	113.58
333 Machinery Mfg.	73.04	59.66	134.49	147.88
334 Computer and Electronic Product Mfg.	67.74	67.87	104.78	104.65
335 Electrical Equipment, Appliance, and Component Mfg.	78.24	53.15	106.15	131.24
336 Transportation Equipment Mfg.	58.34	51.82	64.07	70.59
337 Furniture and Related Product Mfg.	57.04	42.05	52.74	67.73
339 Miscellaneous Mfg.	66.91	57.11	150.75	160.55
Overall (Days)	**65.83**	**65.26**	**113.19**	**113.77**

Table 4 shows the correlations among variables used in the regressions. The highest correlations are found among the three CCC component variables (ARD, APD and IND). The account receivable days variable (ARD) has the positive correlation with the account payable days variable (ARD) at 0.35, indicating that a firm may be more likely to delay payments when it takes longer to collect payments. The inventory days variable (IND) has a positive correlation with both the account payable days variable (APD) and the account receivable day variables (ARD) relatively at 0.37 and at 0.21, suggesting that a firm with slow collection and payment tends to have more inventory as well. None of the correlations are high enough to suggest that multicollinearity may be an issue in this study.

TABLE 4. CORRELATION TABLE.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) ln(ARD)	1.00									
(2) ln(APD)	0.35	1.00								
(3) ln(IND)	0.21	0.37	1.00							
(4) Power	-0.08	0.02	-0.12	1.00						
(5) Crisis	-0.04	-0.05	-0.01	-0.01	1.00					
(6) Customer Concentration	-0.06	0.05	-0.11	0.04	0.01	1.00				
(7) Geographic Diversification	0.07	0.08	0.05	0.01	0.06	-0.01	1.00			
(8) Debt-to-Equity Ratio	0.00	0.00	0.01	0.01	-0.01	-0.03	0.02	1.00		
(9) Ad. Ratio	0.09	0.02	-0.04	-0.01	-0.01	-0.02	-0.06	0.00	1.00	
(10) Capital Intensity	-0.07	0.00	-0.11	0.09	0.00	0.02	0.02	0.01	-0.01	1.00

5.2 Regression Results

As shown in Section 4.1, we use three separate models for ARD, APD, and IND to test the hypotheses. Table 5 presents the regression results of all models. In the ARD model, it shows that greater power leads to shorter ARD, lending support for H1a. A one-unit increase in a firm's power leads to lower ARD by 12.9 percent ($=e^{-0.138}-1=0.87-1$). That is, an increase in revenue by 10 percent of the industry leader's revenue leads to a decrease in ARD by 1.29 percent ($=10\%*(e^{-0.138}-1)$). Table 5 reports the beta coefficients, which are standardized coefficients and show the relative impacts of independent variables. Table 5 shows that power is the third most important factor that affects ARD, next to capital intensity and customer concentration. The control variables show expected signs. Higher customer concentration leads to shorter ARD, implying that dealing with fewer customers helps reduce the period of

debt collection. Increased supply chain complexity leads to longer ARD, showing that more foreign operational locations lengthen the time to collect debt from customers. High capital intensity is associated with shorter ARD.

In the APD model, firms with more power have longer APD at the 5% significance level, lending support for H1b. As a firm increases its revenue by 10 percent relative to the industry leader's revenue, APD will increase by 0.96 percent (=10%*($e^{0.092}$-1)). The beta coefficients show that power is the second most important factor affecting APD, next to geographic diversification. Surprisingly the D/E ratio does not have a significant impact on APD. More geographic diversification and higher capital intensity lead to longer APD.

In the IND model, the results show that firms with more power have shorter inventory days, providing support for H1c, suggesting that it takes industry leaders less time to sell one unit of inventory. If a firm increases its revenue by 10 percent relative to the industry leader, the inventory days will be shortened by 2.97 percent (=10%*($e^{-0.352}$-1)). The beta coefficients show that power is the most important factor that affects IND. The control variables show expected signs. More advertising expenditure relative to sales leads to better awareness and hence shortened IND. Increased supply chain complexity leads to longer IND because more operational locations will lead to less risk pooling and more safety stock. High capital intensity leads to better efficiency and shorter IND.

Before presenting the results of the power and financial crisis interaction term, we report the coefficients of two year dummy variables (Year08 and Year09) among our 11 year dummies to show the main effects of the global financial crisis years[1]. In the ARD model results, the coefficient for year 2008 shows a significant and much stronger negative impact on a focal firm's ARD compared with those for other years, indicating a local firm is more likely to collect payments earlier during the financial crisis. The regression results of the APD model show that the financial crisis in 2008 had a significant negative impact on a focal firm's APD. Again, the coefficient for year 2008 is much stronger than those for other years, implying that during the global financial crisis, APD become shorter than that in the stable period. It is likely because suppliers desire higher cash liquidity and request a shorter APD. In contrast, the regression results of the IND model show that financial crisis does not have significant impacts on a focal firm's inventory days.

