Essays on Nonfinancial Performance Measurement, Relative Bargaining Power and Supply Chain Performance

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This dissertation examines two research questions that contribute to our understanding of the role of accounting information in supply chain relationships. The first research question examines whether nonfinancial performance measures are leading indicators of supply chain financial performance and whether the information contained in these measures have a role in the performance evaluation and rewards processes between firms. Chapter 2 analyzes proprietary performance measurement data from a leading international manufacturer regarding its contractual arrangements with 156 independent distributors. Consistent with predictions, I find that measures of process alignment and, to a lesser extent, measures of detailed information exchange are nonfinancial performance measures that are leading indicators of supply chain sales growth, productivity and profitability. In addition, I find that nonfinancial measures are associated with the manufacturer's decision to renew supply chain contracts. Supplemental analysis examines whether the role of nonfinancial measures in performance evaluations is associated with the evaluation's apparent economic importance or the exclusivity of the supply chain relationship.

The second research question investigates whether buyer bargaining power influences supplier performance. Chapter 3 uses the supplier's FAS 131 disclosure to proxy for the presence of a relatively more powerful buyer ("strong" buyer) and analyzes the financial and operational performance of apparel suppliers. Consistent with prior literature, I find that strong

buyers adversely affect supplier gross margins. However, I find that strong buyers are also associated with efficiency gains for suppliers through lower SG&A expenses and enhanced inventory management. These efficiencies yield higher supplier financial and operational performance despite lower gross margins. Interestingly, I find that suppliers to multiple strong buyers are unable to offset lower gross margins through SG&A expense or inventory management efficiencies. One interpretation of these results is that such suppliers are unable to manage effectively the demands of multiple strong buyers because these demands are not synchronized. Collectively, this dissertation provides important evidence of the apparent productivity and efficiency gains that are available to supply chain partners from engaging in process alignment and exchanging detailed customer demand and inventory information, and how these gains appear to enhance the performance of each firm.

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PREFACE

1.0   INTRODUCTION

Accounting research has been concerned with issues related to supply chain contracting, performance measurement, evaluation and rewards, and the financial performance of supply chain relationships (e.g., Ittner and Larcker 1997; Ittner and Larcker 1998a; Ittner, Larcker, Nagar and Rajan 1999; Anderson, Glenn and Sedatole 2000; Randall and Ulrich 2001; Baiman and Rajan 2002a; Baiman and Rajan 2002b; Kulp 2002; Dekker 2004; Kulp, Lee and Ofek 2004; Narayanan and Raman 2005; Kaplan and Norton 2006; Dekker 2007). Given the extensive literature in accounting that investigates the relationships between contracting, performance measurement, evaluation and rewards, and firm performance, extending this literature to investigate issues between firms appears appropriate.

The role of accountants, particularly managerial accountants, within the firm is changing rapidly. The performance measurement, evaluation and rewards process is expanding to include the monitoring and control of processes that extend beyond the firm, and into the firm's "supply chain." These supply chains, which I view as those organizations situated both upstream and downstream from the firm, and are involved in the procurement, design, production and distribution functions, are becoming increasingly important to academics and practitioners.[1]

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[1] Hopwood (1996) and Cooper and Slagmulder (2004, 2) discuss how an increased interest in "interdependencies and information flows that transcend organizational boundaries" are an expanding area of managerial accounting that has been largely ignored in the accounting literature. My use of the term "supply chain" is similar to prior notions of inter-organizational collaboration. Cooper and Slagmulder (2004, 3) use the term "supply chain" throughout their description of inter-organizational cost management practices.

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Personnel in the operations, procurement, engineering and related functions, which traditionally fall outside of the accounting and finance department, are collecting and using managerial accounting information to make economically important decisions, such as entering and terminating procurement contracts, engaging in new product development activities, devising innovative ways to control inventory, redesigning products to reduce production costs, and reorganizing manufacturing processes to achieve improved production efficiencies. These activities likely have an important association with future firm performance. Managerial accounting researchers have a competitive advantage in engaging in research in this area, and it is important for accounting scholars to actively participate in the growing literature which investigates the role of accounting information within the firm's supply chain.

This dissertation examines two research questions that contribute to our understanding of the role of accounting information in supply chain relationships. The first research question in my dissertation examines whether nonfinancial performance measures are leading indicators of supply chain financial performance and whether the information contained in these measures is emphasized in the supply chain performance evaluation and rewards process. To address this research question, Chapter 2 assesses whether the potential benefits of two supply chain initiatives analyzed in the operations research and management science literature (the extent to which one supply chain partner adopts another partner's recommended processes ("process alignment") and the exchange of detailed customer demand and inventory information between supply chain partners ("detailed information exchange")) are nonfinancial indicators of future supply chain financial performance. While prior studies have examined the relationship between nonfinancial measures, such as customer satisfaction, and a firm's future financial performance

(Ittner and Larcker 1998b; Banker and Mashruwala 2007), studies have not addressed the role of nonfinancial measures in management control systems outside the firm.

Collectively, the results in Chapter 2 extend prior literature in four important directions. First, the chapter extends the literature on nonfinancial performance measurement by examining whether nonfinancial measures are leading indicators of supply chain financial performance. Specifically, using performance measurement data from a leading international manufacturer regarding its contractual arrangements with 156 independent distributors, I find that measures of process alignment are consistently associated with future supply chain sales growth, productivity and profitability. The results suggest that productivity gains from process alignment may enable the supply chain (e.g., manufacturer-distributor, retailer-manufacturer) to offer lower prices in the marketplace, which enhances sales growth. Importantly, the supply chain is able to retain some of the productivity benefits, which enhances profitability. The results also suggest that measures of detailed information exchange are leading indicators of sales productivity, but not sales growth or profitability. This indicates that the exchange of detailed customer demand and inventory information within the supply chain is associated with the efficient use of resources (more gallons of lubricant sold per salesperson), but these productivity gains do not necessarily translate into enhanced sales or profitability.

Second, Chapter 2 investigates whether the information contained in nonfinancial measures is reflected in the supply chain performance evaluation and rewards process. Specifically, I investigate whether the manufacturer emphasizes nonfinancial measures in important supply chain performance evaluations, including the decision to continue the supply chain relationship. I find that nonfinancial measures contain information that the manufacturer uses in the performance evaluation and rewards process. In particular, measures of process

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alignment are associated with all performance evaluations, while the measure of detailed information exchange is associated only with the least economically important evaluation, which is the manufacturer's assessment of whether the distributor is oriented towards future sales growth.

Third, Chapter 2 examines whether the economic importance of the manufacturer's evaluation of their distributor's performance affects the use of nonfinancial measures in the performance evaluation and reward system. I find that the incremental contribution of nonfinancial measures in the performance evaluation and rewards process varies as the economic impact of the evaluation changes. In particular, I find that financial measures possess relatively more explanatory power in the manufacturer's contract renewal decision, which is the most economically important evaluation in my research setting. However, nonfinancial measures have relatively more explanatory power than financial measures for the manufacturer's remaining performance evaluations. This result suggests that the manufacturer relies more on financial performance (e.g., sales growth) rather than nonfinancial performance (e.g., measures of process alignment) as the economic impact of the evaluation increases.

A fourth contribution from the analysis in Chapter 2 is the examination of whether the exclusivity of the supply chain relationship, which I define as whether the distributor sells only one manufacturer's products, moderates the use of nonfinancial measures in performance evaluation and reward systems. I find that exclusive distributor's performance evaluations are less sensitive to measures of process alignment. This suggests that exclusive status provides a benefit to distributors in the performance evaluation process. In addition, I find that exclusive distributor's performance evaluations are more sensitive to the measure of detailed information exchange. One interpretation of this result is that supply chain partners may view a non-

exclusive distributor as both a source of information about the competitive marketplace and a source of information leakage to industry competitors. That is, a non-exclusive distributor that exchanges detailed information *with* the manufacturer may also exchange detailed information *about* the manufacturer with industry competitors. This is an important result because studies that recommend implementing performance measurement in supply chains have generally ignored the potential moderating role of various contextual factors specific to these settings, such as whether the supply chain is an exclusive or nonexclusive relationship.

The second research question in my dissertation investigates whether buyer bargaining power influences supplier financial and operational performance. Relative bargaining power is implicitly important in Chapter 2, because the research setting examines the performance measurement, evaluation and rewards process between a relatively more powerful manufacturer and their potentially weaker distributors. Despite the importance of relative bargaining power in this setting, the data do not provide an opportunity to more closely examine the relationship between bargaining power and performance in the supply chain. In Chapter 3, I examine how relative bargaining power affects supply chain performance.

Collectively, Chapter 3 extends prior literature by examining the association between buyer bargaining power and supplier financial and operational performance beyond supplier gross margins. I adopt an organizing framework for supplier performance measurement that examines two fundamental elements of firm profitability: profit margin and asset turnover. An improvement in either measure without a decline in the other will enhance return on invested capital. Using the supplier's FAS 131 major customer disclosure as a proxy for the presence of a relatively more powerful buyer ("strong" buyer), I find that strong buyers are associated with efficiency gains for their suppliers via lower supplier SG&A expenses and enhancements in

inventory management capabilities. In addition, while strong buyers capture a share of these gains through lower supplier gross margins, suppliers also retain a share of these gains, which yields higher overall supplier financial performance.

Interestingly, the efficiency gains available to suppliers do not appear to increase in the presence of multiple strong buyers. I find that suppliers to multiple strong buyers are unable to achieve gains that are large enough to offset lower gross margins. I also find that suppliers to multiple strong buyers are unable to incrementally obtain inventory management efficiencies. One interpretation of these results is that such suppliers are unable to manage effectively the demands of multiple strong buyers because these demands are not synchronized. The additional stochasticity induced in the suppliers' environment may contribute to declines in asset turnover and lower profit margins. Overall, the evidence indicates that strong buyers do not extract all the gains to trade from their relatively weaker suppliers, while suppliers to multiple strong buyers are unable to achieve sufficient efficiency gains to offset gross margin declines.

Chapter 3 contributes to the existing literature that investigates the influence buyer bargaining power may have on supplier financial and operational performance. I find that prior results which depend on supplier gross margins to argue that strong buyers adversely affect supplier financial performance may not fully reflect the potential efficiency benefits that accrue to suppliers in other aspects of their business. These results complement and extend prior accounting research that assumes suppliers achieve performance benefits from more intensive buyer-supplier interactions (Kulp et al. 2004) or does not directly examine the value and performance implications for those suppliers in strong buyer-supplier relationships (Gosman et al. 2004). In addition, these results complement prior accounting research that suggests suppliers to strong buyers may experience inventory management benefits after adopting JIT production

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methods (Balakrishnan, Linsmeier and Venkatachalam 1996). In addition, I provide some of the first evidence that suggests the number of strong buyers may have an affect on supplier performance. More generally, the results suggest that arguments which only consider the potential adverse affect a strong buyer could have on supplier performance may present only a partial view of the broader buyer-supplier financial and operational performance situation.

The remainder of the dissertation is organized as follows. Chapter 2 assesses whether the potential benefits of the extent to which one supply chain partner adopts another partner's recommended processes and the exchange of detailed customer demand and inventory information between supply chain partners are nonfinancial indicators of future supply chain financial performance. Section 2.2 reviews related literature and develops the hypotheses. Sections 2.3 and 2.4 describe the research setting and the data used to test the hypotheses, respectively. Section 2.5 presents the main results, which are analyzed further in sections 2.6 and 2.7. Section 2.8 concludes. Chapter 3 examines the relationship between buyer bargaining power and supplier operational and financial performance. Section 3.2 reviews related literature and develops the hypotheses. Sections 3.3, 3.4 and 3.5 describes characteristics of the sample used to test the hypotheses, presents the main empirical results, and reports robustness tests, respectively. Section 3.6 concludes. Chapter 4 summarizes the dissertation and concludes.

2.0 NONFINANCIAL PERFORMANCE MEASURES, FUTURE FINANCIAL PERFORMANCE AND PERFORMANCE EVALUATIONS: EVIDENCE FROM A SUPPLY CHAIN

2.1 INTRODUCTION

The role of nonfinancial performance measures in management control systems continues to generate considerable interest among researchers and practitioners. While prior studies generally focus on the relationship between nonfinancial performance and future firm performance (Ittner and Larcker 1998b; Banker, Potter and Srinivasan 2000; Ittner, Larcker and Meyer 2003; Banker and Mashruwala 2007), studies have not addressed the role of nonfinancial measures in the management control systems that monitor and evaluate contractual relationships between firms ("supply chain relationships"). This limited attention is perhaps surprising given the widespread interest in the use of accounting information in supply chain performance evaluation and reward systems (Lapide 2000; Baiman and Rajan 2002a, 2002b; Narayanan and Raman 2005; Charron 2006; Kaplan and Norton 2006; Brewer and Speh 2001; Rizza 2006; Stadtler and Kilger 2008).[2]

In this paper, I assess whether the potential benefits of two well-recognized supply chain initiatives, process alignment between supply chain partners and the exchange of detailed

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[2] For example, Narayanan and Raman (2005) describe a home appliance manufacturer that wanted to improve its retail partner's performance. Because retailer sales efforts are not directly observable, the manufacturer must rely on sales outcomes, a noisy signal of retailer effort. The authors recommend alleviating retailer moral hazard through more extensive monitoring of supply chain activities.

information between these firms, are nonfinancial indicators of three measures of future supply chain financial performance - sales growth, productivity and profitability.[3] In addition, I examine whether information contained in these measures is emphasized in supply chain performance evaluations. I define "process alignment" as the extent to which one supply chain partner adopts another partner's recommended processes.[4] I define "detailed information exchange" as the exchange of detailed customer demand and inventory information between supply chain partners. The analysis uses six years of performance measurement data from a leading international manufacturer regarding its contractual arrangements with 156 independent distributors.[5] Given the growing literature that documents the economic importance of supply chain relationships (Randall and Ulrich 2001; Gosman, Kelly, Olsson and Warfield 2004; Hendricks and Singhal 2005), it is important to understand how firms design management control systems to monitor and evaluate supply chain performance.

Consistent with prior literature, which finds that nonfinancial measures are associated with future firm financial performance, I find that measures of process alignment are

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[3] Kaplan and Norton (1992) encourage firms to select nonfinancial measures that relate to enhancements in internal productivity and improvements in sales growth because such measures will ultimately drive profitability. This argument suggests that measures of sales growth, productivity and profitability also represent reasonable measures of supply chain financial performance.

[4] As an example of process alignment, Brown, Lee and Petrakian (2000) describe the "virtual business model" of Xilnix, a semiconductor manufacturer. Xilnix subcontracts logistics, sales, distribution and most manufacturing to its supply chain partners. Xilnix performs research and development, supply chain management, marketing and customer service activities in-house. Xilnix focuses its efforts on developing better ways to manufacturer semiconductors and then implements its ideas by redesigning its supply chain partners' processes.

[5] Manufacturers distribute their products to consumers in a variety of ways, from owning the distribution network, to franchising distributors or employing independent distributors. In this paper, I focus on the manufacturer-independent distributor arrangement. According to the National Association of Wholesale-Distributors, revenues of the 260,000 independent distributors operating in the U.S. totaled $3.9 trillion in 2006, with grocery and petroleum products distributors representing the two largest industry sectors. The magnitude of these figures suggests that independent distributors are an important link in a manufacturer's supply chain. Franchise contracts differ from my research setting because franchisees generally do not require contract renewal and are subject to "good cause" termination clauses as defined by state law. Agency conflicts in franchise relationships are more severe than in my setting, because the franchisor is restricted in their ability to terminate franchisee contracts. In response, the franchisor charges a fixed fee designed to extract the expected surplus, which leaves the franchisee with positive profit when effort is "high" and a loss when effort is "low." Brickley and Dark (1987), Lal (1990) and Lafontaine and Slade (2007) examine agency issues in franchises.

nonfinancial indicators of future supply chain financial performance. In particular, the results indicate that measures of process alignment are consistently associated with future measures of supply chain productivity, sales growth and profitability. These results suggest that productivity improvements from aligning processes across supply chain partners may enable firms to offer lower prices in the marketplace, which enhances sales growth. Importantly, the manufacturer and distributor are able to retain a share of the productivity gains, which enhances profitability.

The association between measures of detailed information exchange and future supply chain financial performance is less conclusive. Consistent with predictions that detailed information exchange will reduce total supply chain costs (Chen 1998, Cachon and Fisher 2000), I find that measures of detailed information exchange are positively associated with supply chain productivity. However, in my research setting, I find that detailed information exchange is not associated with measures of sales growth or profitability. These result suggests that the exchange of detailed customer demand and inventory information within the supply chain is associated with the efficient use of resources (more gallons of lubricant sold per salesperson), but these gains do not necessarily translate into enhanced sales or profitability. This is consistent with prior studies that document mixed evidence on the benefits of information exchange within the supply chain (Ittner, Larcker, Nagar and Rajan 1999; Kulp et al. 2004).

I extend the nonfinancial performance measure literature by investigating whether the information contained in these measures is emphasized in the supply chain performance evaluation and rewards process. I find that nonfinancial measures contain information that the manufacturer uses in the performance evaluation and rewards process. In particular, measures of process alignment are associated with all performance evaluations, while the measure of detailed information exchange is associated only with the least economically important evaluation, which

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is the manufacturer's assessment of whether the distributor is oriented towards future sales growth. The limited role of detailed information exchange in the performance evaluation and rewards process may partially reflect firms' concerns that supply chain partners may manipulate their reports by either sharing only partial information or not reporting honestly (Lee et al. 1997; Cachon and Lariviere 2001; Ozer and Wei 2006).[6] Collectively, my results suggest that nonfinancial measures, particularly measures of process alignment, are leading indicators of future supply chain performance, and that the information contained in these measures are important inputs into the performance evaluation and rewards process between firms.

I extend prior literature by examining the relative explanatory power of financial and nonfinancial measures in the performance evaluation and rewards process. Interestingly, I find that the relative importance of financial versus nonfinancial performance measures varies with the economic importance of the evaluation. The results indicate that financial measures, such as sales growth, have greater relative explanatory power in supply chain contract renewal evaluations, which represent the most economically important evaluation in my research setting. In contrast, nonfinancial measures, such as process alignment, have greater relative explanatory power in the less economically important supply chain performance evaluations (e.g., the distributor's strategic fit in the manufacturer's distribution network). These results are particularly interesting because the financial measures are not formally incorporated into the manufacturer's performance measurement process, which suggests information outside of the measurement process ultimately enters into the determination of evaluations and rewards.