[1] An individual year dummy variable is coded 1 for observations in each year. Otherwise, it is coded 0. A total of eleven year dummy variables are included in the model for our data period (2000~2011) while year 2000 is the base year.

TABLE 5. REGRESSION RESULTS.

	Model 1			Model 2			Model 3		
	DV: ln(ARD)	**St. Dev.**	**beta**	**DV: ln(APD)**	**St. Dev.**	**beta**	**DV: ln(IND)**	**St. Dev.**	**beta**
Power	-0.138***	0.033	-0.060	0.092**	0.042	0.031	-0.352***	0.050	-0.100
Year08	-0.168***	0.032	-0.10	-0.188***	0.041	-0.087	-0.063	0.048	-0.024
Year09	-0.037	0.032	-0.02	-0.055	0.041	-0.025	-0.056	0.048	-0.022
Power x Crisis	-0.009	0.085	-0.002	0.222**	0.108	0.031	0.094	0.128	0.011
Customer Concentration	-0.108***	0.022	-0.066						
Debt-to-Equity Ratio				-0.00003	0.0002	-0.003			
Advertising Ratio							-0.594***	0.129	-0.061
Geographic Diversification	0.008***	0.002	0.042	0.014***	0.003	0.062	0.015***	0.004	0.052
Capital Intensity	-0.060***	0.012	-0.066	0.003	0.015	0.003	-0.113***	0.018	-0.082
Year01	-0.096***	0.032	-0.053	-0.081**	0.041	-0.035	-0.004	0.049	-0.001
Year02	-0.053*	0.031	-0.031	-0.023	0.040	-0.011	-0.026	0.047	-0.010
Year03	0.002	0.031	0.001	0.023	0.040	0.010	-0.024	0.047	-0.009
Year04	-0.045	0.031	-0.027	-0.014	0.040	-0.007	-0.030	0.047	-0.012
Year05	-0.034	0.031	-0.021	-0.013	0.039	-0.006	-0.069	0.047	-0.027
Year06	-0.036	0.031	-0.022	0.010	0.039	0.004	-0.003	0.047	-0.001
Year07	-0.032	0.031	-0.019	0.021	0.040	0.010	0.019	0.047	0.007
Year10	-0.061*	0.032	-0.035	0.001	0.040	0.000	-0.013	0.048	-0.005
Year11	-0.110***	0.032	-0.063	-0.066	0.041	-0.029	0.001	0.048	0.000
Industry Dummy	Included			Included			Included		
No. of observations	5,159			5,159			5,159		
R-squared	0.1111			0.1230			0.1391		

(Note: *** indicates p<0.01, ** p<0.05, and * p<0.1)

Regarding the moderating effects of the global financial crisis, the impact of power is prominent only on APD, but neither on ARD nor on IND, during the global financial crisis of 2008-2009. Hence, we find support for H2b but not for H2a and H2c. We attribute the results to the nature of the financial crisis in 2008, a demand crisis which most firms are facing much weaker demand. During the financial crisis, suppliers have difficulty using more power on their customers to collect debt sooner because their buyers were facing extremely low demand and low cash inflows as well.

In contrast, buyers with greater power may use their power more often to delay payments because of slower sales and lower cash flows, leading to longer APD. In addition, manufacturers with greater power can hardly push more inventory to customers because of extremely low demand in the presence of global financial crisis.

VI. DISCUSSION

6.1 Managerial Implications

Managerial implications of our empirical results are discussed in terms of the consequence of neglecting the bargaining mechanism and the dynamic nature of the bargaining mechanism that necessitates judicial use of the bargaining power by a focal firm.

First, our findings support the stream of research that emphasizes the importance of considering both bargaining mechanism and collaborative mechanism together in evaluating net gains of supply chain investments for each supply chain partner (Crook and Combs, 2007; Sucky, 2005; Yeung et al., 2009). Collaborative mechanism mutually benefits all supply chain partners (Min et al., 2005) while bargaining mechanism drives unequal allocation of the gains across all supply chain partners. For instance, mutual collaborative investments among supply chain partners can expedite flows of goods and payments, resulting in equal benefits to every partner such as faster product development, lean manufacturing, and shorter cash cycle. However, some supply chain partners may have to bear extra costs of the investment, resulting in different firm performances. By narrowly focusing on financial or operational performance indicators of a focal firm, previous studies may have potentially overestimated the gains of supply chain collaborations while overlooking the expenses of other supply chain partners (Cao and Zhang, 2011; Jayaram et al., 2008; Wu et al., 2006) or excessively generalized the benefits of supply chain collaborations to every supply chain partner. Failure to consider bargaining mechanism may not capture variances across individual performances of each supply chain partner and the overall performance of the entire supply chain.