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[6] "Traditionally, sales data and inventory status data have been considered to be proprietary to retailers with no obligation or reason to share it with others… [Our paper] is silent about the interesting and challenging question of why the *retailer* should provide the manufacturer with the data. " (Lee et al. 1997, 558, emphasis is in the original). Ozer and Wei (2006) give numerous examples of the presence of forecast manipulation in supply chains.

The supply chain setting provides a unique opportunity to examine how contextual factors may affect the use of nonfinancial measures in the performance evaluation and rewards process between firms. Advocates of supply chain performance measurement have not emphasized how the characteristics of these settings may affect the use of performance measures. I focus on the issue of whether the distributor has exclusive distribution rights and find that exclusive distributors (distributors who promote only one manufacturer's products) receive performance evaluations that are consistently less sensitive to measures of process alignment. This suggests that exclusive status provides a benefit to distributors in the performance evaluation process by reducing the distributor's need to engage in process alignment activities. This result highlights how contextual factors, such as whether the relationship is exclusive or non-exclusive, are important considerations in the design of supply chain performance measurement practices.

This paper contributes to the nonfinancial performance measurement literature by examining the relationship between nonfinancial measures and supply chain financial performance, as well as investigating the role of nonfinancial measures in the supply chain performance evaluation and reward process. The paper provides some of the first empirical evidence using actual performance measurement data to assess the potential relationship between aligning processes across the supply chain, exchanging detailed customer demand and inventory information between supply chain partners and supply chain financial performance. In addition, the paper uses actual performance evaluations to assess whether the information contained in nonfinancial measures is emphasized in performance evaluations, an approach which complements recent research which investigates the emphasis placed on nonfinancial measures in important managerial decisions, such as retail store closures (Banker and Mashruwala 2007).

Finally, to my knowledge, this is the first study that examines how the economic importance of the performance evaluation and how contextual factors of the supply chain relationship affect the emphasis placed on nonfinancial measures in the performance evaluation and rewards process. These results have important implications for the implementation of supply chain management control systems and the design of management reporting.

The remainder of the chapter is organized as follows. Section 2.2 reviews related literature and develops the hypotheses. Sections 2.3 and 2.4 describe the research setting and the data used to test the hypotheses, respectively. Section 2.5 presents the main results, which are analyzed further in sections 2.6 and 2.7. Section 2.8 concludes.

2.2   THEORY AND HYPOTHESES

2.2.1   Supply Chain Relationships and Agency Conflicts

Supply chain relationships, such as the relationship between manufacturers and their distributors, have the potential for agency conflicts.[7] The distributor's sales and operations activities affect both its welfare and that of the manufacturer. While the distributor and manufacturer seek to maximize profits, the distributor, who typically stocks competing manufacturers' products, may not exert sufficient effort to sell a particular manufacturer's products. Because the manufacturer does not directly observe distributor choices, such as the allocation of sales effort across competing brands, the manufacturer observes an imperfect signal of the distributor's actions.

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[7] For additional description of agency issues in supply chains, see Baiman and Rajan (2002), Narayanan and Raman (2005) and Brickley, Smith and Zimmerman (1997, Chapter 15).

For example, poor sales growth could be due to the distributor selling competing products, stocking insufficient inventory, providing inadequate sales training or a lack of demand for the manufacturer's products. To encourage the distributor to promote the manufacturer's products, the manufacturer would design contracts to align the interests of its distributors with the manufacturer's objectives. To do this effectively, the manufacturer must identify informative measures of supply chain performance and incorporate these measures in the distributor's contract in a cost-effective manner.

2.2.2   Nonfinancial Performance Measures and Supply Chain Financial Performance

There is a large existing literature that investigates the association between the information contained in nonfinancial performance measures and measures of firm value and performance.[8] In contrast to prior literature, there is limited empirical research that examines the use of nonfinancial measures in relationships between firms ("supply chain relationships"). Supply chain relationships are a particularly interesting setting to examine the use of nonfinancial measures because the information necessary to construct these measures may be limited. Firms can more easily measure nonfinancial performance (e.g., order processing times) within the firm, because they have ready access to internal employees and documentation. However, in supply chain relationships, it is likely to be more difficult to obtain similar information because important aspects of this information are housed within another firm.

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[8] This research has investigated the role of nonfinancial measures in the valuation of a firm's intangible assets (Amir and Lev 1996; Behn and Riley 1999; Riley, Pearson and Trompeter 2003), in CEO and employee compensation contracts (Bushman, Indjejikian and Smith 1996; Banker, Potter and Srinivasan 2000; Core, Guay and Verrechia 2003; Ittner, Larcker and Rajan 1997; Ittner and Larcker 2001; HassabElnaby, Said and Wier 2005) and the usefulness of nonfinancial measures in a firm's internal decision making process (Banker and Mashruwala 2007). Overall, these studies generally show that nonfinancial measures are relevant for valuing the firm and may be leading indicators of a firm's financial performance, although with mixed results.

Evidence suggests that it may be quite difficult to obtain from supply chain partners the information necessary to construct nonfinancial measures. For example, Lee et al. (1997, 558) state, "[t]raditionally, sales data and inventory status data have been considered to be proprietary to retailers with no obligation or reason to share it with others." If relevant information is obtained from a partner, then it may not be accurate. Ozer and Wei (2006) discuss numerous instances of firms manipulating their customer demand forecasts to ensure that supply chain partners carry sufficient inventory. Lacking the information necessary to construct nonfinancial measures, supply chain partners may instead emphasize financial performance when monitoring and evaluating their supply chain partners.[9]

Despite the potential difficulties in measuring nonfinancial performance, these measures likely have an important role in predicting future supply chain performance. Supply chain partners are increasingly aligning processes that extend across firm boundaries, such as order fulfillment, manufacturing, product design and customer returns (Brown, Lee and Petrakian 2000). Researchers frequently describe supply chain partners as engaging in joint decision making (Heide and John 1990; Ittner et al. 1999), long-term forecasting (e.g., Spekman 1988; Noordewier et al. 1990; Aviv 2001) and the purposeful organization and synchronization of activities (Buvik and John 2000). These activities suggest that the extent to which one supply chain partner adopts another partner's recommended processes ("process alignment") is a potentially valuable nonfinancial performance measure in supply chain relationships.

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[9] Recent evidence suggests that firms have difficulty in identifying measures to monitor, evaluate and control their supply chain relationships. In a recent survey, Powell (2002) indicates that only 28 percent of respondents have implemented a performance measurement system to monitor supply chain performance. While several practitioner studies attempt to identify measures that may be important to supply chain partners, such as quality control and on-time delivery (Brewer and Speh 2001; Narayanan, Verkleeren and Kulp 2002; Kaplan and Norton 2006), a prevailing view in the supply chain management literature is that (Ramdas and Spekman 2000, 4) "there is little consensus…on what factors are needed for high [supply chain] performance."

Process alignment can have substantial benefits for the entire supply chain. For example, in the lubricant manufacturer-distributor supply chain, the manufacturer has preferred selling and operating methods that it wants the distributor to follow, such as employing a sales force proficient in the technical specifications of the manufacturer's products. Distributors who lack such technical knowledge may mismatch a customer's lubricant needs with an inappropriate product, such as recommending the use of a medium-grade (rather than high-grade) lubricant to care for compressor bearings, which are highly sensitive to lubricant specifications and can be easily damaged by a lubricant with improper viscosity. By offering frequent sales training, the manufacturer seeks to standardize its distributor's sales knowledge, which helps to improve the average level of distributor service provision, and to reduce the associated variation in this measure. Hence, enhanced process alignment can reduce errors in distributor decision making, which enables the manufacturer to ascribe poor distributor performance more precisely to moral hazard. In addition, process alignment may improve contract efficiency by reducing the noise in outcome performance measures.

At the same time, for several reasons, a supply chain partner will not always benefit from process alignment. The distributor may not find it optimal to adopt a manufacturer's recommended processes because many lubricant distributors also sell competing manufacturers' products. For example, if a manufacturer encourages the display of their marketing materials in the distributor's warehouse, the distributor may not be able to display competing manufacturers' materials. In addition, because process alignment typically requires supply chain partners to make relationship-specific investments (i.e., attend sales training, purchase manufacturer's marketing materials), distributors may not adopt recommended methods if they do not believe that any benefit from process alignment (e.g., increase in profitability) will offset increases in

costs. In addition, distributors may believe that a manufacturer will not reward the distributor for its alignment efforts.

There is limited prior literature that investigates whether measures of process alignment are leading indicators of supply chain performance.[10] Kulp et al. (2004) find that collaboration between supply chain partners on inventory purchasing and the design of new products is associated with higher perceived manufacturer profit margins and wholesale prices. To the extent that supply chain partner involvement in new product design is consistent with process alignment, the evidence suggests that at least one supply chain partner (the manufacturer) may benefit from aligning processes throughout the supply chain. The paper, however, relies on survey data that reflects the average supply chain practices across all of the manufacturer's supplier relationships. As Ittner and Larcker (1997) indicate, a stronger test of this relationship would be to examine the actual performance measures that are used in practice to monitor, evaluate and control individual supply chain relationships.

Despite the potential costs process alignment may impose on the distributor, if the manufacturer's processes are more effective at enhancing supply chain performance, then ignoring process alignment may increase a distributor's opportunity cost of lost sales, reduce distributor productivity and potentially reduce profits. If the benefits of process alignment outweigh the associated costs, then supply chain partners have the incentive to align with the manufacturer's processes. This argument implies that measures of supply chain process

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[10] Ittner and Larcker (1997) investigate the related question of whether the implementation of process management tools within the firm can enhance firm performance. Using survey data collected from firms in the automotive and computer industries, Ittner and Larcker (1997) find that a focus on process improvement within the firm is positively related to pre-tax return on assets in the automotive industry. This result suggests that process improvements may enhance productivity. However, the paper finds that these productivity improvements do not translate into higher profit margins. Interestingly, in the computer industry, the paper finds that a focus on process management is not related to pre-tax return on assets, and is negatively related to pre-tax return on sales. In general, there is mixed evidence regarding the potential performance benefits that accrue from focusing on process improvement activities within the firm.

alignment should be positively associated with future supply chain financial performance, which leads to Hypothesis 1.

HYPOTHESIS 1: *Supply chain process alignment is positively associated with future supply chain financial performance.*

In addition to supply chain partners' process alignment efforts, another well-recognized supply chain initiative is the increasing focus on enhancing the exchange of detailed customer demand and inventory information between firms, which I define as "detailed information exchange" (Lee, Padmanabhan and Whang 1997; Baiman and Rajan 2002a, 2002b; Chen 2003; et al. 1999; Frazier et al. 1988; Heide 1994). Unlike process alignment, which focuses on the standardization of activities between firms, detailed information exchange captures firms' communications regarding customer demand and inventory levels.

Existing literature argues that detailed information exchange may enhance supply chain performance by reducing distributor information rents and by revealing hidden information for decision making purposes (Chen 1998; Gavirneni et al. 1999; Cachon and Fisher 2000; Narayanan and Raman 2005). For example, Chen (1998) studies the value of inventory/demand information in a supply chain in which the retailer orders from a manufacturer who, in turn, orders from an outside source with unlimited supply. In this setting, Chen (1998) finds that centralized information (i.e., detailed information exchange) reduces supply chain costs by an average of 1.75 percent. Similarly, Cachon and Fisher (2000) find that, under certain conditions, when a warehouse has real-time information regarding the retailer's inventory (i.e., detailed information exchange), the warehouse can use a more sophisticated ordering and allocation

policy that reduces supply chain costs by an average of 2.2 percent.[11]   While these results

suggest that detailed information exchange among supply chain partners may enhance supply

chain productivity (lower total supply chain costs), it remains unclear whether detailed

information exchange is associated with other performance benefits, such as enhanced sales

growth, improved profitability and longer-term supply chain relationships.

The limited empirical analysis available to complement the preceding analytical research

on the value of detailed information exchange to supply chain partners provides mixed results.

Using survey data from 54 manufacturing firms, Kulp et al. (2004) investigate the effect of

sharing information regarding customer needs and inventory levels (e.g., detailed information

exchange) on perceptions of manufacturer performance.   The study finds that information

sharing is positively associated with a manufacturer's perceived profit margin, but only for firms

that achieve industry-average profitability relative to those that achieve below industry-average

profitability.   The paper suggests that information sharing among supply chain partners may

allow firms to remain competitive, but that information sharing may not be sufficient to achieve

above-normal financial performance.

Ittner et al. (1999) use survey data on supplier practices in the automotive and computer

industries to examine whether supplier selection and monitoring practices affect the association

between organizational performance and supplier strategies.   As part of the analysis, the study

investigates the frequency of meetings between supply chain participants (e.g., detailed

information exchange).   Interestingly, when analyzing the performance effects of individual

supplier practices, Ittner et al. (1999, 272) report that higher meeting frequency is negatively

associated with the buyer's return on assets.   The paper suggests that this negative association

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[11] Cachon and Fisher (2000) show that additional gains from information exchange may be due to the
manufacturer's ability to reduce batch sizes and cut order processing times.

may indicate that detailed information exchange occurs when supply chain partners encounter significant problems. Hence, the causality may run from supply chain productivity to detailed information exchange, rather than vice-versa.[12]

I extend the investigation into the relationship between detailed information exchange and supply chain performance by examining the actual performance measures used by a supply chain partner to monitor, evaluate and control supply chain partner performance. Prior literature relies exclusively on survey data to investigate the relationship between detailed information exchange and supply chain performance.[13] It is important to examine the association between measures of detailed information exchange and supply chain performance because exchanging such information is an increasingly important feature of supply chain relationships. Because analytical models generally predict a positive relationship between the exchange of detailed customer demand and inventory information and supply chain outcomes, this argument leads to Hypothesis 2.[14]

> **HYPOTHESIS 2:** *The exchange of detailed customer demand and inventory information among supply chain partners is positively associated with future supply chain financial performance.*

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[12] Similarly, in field-based research regarding new product development activities, Cooper and Slagmulder (2004) document that buyer and supplier engineers may meet more frequently when the supplier is incurring losses from manufacturing products for the buyer.

[13] Kulp et al. (2004) assume that retailers will also benefit from information sharing, but the paper dies not test this assumption explicitly.

[14] Cachon and Fisher (2000) assume that information is always shared truthfully. However, in some circumstances, the distributor may prefer not to disclose its private information fully and truthfully. For example, information about the competitive marketplace may reveal that the distributor has an increased opportunity to sell the manufacturer's products but has instead chosen to promote competitor's products. Anticipating the manufacturer's opportunism, the distributor may be reluctant to provide information. If the distributor is contractually required to provide reports, then they may strategically misrepresent their private information.

2.2.3 Nonfinancial Performance Measures and Supply Chain Performance Evaluations

There are several reasons to believe that measures of process alignment and detailed information exchange will provide a valuable source of information in the performance evaluation and reward systems between firms. It is generally assumed in the nonfinancial performance measurement literature that nonfinancial measures, if associated with future financial performance, provide information about the alignment between an agent's (distributor's) actions and the principal's (manufacturer's) desired outcomes (Feltham and Xie 1994; Ittner et al. 2003). While prior studies find that nonfinancial measures have an important role in compensation contracts (e.g., Ittner, Larcker and Rajan 1997), existing studies do not investigate the use of nonfinancial measures in the contracting and performance evaluation process between firms.

Recent research has begun to examine a related question regarding the role of nonfinancial measures in managerial decision making. In a retail store setting, Banker and Mashruwala (2007) argue that if managers maximize expected future profits, then measures of customer satisfaction and employee satisfaction, which in their sample are leading indicators of store profitability, should be incorporated in managers' store closure decisions. Consistent with this prediction, the paper finds that managers are more likely to close a store that has lower levels of customer satisfaction and employee satisfaction, after controlling for financial performance. In a supply chain setting, by incorporating nonfinancial measures that are reflective of future performance in the performance evaluation and rewards process, supply chain partners can encourage the firms to focus on nonfinancial performance.

I examine whether supply chain managers rely on measures of process alignment and detailed information exchange in three important performance evaluations: 1) evaluating whether to continue or terminate a supply chain relationship, 2) evaluating a supply chain partner's

strategic fit within the supply chain network, and 3) evaluating a partner's orientation towards future sales growth. The preceding arguments suggest that if measures of process alignment and detailed information exchange are leading indicators of supply chain performance, then manufacturer's will include these measures in the set of information they use to evaluate performance. Hence, the likelihood of continuing the supply chain relationship and the likelihood of a supply chain partner receiving a higher performance evaluation should be positively associated with measures of process alignment and detailed information exchange. This suggests the following two hypotheses:

HYPOTHESIS 3: *Higher assessments of nonfinancial performance will increase the likelihood that the supply chain relationship will continue.*

HYPOTHESIS 4: *Higher assessments of nonfinancial performance will increase the likelihood that a supply chain partner will receive higher performance evaluations.*

2.3   RESEARCH SETTING

I test my hypotheses using data from the U.S. lubricant division of International Petroleum Corporation (IPC), a disguised name for a leading manufacturer of petroleum products. I chose this research setting because (1) manufacturer-distributor relationships are an economically important link in the supply chain, (2) the manufacturer uses identical distribution contracts of the same length with their distributors, (3) the manufacturer maintains detailed records of distributor performance, and (4) I had access to both manufacturer and distributor personnel.

The research setting extends prior literature along three important dimensions. First, because the limited prior empirical studies are largely based on survey data (e.g., Ittner et al. 1999; Kulp et al. 2004), they are a step removed from the actual performance measures collected by the firm for a specific supply chain situation.[15] My study uses actual performance measures and hence reflects a more direct measure of the relation between the measures used in practice and supply chain financial performance. Second, the study extends the unit of analysis from the performance of a manufacturer or a buyer to the performance of a manufacturer-distributor supply chain. By focusing on measures of supply chain performance, such as sales growth, productivity, and profitability, this paper provides more direct evidence concerning the literature's argument that process alignment and detailed information exchange are positively related to supply chain financial performance. Third, I can assess whether nonfinancial measures inform the performance evaluation and rewards process. Assessing whether process alignment and detailed information exchange inform performance evaluations and rewards can provide additional support for the role of nonfinancial measures in supply chain relationships.

2.3.1   Economic Environment

Major lubricant manufacturers such as IPC have increasingly relied on independent distributors to promote their products in the U.S. marketplace. While in the 1970s most manufacturers employed their own sales force to cultivate customer accounts and deliver products, this business model has changed significantly as major manufacturers began to rely on the sales and delivery

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[15] Ittner et al. (1999, 276) state that their survey data "reflect average supplier practices for the organization. A more powerful test…would entail an examination of individual supplier contracts and the selection criteria and monitoring practices" used to control supply chain partners.

capabilities of independently owned and operated distributors. By the early 2000s, over 75 percent of annual lubricant sales were made through IPC's network of independent distributors.[16] I discuss the evolution of the U.S. lubricant distribution business and describe in detail the operation of a typical lubricant distributor in Appendix A.