Another consequence of overlooking bargaining mechanism is inaccurate estimations and inappropriate inferences of a firm's inventory level. Our empirical results clearly show that power gained through bargaining mechanism is a significant predictor of a firm's inventory level. Traditionally, inventory literature suggests various determinants of inventory level, including market demand, inventory costs, geographic dispersion, firm's strategy, etc. (Han et al., 2013; Ke et al., 2014). However, these studies did not include a power variable that can be captured by a firm's position within an industry. Using the literature highlighting the impact of industry characteristics on a firm's performance (Goddard et al., 2009; Weerawardena et al., 2006), we provide empirical evidence that a focal firm's power obtained from its position in an industry enables the focal firm to push out its inventory to its supply chain partners, resulting in a reduction in the focal firm's inventory level. By noting the effects of bargaining power, supply chain partners may be able to develop better estimates and planning in collaboration with a more powerful focal firm in the supply chain. Therefore, our findings contribute to the extant inventory literature by testing an additional important factor for inventory level.

Second, our results also imply that there is an externality cost associated with

the exercise of bargaining power. The impact of bargaining is determined not only by the size of power but also by a firm's willingness to exercise bargaining power. This willingness should be based on a firm's motivation (i.e., the relative importance of cash liquidity), which may be in a constant change and deemed dynamic. For instance, cash liquidity becomes more critical during the financial crisis when the cost of capital is higher due to increased market uncertainty and individual firm's risk exposure. During the financial crisis, the firm's willingness to exercise bargaining power tends to increase for a higher survival rate with the improved cash liquidity. However, the question is why a firm does not maximize the exercise of its bargaining power during the non-financial crisis period. We believe that a significant amount of unintended costs is associated with the exercise of bargaining power. Shorter CCC of a focal firm means longer CCC of its supply chain partners, which may deteriorate profitability of these supply chain partners. Low profitability of the supply chain partners may lead to lower long-term performance (e.g., poor product quality, delayed product development, unstable supply of raw materials), which may subsequently deteriorate the long-term performance of the entire supply chain, including the focal firm.

Our results suggest that a focal firm with a stronger power over its supply chain partners may want to avoid the constant exercise of its bargaining power at a maximum level. Indeed, there is a dynamic nature when a firm is more or less willing to exercise its power due to the associated costs. In the short run, a powerful focal firm may be able to obtain more gains by taking advantage of its supply chain partners. However, in the long run, the performance of the entire supply chain may not be sustainable if its suppliers and customers are not able to obtain fair shares of the gains. Therefore, the key implication to management is that a powerful focal firm should exercise its bargaining power with great discretion and the use of cooperative strategies is more preferable for sustainable benefits in the long run.

VII. CONCLUSIONS

Based on a large dataset of manufacturing firms collected from the Compustat databases, our research is the first study to use extensive empirical data to test the relationships between the bargaining power of a focal firm and three components of its cash conversion cycles. We find that the power of a focal firm is negatively associated with its account receivable days, indicating that with stronger power the focal firm may be able to collect cash from its customer sooner. We also find that the power of a focal firm is positively associated with its account payable days, indicating that with stronger power the focal firm may be able to delay cash payments to its suppliers without penalties. Both findings suggest that the focal firm exercises its bargaining power at the expenses of its downstream customers and upstream suppliers. We also find that the power of a focal firm is negatively associated with its inventory days, suggesting that with stronger power the focal firm may be able to push raw inventory towards its upstream suppliers and finished goods inventory towards its downstream customers, resulting in leaner inventory on its own books. We further test the moderating effects of the global financial crisis on the relationship between power and three components of CCC and find that the positive impact of power on account payable days has become greater in the presence of financial crisis. From a contingency perspective, our study provides empirical

analysis of the potential moderating effects of the financial crisis on the relationship between a focal firm's power and the costs of its supply chain partners.

This research is subject to several limitations primarily due to data limitations. First, it is noted that the R-squared scores across all three models are relatively low, ranging from 11% to 14%, despite that they remain highly significant. The low R-squared is likely caused by the fact that we are not able to include all other factors which may have significant impacts on ARD, APD and IND due to data unavailability. For example, many supplier-specific characteristics may have significant impacts on APD, many buyer-specific characteristics may have significant impacts on ARD, and a focal firm's internal operations and supply chain networks may also have significant impacts on its IND. Future research using dyadic data on suppliers and buyers shall further improve our understanding of the power relationship and its impacts on cash conversion cycle. Second, current study is focused on U.S. manufacturing firms. Wholesalers and retailers like Walmart and BestBuy may be able to exert a great amount of power on its supply chain partners. A comparative study of retailers and wholesalers will complement this study and enhance our understanding of power relationship in a different supply chain context. Third, the significance of bargaining power may vary across different manufacturing industries. In-depth case studies of representative industries may also be desirable to refine our findings.

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