To support this new business model, IPC modified its performance evaluation and rewards process to emphasize perceived drivers of sales growth, productivity and profitability. IPC was dissatisfied with its distributor's response to the introduction of formula-based financial incentive plans to motivate the promotion of IPC's products. In the late 1990s, most manufacturers in this industry, including IPC, introduced volume and growth incentives consisting of a cents-per-gallon rebate. Because most distributors carry multiple competing manufacturers' products, distributors found that they could rotate lubricant volume between different manufacturers in alternating years to capitalize on competing manufacturers' rebates. In response to this behavior, most major manufacturers eventually discontinued cents-per-gallon rebates. Beginning in 2000, IPC discontinued its formula-based cents-per-gallon rebates in favor of a scorecard approach that primarily emphasizes nonfinancial performance for evaluating and rewarding its distributors.

2.3.2 Performance Measures

In 2000, IPC began to monitor a set of 14 performance measures, which track nonfinancial and financial aspects of its relationship with each distributor. IPC evaluates its distributors using this scorecard system prior to making distributor contract renewal decisions. Contract renewals were

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[16] IPC sells products (e.g., quart packages of passenger car lubricants) through retail and wholesale chains. The U.S. lubricants business is a significant part of a division that generated a large portion of IPC's 2006 profits.

awarded in 2004 and 2007 based on distributor performance from 2001-03 and 2004-06, respectively.[17] With the assistance of IPC personnel, I assigned each scorecards performance measure to either a "process alignment" dimension or to a "detailed information exchange" dimension, which are the focus of the empirical analysis.

Near the end of a distributor's three-year contract with IPC, IPC Sales Support Employees (SSEs) assess distributor performance on 13 of the 14 performance measures using a scale of one through five.[18] SSEs develop an overall measure of distributor performance based on an equal weighting of the 13 nonfinancial performance measures. According to IPC personnel, an "average" distributor should receive a score of three on a particular nonfinancial measure.

Table 1 defines the performance measures that comprise IPC's scorecard and organizes the nonfinancial measures into my measures of process alignment and detailed information exchange. The first performance measure included in the IPC scorecard is relationship profitability (IPC Gross Margin). I define *Profit* to be IPC's gross margin on the sales of lubricants to the distributor. *Profit* reflects the distributor's product mix (lubricants earn different margins). According to IPC personnel, IPC uses their gross margin to proxy for the profitability of both IPC and their distributor, because distributors do not share their financial statements with IPC.

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[17] Approximately 15 IPC Sales Support Employees (SSEs) monitor the distribution network. SSEs have an average of 10 years of experience in their role, and have worked for IPC an average of 12 years. SSEs have extensive knowledge of, and interaction with, individual distributors. Among the issues that SSEs manage is distributor's promotion of IPC products versus competitors' products. In 2003, IPC products accounted for an average of 78.5 percent of an individual distributor's total volume, ranging from a low of 10.7 percent to a high of 100 percent.
[18] Assessments are based on predetermined criteria for each nonfinancial performance measure to provide standardization across evaluators. For the 2006 assessment, IPC expanded the scale from one to five to zero to five. IPC does not share the performance measure categories or evaluations with its distributors. Instead, SSEs discuss areas of improvement with distributors.

Table 1. Definitions of Nonfinancial and Financial Performance Measures IPC uses to evaluate the U.S.

Independent Distributor Network.

	Variable name	Performance measure	Definition of exemplary performance
1	*Profit*	IPC Gross Margin	Not applicable
2	*ProcessAlign*	Develops Sales Plan	Develops annual sales plan with IPC involvement. Performs quarterly progress reviews with IPC.
3	*ProcessAlign*	Develops Strategy	Develops three-to-five year business plans with IPC involvement. Tracks relevant KPIs.
4	*ProcessAlign*	Management Involvement	Principal takes active, personal role in day-to-day management, and attends IPC-organized meetings.
5	*ProcessAlign*	Sales Management Focus	Full-time sales management dedicated to growing IPC sales and participates in IPC sales programs.
6	*ProcessAlign*	Supports IPC Marketing Strategy	Utilizes all IPC marketing programs and resources.
7	*ProcessAlign*	Average Number of Sales Staff	Adequate number of salespersons to provide growth.
8	*ProcessAlign*	Offers Total Line of IPC Lubricants	Distributes full line of IPC lubricants and participates in recommended programs.
9	*ProcessAlign*	Sales Proficiency	Well-trained sales force dedicated to growing IPC sales.
10	*ProcessAlign*	Offers Fee-Based Services	Actively manages wide range of fee-based services.
11	*ProcessAlign*	Physical Asset Sufficiency	Permanent bulk tanks that have the highest ability to preserve lubricant quality specifically for storage of IPC lubricants.
12	*ProcessAlign*	Ensures IPC Product Quality	Exceeds all IPC quality assurance guidelines with no quality-related incidents.
13	*ProcessAlign*	Repackaging Ability	State-of-the-art dedicated repackaging facility that maximizes packaging runs and maintains proper inventory mix.
14	*InfoExch*	Willingness to Share Information	Shares lawful information that furthers supply chain sales growth.

Table 1 identifies several important process alignment activities that IPC encourages their distributors to undertake. I define *ProcessAlign* as the distributor's average score across 12 performance measures from Table 1 (performance measures number 2 through 13 in Table 1): Develops Sales Plan, Develops Strategy, Management Involvement, Sales Management Focus, Supports IPC Marketing Strategy, Average Number of Sales Staff, Offers Total Line of IPC Lubricant Products, Sales Proficiency, Offers Fee-Based Services, Physical Asset Sufficiency, Ensures IPC Product Quality and Repackaging Ability. As *ProcessAlign* increases, IPC evaluates the distributor as more aligned with IPC's recommended processes. Hypothesis 1 predicts that measures of process alignment will be positively associated with future supply chain sales growth, productivity and profitability.[19]

Table 1 also identifies a measure of detailed information exchange. According to IPC personnel, distributors are an important source of information about customer demand and inventory levels. I define *InfoExch* as the distributor's score on the performance measure Willingness to Share Information (performance measure number 14 in Table 1), which reflects IPC's assessment of the level of detailed information exchanged with the distributor. Hypothesis 2 predicts that the measure of detailed information exchange will be positively associated with future supply chain sales growth, productivity and profitability.

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[19] IPC personnel state that a distributor that charges fees for its services is oriented towards sales maximization. For example, distributors may fill customer storage tanks. IPC views those distributors that charge for this service as oriented towards sales maximization. IPC prefers to contract with distributors that focus on sales maximization.

2.3.3 Distribution Contracts

IPC requires the distributor to sign a distribution contract that is subject to renewal every three years. The contract clearly states that the objective of the relationship is to maximize the sales of IPC lubricants. Perhaps surprisingly, given IPC's extensive knowledge of the distributor's task, the contract does not explicitly incorporate financial outcomes. For instance, there is no explicit role for jointly observable and contractible performance measures such as sales growth. Further, the contract does not detail any explicit bonus payments that the distributor can earn, for example, by achieving a pre-determined sales target or providing exceptional customer service. Instead, the contract takes a simple form in which the distributor either is or is not awarded another three-year contract renewal. Rather than pay an annual bonus or provide formula-based rebates, IPC uses the possibility of contract nonrenewal as the primary incentive device through which to motivate distributors to take recommended actions.[20]

The possibility of contract nonrenewal is real. IPC has reduced the size of its U.S. distributor network from 2,000 distributors in the early 1990s to fewer than 200 in 2007, and continues to optimize the distributor network. This scale of distributor reduction is not unusual in the lubricants industry. Another major manufacturer has reduced its distribution network from 1,200 distributors to 255 (Petroleum Trends 2005). Relationships lasting over 50 years have recently been nonrenewed because "such loyalty is irrelevant in today's marketplace" (Glenn 2004, 2). In addition, efforts to consolidate distribution networks is not unique to petroleum products, as Deere & Co., General Motors and Chrysler are also actively reducing the number of dealerships that sell their products (Brat and Aeppel 2007; Boudette and Valcourt 2007).

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[20] Similarly, Cooper and Slagmulder (2004) document that, for buyer-supplier relationships in the Japanese manufacturing industry, the primary incentive is continued business.

2.4 DATA AND VARIABLE DEFINITIONS

I test my hypotheses using distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply chain performance from 2001-03 and 2004-06, respectively. Information was available for 156 distributors across the 2001-03 and 2004-06 contract periods.

2.4.1 Process Alignment and Information Exchange

Hypothesis 1 predicts a positive association between the measures of process alignment and supply chain financial performance. As discussed previously, IPC evaluates the distributor's alignment with IPC's recommended processes. Using data from IPC's scorecard, I define *ProcessAlign* as the distributor's average score across 12 nonfinancial performance measures defined in Table 1 (performance measures number 2 through 13 in Table 1). As *ProcessAlign* increases, IPC views the distributor as more aligned with IPC's recommended processes. Results consistent with Hypothesis 1 would show a positive association between *ProcessAlign* and future supply chain financial performance.

Hypothesis 2 predicts a positive association between measures of detailed information exchange and supply chain financial performance. As discussed previously, I define detailed information exchange, *InfoExch*, using the distributor's score on one performance measure: Willingness to Share Information (performance measure number 14 in Table 1). IPC evaluates

the distributor's propensity to exchange detailed information as *InfoExch* increases.[21] Results

consistent with Hypothesis 2 would show a positive association between *InfoExch* and future

supply chain financial performance. I define the distributor's overall performance evaluation,

AvgScore, as the average score across all 13 nonfinancial performance measures defined in Table

1 (performance measures number 2 through 14).

2.4.2   Supply Chain Financial Performance

I define supply chain financial performance using three performance measures - sales growth,

sales productivity and relationship profitability. Kaplan and Norton (1992) encourage firms to

select nonfinancial measures that relate to enhancements in internal productivity and sales

growth because such measures will ultimately drive profitability. In this research setting, using

variables related to revenue as measures of supply chain financial performance is also consistent

with the supply chain's goal of increasing IPC product sales. For these reasons, I select sales

growth, sales productivity and relationship profitability as the key measures of supply chain

financial performance.

I define sales growth as follows. Distributors' revenue consists of high-end, middle-

range and national account lubricant volumes. High-end lubricants typically generate higher

margins compared to middle-range lubricants. National account volume is allocated to the

distributor from IPC's national sales efforts. A national account is a customer that places an

order directly with IPC (not an IPC distributor), because the customer requires lubricants to be

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[21] According to IPC documentation, a distributor who receives a low information exchange score "…shares
information reluctantly and only when asked through specific, pointed and probing questions and even then
withholds information necessary to make a mutually (IPC and distributor) fair business decision…distributor
intentionally withholds information."

delivered to multiple locations by multiple distributors.[22] In turn, IPC reimburses the distributor

a fixed fee to deliver national account orders.[23] It is important to exclude national account

volume from the distributor's sales performance because they do not exercise as much control

over these accounts compared to customer accounts cultivated directly by the distributor.

Accordingly, I define *SalesGrow* as the growth in non-national account lubricant volume during

the contract period.

Distributor sales personnel account for the majority of IPC's sales presence in the

marketplace, and IPC is concerned with sales productivity. I measure sales productivity,

SalesProd, as the natural logarithm of the number of gallons of IPC lubricants sold (in

thousands) per full-time-equivalent salesperson assigned to promote IPC products, excluding

national account volume, during the contract period. *SalesProd* increases as the distributor's

sales force sells more lubricants, holding constant the number of salespersons. *SalesProd*

measures labor efficiency and it is widely believed that increasing labor productivity is necessary

to reduce costs (Garrison, Noreen and Brewer 2006).

The third measure of supply chain financial performance measures relationship

profitability. I obtain IPC's gross margin per gallon of lubricant sold to a distributor, *Profit*,

which incorporates the mix of products sold to the distributor, which, in turn, is sold to the end

customer. If measures of process alignment and detailed information exchange are leading

indicators of financial performance, then these measures should not only enhance sales growth

and sales productivity, but these measures should also translate into higher profitability.

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[22] Most major lubricant manufacturers conduct sales efforts at the national level for large, geographically dispersed
customers (see Lubricants World (May 2003, 9) for more detail).
[23] In 2002, national account lubricant volume accounted for 35 percent of distributor volume in the U.S. market.

In summary, I examine the relationship between measures of process alignment, detailed information exchange and sales growth, sales productivity and relationship profitability using the following models:

$$SalesGrow_{t+1} = \alpha + \beta_1 ProcessAlign_t + \beta_2 InfoExch_t + \beta_3 SalesGrow_t + Controls + \varepsilon_{t+1} \quad (1)$$

$$SalesProd_{t+1} = \alpha + \beta_1 ProcessAlign_t + \beta_2 InfoExch_t + \beta_3 SalesProd_t + Controls + \varepsilon_{t+1} \quad (2)$$

$$Profit_{t+1} = \alpha + \beta_1 ProcessAlign_t + \beta_2 InfoExch_t + \beta_3 Profit_t + Controls + \varepsilon_{t+1} \quad (3)$$

The right-hand sides of equations (1), (2) and (3) represent information available at the end of year t for predicting supply chain financial performance during period $t+1$, which is the next distribution contract period. This information includes the process alignment and detailed information exchange nonfinancial performance measures, as well as past distributor financial performance. Hypotheses 1 and 2 predict a positive and significant coefficient estimate on *ProcessAlign* and *InfoExch* ($\beta_1 > 0$, $\beta_2 > 0$) in each model.

2.4.3 Distributor Contract Renewals and Performance Evaluations

I use three measures of supply chain performance evaluation and rewards. First, I collect data regarding IPC's 2007 contract renewal decision (*Renew*). There are important consequences for the manufacturer-distributor relationship when a contract is not renewed. For example, IPC may lose a significant portion of its customer base if it elects not to renew a distributor's contract. The distributor may incur significant search costs in identifying a new manufacturer to provide

the lubricants its customers require. In addition, the distributor may need to notify its creditors that the contract has been terminated.[24]

Second, I examine IPC's evaluation of a distributor's strategic fit in the distribution network. *SFit* is measured on a scale of one through five in the 2004 and 2007 performance evaluations. IPC personnel indicate that nonfinancial measures form the basis for discussing ways to redesign the distribution network. From these discussions, each distributor receives a strategic fit score that reflects IPC's view of the distributor's fit in the distribution network. The more favorable the score, the more likely IPC will be to renew the distributor's contract in the future. There are important consequences for a distributor who receives a low *SFit* score, including a potential increase in monitoring by IPC to determine whether the distributor should be replaced. Although less economically significant than the contract renewal decision, a strategic fit score is an important distributor evaluation.

The third supply chain performance evaluation I examine is IPC's evaluation of a distributor's orientation towards sales growth. *GOriented* is measured on a scale of one (zero) through five for the 2004 (2007) evaluation. IPC personnel indicate that nonfinancial measures form the basis for discussing whether a distributor is in a position to aggressively grow its lubricants business. From these discussions, each distributor receives a score that reflects IPC's view of the distributor's growth orientation. The more favorable the score, the more positive IPC views the distributor relationship. Compared to contract renewal and strategic fit evaluations, *GOriented* is the least important economically, but a low score may again trigger increased scrutiny.

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[24] While it is possible that the benefits of nonrenewal outweigh the costs of process alignment and information exchange from the distributor's perspective, distributors view nonrenewal as bad for their business and indicate that uncertainty regarding contract renewal is their top concern (Glenn 2003).

In summary, I examine the relationship between measures of process alignment, detailed information exchange and contract renewals, strategic fit evaluations and growth orientation evaluations using the following models:

$$\Pr(Renew_{t+1} = 1) = f(ProcessAlign_{t+1}, InfoExch_{t+1}, FinancialPerformance_{t+1}, Controls) \quad (4)$$

$$\Pr(SFit_{t+1} \leq k) = f(ProcessAlign_{t+1}, InfoExch_{t+1}, FinancialPerformance_{t+1}, Controls) \quad (5)$$

$$\Pr(GOriented_{t+1} \leq k) = f(ProcessAlign_{t+1}, InfoExch_{t+1}, FinancialPerformance_{t+1}, Controls) \quad (6)$$

The right-hand sides of equations (4), (5) and (6) represent information available at the end of year $t+1$ for predicting whether a distributor receives a contract renewal (*Renew*) or for predicting the cumulative probability that a distributor receives an evaluation of k, or lower, for its strategic fit in IPC's network (*SFit*) and its orientation towards future growth (*GOriented*). The information available at the end of year $t+1$ includes the process alignment and detailed information exchange nonfinancial measures, as well as current distributor financial performance (sales growth, sales productivity, and relationship profitability). Hypotheses 3 and 4 predict a positive and significant coefficient estimate on *ProcessAlign* and *InfoExch* in each model.

2.4.4 Control Variables

The distributor's financial performance depends on factors in addition to the explanatory variables *ProcessAlign* and *InfoExch*. I use a one contract period lag in the distributor's financial performance to control for its ability to successfully manage its business and to capture potential

distributor size-related effects.[25] All regressions control for the distributor's geographic location to account for potential variation in supply chain performance due to location. All results are robust to including the ratio of IPC lubricant volume to total distributor lubricant volume as a proxy for the importance of the supply chain relationship to IPC and the distributor.

2.5 EMPIRICAL RESULTS

2.5.1 Descriptive Statistics

Table 2 reports descriptive statistics of relevant variables from the pooled sample of 2004 and 2007 data. All results are reported after the removal of six observations deemed to be influential based on tests proposed by Belsley, Kuh and Welsh (1980) and Neter, Kutner, Nachtsheim and Wasserman (1996). IPC personnel indicate that an "average" distributor receives a score of three on an evaluation, which is consistent with the statistics in Table 2. The mean (median) overall assessment score for a distributor (*AvgScore*) is 3.11 (3.15), while the mean (median) process alignment score (*ProcessAlign*) is 3.03 (3.09).   The mean (median) detailed information exchange score (*InfoExch*) is 3.51 (3.50), which suggests the average supply chain relationship provides some information necessary to make mutually beneficial business decisions.

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[25] I do not have access to accurate measures of distributor size. IPC does not collect distributor financial statements. While controlling for prior distributor performance is not the same as controlling for size, it represents the best available proxy for any potential size-related effects.

Table 2. Descriptive Statistics of variables from the pooled sample of 2004 and 2007 data.

I use distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply chain performance from 2001-03 and 2004-06, respectively. *AvgScore* is the average score across performance measures number 2 through 14 in Table 1. *ProcessAlign* is the distributor's average score across performance measures number 2 through 13 in Table 1. *InfoExch* is the distributor's score on performance measure number 14 in Table 1. *SalesGrow* is the growth in non-national account lubricant volume during the contract period. *SalesProd* is the natural logarithm of the number of gallons of IPC lubricants sold (in thousands) per full-time-equivalent salesperson assigned to promote IPC products, excluding national account volume, during the contract period. *Profit* is IPC's gross margin per gallon of lubricant sold to a distributor. *Renew* is an indicator that equals one when IPC decides to renew the distributor's contract, and zero otherwise. *SFit* is IPC's evaluation of a distributor's strategic fit in the distribution network. *GOriented* is IPC's evaluation of a distributor's orientation towards sales growth. *SalesAlign* is the distributor's average score across performance measures number 2 through 10 in Table 1. *OpsAlign* is the distributor's average score across the performance measures number 11 through 13 from Table 1. *AvgScore, ProcessAlign, InfoExch, SFit, GOriented, SalesAlign* and *OpsAlign* are scores based on a scale of one (zero) through five in the 2004 (2007) performance evaluations.

	Mean	Standard Deviation	First Quartile	Median	Third Quartile
AvgScore	3.11	0.83	2.60	3.15	3.69
ProcessAlign	3.03	0.87	2.47	3.09	3.67
InfoExch	3.51	0.93	3.00	3.50	4.00
SalesGrow	0.04	0.24	-0.09	0.02	0.14
SalesProd	5.60	0.82	5.12	5.68	6.13
Profit ($/gallon)	1.99	0.55	1.66	1.96	2.29
Renew	0.82	0.38	-	-	-
SFit	3.04	1.20	2.00	3.00	4.00
GOriented	2.69	1.29	2.00	3.00	4.00
SalesAlign	2.88	0.96	2.14	2.88	3.62
OpsAlign	3.41	0.89	3.00	3.61	4.00

Table 2 also shows that the measures of supply chain financial performance exhibit significant variation during the sample period. Distributor sales growth (*SalesGrow*) has an inter-quartile range between -9 percent to +14 percent, while distributor sales productivity (*SalesProd*), defined as the natural log of the number of gallons of lubricant sold per dedicated full-time equivalent salesperson, ranges from 5.12 to 6.13 (from 170,000 gallons to 460,000 gallons of lubricants sold per salesperson, respectively). Relationship profitability (*Profit*) has an inter-quartile range from $1.66 per gallon to $2.29 per gallon sold. This evidence suggests that there is significant variation in the financial performance of IPC's distributors.

Table 2 also reports descriptive statistics regarding supply chain performance evaluations. IPC did not renew 18 percent of its distributors (1 - *Renew*) for an additional three-year contract in the sample period. This significant nonrenewal rate reflects the economic importance of the contract renewal decision for IPC and the distributor. Hence, it is an important component of supply chain incentives. The rate of contract nonrenewal is similar to publicly-reported nonrenewal rates in this industry (Petroleum Trends 2005). *SFit* and *GOriented* also exhibit significant variation during the sample period, with first (third) quartiles of 2.00 (4.00) for each performance evaluation, which suggests that these evaluations have variations that may be related to distributor performance.

Panel A of Table 3 presents correlations between variables included in the empirical analysis. These correlations are based on the pooled sample of 2004 and 2007 data. Consistent with Hypothesis 1, Panel A reports that *ProcessAlign* is positively correlated (based on Pearson correlations) with supply chain sales growth (*SalesGrow*, $\rho = 0.20$, $p < 0.001$), sales productivity, (*SalesProd*, $\rho = 0.32$, $p < 0.001$) and relationship profitability (*Profit*, $\rho = 0.22$, $p < 0.001$). This evidence suggests that the productivity gains from process alignment may enable the supply chain to offer lower prices in the marketplace, thereby enhancing sales growth. In addition, the supply chain is able to retain some of the productivity benefits, thereby enhancing profitability. This evidence suggests that measures of process alignment are associated with supply chain financial performance, which is consistent with Hypothesis 1.

Table 3. Pearson and Spearman Correlations of variables from the pooled sample of 2004 and 2007 data.

Panel A presents correlations among the pooled sample of observations. Pearson (Spearman) correlation coefficients are presented in the lower (upper) triangle. I use distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply chain performance from 2001-03 and 2004-06, respectively. *ProcessAlign* is the distributor's average score across performance measures number 2 through 13 in Table 1. *InfoExch* is the distributor's score on performance measure

number 14 in Table 1. *SalesGrow* is the growth in non-national account lubricant volume during the contract period. *SalesProd* is the natural logarithm of the number of gallons of IPC lubricants sold (in thousands) per full-time-equivalent salesperson assigned to promote IPC products, excluding national account volume, during the contract period. *Profit* is IPC's gross margin per gallon of lubricant sold to a distributor. *Renew* is an indicator that equals one when IPC decides to renew the distributor's contract, and zero otherwise. *SFit* is IPC's evaluation of a distributor's strategic fit in the distribution network. *GOriented* is IPC's evaluation of a distributor's orientation towards sales growth. *AvgScore, ProcessAlign, InfoExch, SFit, GOriented, SalesAlign* and *OpsAlign* are scores based on a scale of one (zero) through five in the 2004 (2007) performance evaluations.

Panel B presents correlations among the 2004 and 2007 sample. *AvgScore04* and *AvgScore07* are the distributor's average scores across performance measures number 2 through 14 in Table 1 for the 2004 and 2007 performance evaluations. *ProcessAlign04* and *ProcessAlign07* are the distributor's average scores across performance measures number 2 through 13 in Table 1 for the 2004 and 2007 performance evaluations. *InfoExch04* and *InfoExch07* are the distributor's score across on performance measure number 13 in Table 1 for the 2004 and 2007 performance evaluations.

Panel A	*ProcessAlign*	*InfoExch*	*SalesGrow*	*SalesProd*	*Profit*	*Renew*	*SFit*	*GOriented*
ProcessAlign	**1.00**	0.62	0.25	0.28	0.21	0.34	0.58	0.66
InfoExch	0.64	**1.00**	0.12**	0.15	-0.17	0.19	0.34	0.42
SalesGrow	0.20	0.05^{NS}	**1.00**	0.20	-0.17	0.19	0.16	0.49
SalesProd	0.32	0.15	0.18	**1.00**	-0.23	0.11**	0.30	0.23
Profit	0.22	-0.17	-0.18	-0.25	**1.00**	-0.09^{NS}	-0.23	-0.22
Renew	0.33	0.21	0.17	0.13	-0.07^{NS}	**1.00**	0.34	0.37
SFit	0.55	0.32	0.09*	0.25	-0.22	0.33	**1.00**	0.43
GOriented	0.66	0.44	0.37	0.23	-0.24	0.37	0.42	**1.00**

Panel B	*AvgScore07*	*ProcessAlign07*	*InfoExch07*
AvgScore04	0.70	-	-
ProcessAlign04	-	0.72	-
InfoExch04	-	-	0.27

*, ** Indicates correlation is significant at 10 percent, 5 percent level, respectively. NS indicates correlation coefficient is not significantly different from zero at the 10 percent level. All unmarked correlations are significantly different from zero at the 1 percent level.

Hypothesis 2 predicts a positive association between detailed information exchange and measures of supply chain financial performance. However, Panel A of Table 3 reports that *InfoExch* is not consistently related to supply chain financial performance. In particular, *InfoExch* is not associated (based on Pearson correlations) with sales growth (*SalesGrow*, $\rho =$ 0.05, p < 0.29). Consistent with the predictions that detailed information exchange is associated with lower supply chain costs (i.e. Cachon and Fisher 2000), *InfoExch* is positively associated

with sales productivity (*SalesProd*, $\rho = 0.15$, $p < 0.001$). Perhaps surprisingly, *InfoExch* is inversely associated with relationship profitability (*Profits*, $\rho = -0.17$, $p < 0.001$). Taken together, this evidence suggests that the productivity gains from detailed information exchange do not necessarily enhance sales growth or profitability, which is consistent with prior studies (Ittner et al. 1999, Kulp et al. 2004).

Hypotheses 3 and 4 predict a positive association between *ProcessAlign*, *InfoExch* and supply chain performance evaluations. Consistent with these predictions, Panel A of Table 3 reports that *ProcessAlign* and *InfoExch* are positively correlated with (1) the contract renewal evaluation (*Renew*, $\rho = 0.33$, $p < 0.001$), (2) the strategic fit evaluation (*SFit*, $\rho = 0.55$, $p < 0.001$), and (3) the growth orientation evaluation (*GOriented*, $\rho = 0.66$, $p < 0.001$). This evidence is consistent with nonfinancial measures having an important role in the performance evaluation and rewards process between firms.

Panel B of Table 3 reports correlations across the 2001-03 and 2004-06 evaluation periods to examine the variation of nonfinancial measures. *AvgScore*, *ProcessAlign* and *InfoExch* are positively correlated between the assessment periods ($\rho = 0.70$, $p < 0.001$, $\rho = 0.72$, $p < 0.001$ and $\rho = 0.27$, $p < 0.001$, respectively). The pattern of correlations suggests that measures of process alignment are somewhat persistent across time, while detailed information exchange has some inter-temporal variation.

2.5.2 Nonfinancial Performance Measures and Supply Chain Financial Performance

Prior to testing Hypotheses 1 and 2, I examine the results of *AvgScore* to assess model specification. I expect that the distributor's overall score will be positively associated with

future financial performance, because distributors that achieve a higher overall score are those that achieve higher measures of process alignment and detailed information exchange. Consistent with this intuition, Columns 1, 2 and 3 of Table 4, Panel A report that *AvgScore04*, defined as the distributor's overall evaluation based on 2001-03 performance, is positively associated with measures of future supply chain financial performance, *SalesGrow07*, *SalesProd07*, and *Profit07*, measured during the 2004-06 contract period. As expected, past financial performance is positively associated with future financial performance in each model, which indicates persistence in financial performance across contract periods.

Table 4. Ordinary Least Squares Regressions Examining the Relationship between Past Process Alignment and Information Exchange and Future Supply Chain Financial Performance after controlling for Past Financial Performance.

Panel A presents OLS regressions which investigate the relationship between *AvgScore* and measures of supply chain future financial performance. I use distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply chain performance from 2001-03 and 2004-06, respectively. *AvgScore04* is the distributor's average scores across performance measures number 2 through 14 in Table 1 for the 2004 performance evaluation. *Past Dep. Variable (2004)* is the past dependent variable from the 2004 performance evaluation. *Geographic Control* is an indicator that equals one when the distributor is located in the eastern half of the U.S., and zero otherwise. *SalesGrow07* is the growth in non-national account lubricant volume during the 2004-06 contract period. *SalesProd07* is the natural logarithm of the number of gallons of IPC lubricants sold (in thousands) per full-time-equivalent salesperson assigned to promote IPC products, excluding national account volume, during the 2004-06 contract period. *Profit07* is IPC's gross margin per gallon of lubricant sold to a distributor during the 2004-06 contract period. *AvgScore, ProcessAlign* and *InfoExch* are scores based on a scale of one (zero) through five in the 2004 (2007) performance evaluations. T-statistics (two-tailed) are presented in parenthesis.

Panel B presents OLS regressions which investigate the relationship between *ProcessAlign, InfoExch* and measures of supply chain future financial performance. *ProcessAlign04* is the distributor's average score across performance measures number 2 through 13 in Table 1 during the 2001-03 contract period. *InfoExch04* is the distributor's score on performance measure number 14 in Table 1 during the 2001-03 contract period. *SalesGrow07* is the growth in non-national account lubricant volume during the 2004-06 contract period. *SalesProd07* is the natural logarithm of the number of gallons of IPC lubricants sold (in thousands) per full-time-equivalent salesperson assigned to promote IPC products, excluding national account volume, during the 2004-06 contract period. *Profit07* is IPC's gross margin per gallon of lubricant sold to a distributor during the 2004-06 contract period. *ProcessAlign04* and *InfoExch04* are scores based on a scale of one (zero) through five in the 2004 (2007) performance evaluations. T-statistics (two-tailed) are presented in parenthesis.

	(1)	(2)	(3)
Panel A: Scorecard Average	*SalesGrow07*	*SalesProd07*	*Profit07*
Intercept	-0.333 ***	1.466 ***	0.405 *
	(-2.96)	(3.78)	(1.79)
AvgScore04	0.010 ***	0.261 ***	0.343 ***
	(3.20)	(3.56)	(4.91)
Past Dep. Variable (2004)	0.085 **	0.512 ***	0.779 ***
	(2.21)	(7.36)	(19.76)
Georgraphic Control	Y	Y	Y
F-stat	6.70 ***	28.31 ***	310.15 ***
Adj. R-sqr	0.10	0.36	0.86
n	156	156	152
Panel B: Scorecard Measures	*SalesGrow07*	*SalesProd07*	*Profit07*
Intercept	-0.355 ***	0.984 **	0.760 ***
	(-2.83)	(2.30)	(2.97)
ProcessAlign04	0.084 ***	0.149 **	0.419 ***
	(2.60)	(2.06)	(5.78)
InfoExch04	0.021	0.170 ***	-0.089 *
	(0.78)	(2.83)	(-1.90)
Past Dep. Variable (2004)	0.084 **	0.552 ***	0.745 ***
	(2.18)	(7.80)	(18.48)
Georgraphic Control	Y	Y	Y
F-stat	5.00 ***	23.65 ***	245.96 ***
Adj. R-sqr	0.10	0.37	0.86
n	156	156	152

***, **, * Indicates significance at the 1 percent, 5 percent, 10 percent (two-tailed), respectively.

Table 4, Panel B reports results from estimating equations (1), (2) and (3) using measures of future supply chain financial performance (*SalesGrow07, SalesProd07, Profit07*) as dependent variables. As previously discussed, evidence supporting Hypothesis 1 would show a positive and significant coefficient on past measures of process alignment (*ProcessAlign04*), in regressions with measures of future supply chain financial performance as the dependent variable. Consistent with Hypothesis 1, the results in Panel B indicate that measures of process alignment are positively associated with future measures of sales growth ($\beta = 0.084$, $p < 0.01$),

sales productivity (β = 0.149, p < 0.01) and relationship profitability (β = 0.419, p < 0.01). These results are also economically significant. For example, using the coefficient estimates from Column 1 of Panel B (Column 3 of Panel B), moving from the first quartile of process alignment to the third quartile increases future sales growth (relationship profitability) by 5.4 percent (17.8 percent). These results indicate that nonfinancial performance measures are leading indicators of supply chain financial performance, after controlling for past performance.

Table 4, Panel B also reports results for Hypothesis 2. As previously discussed, evidence supporting this hypothesis would show a positive and significant coefficient on past measures of detailed information exchange (*InfoExch04*), in regressions with measures of future supply chain financial performance as the dependent variable. The results in Panel B indicate that *InfoExch* is not consistently associated with future supply chain financial performance.

In particular, the results in Table 4, Panel B suggest that *InfoExch* is not associated with future measures of sales growth (β = 0.021, p = 0.44). This suggests detailed information exchange about customer relationships and inventory levels does not readily translate into the identification of new sales opportunities. Column 2 of Table 4, Panel B indicates that *InfoExch* is positively associated with future measures of sales productivity (β = 0.170, p < 0.01). This result indicates that detailed information exchange is associated with selling more lubricants per salesperson, thereby enhancing sales productivity.

Despite an enhancement in sales productivity, Column 3 of Panel B, Table 4 indicates that *InfoExch* has a (moderately) negative association with relationship profitability (β = -0.089, p < 0.10). While contrary to Hypothesis 2, this evidence is consistent with prior literature. For example, Ittner et al. (1999) find that increased meeting frequency between buyers and suppliers (a potential proxy for detailed information exchange) is associated with lower return on assets,

contrary to their predictions. Ittner et al. (1999) argue that struggling firms may be more likely to exchange information to a greater extent in an effort to improve performance. While my evidence is consistent with studies that suggest detailed information exchange is associated with lower supply chain costs (i.e., higher sales productivity), the results also suggest that these productivity gains do not enhance measures of sales growth or relationship profitability.

In summary, the results in Table 4 indicate that nonfinancial performance measures are leading indicators of supply chain sales growth, sales productivity and relationship profitability. In particular, measures of process alignment are consistently related to future performance. However, detailed information exchange is positively associated with supply chain productivity, but not with measures of sales growth. In addition, detailed information exchange is inversely associated with relationship profitability, which suggests less profitable supply chain partners may have a propensity to exchange detailed information. This pattern of results suggests that, while detailed information exchange may benefit supply chain productivity, these productivity gains (unlike the gains from process alignment) do not enhance future sales growth and profitability. Collectively, the results indicate that nonfinancial measures, particularly measures of process alignment, have an important role in supply chain management control systems.

2.5.3 Nonfinancial Performance Measures and Contract Renewals

As previously discussed, Hypothesis 3 predicts that higher assessments of process alignment and detailed information exchange will increase the likelihood that a supply chain partner's contract will be renewed. Table 5 presents results from estimating equation (4), which examines the likelihood of contract renewal (*Renew07*) based on measures of process alignment, detailed information exchange and several measures of supply chain financial performance. Evidence

supporting Hypothesis 3 would show a positive and significant coefficient on *ProcessAlign07*

and *InfoExch07*.

Table 5. Logistic Regressions Examining the Relationship between Process Alignment, Information Exchange and

Supply Chain Contract Renewals in 2007**.**

The table presents logistic regressions which examine the relationship between contemporaneous measures of *ProcessAlign*, *InfoExch* and supply chain contract renewals in 2007. I use distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply chain performance from 2001-03 and 2004-06, respectively. *ProcessAlign07* is the distributor's average score across performance measures number 2 through 13 in Table 1 during the 2004-06 contract period. *ProcessChange* is the change in the distributor's average score across performance measures number 2 through 13 in Table 1 between the 2001-03 and the 2004-06 contract periods. *InfoExch07* is the distributor's score on performance measure number 14 in Table 1 during the 2004-06 contract period. *InfoExchChange* is the change in the distributor's average score on performance measure number 14 in Table 1 between the 2001-03 and the 2004-06 contract periods. *SalesGrow07* is the growth in non-national account lubricant volume during the 2004-06 contract period. *SalesProd07* is the natural logarithm of the number of gallons of IPC lubricants sold (in thousands) per full-time-equivalent salesperson assigned to promote IPC products, excluding national account volume, during the 2004-06 contract period. *Profit07* is IPC's gross margin per gallon of lubricant sold to a distributor during the 2004-06 contract period. *SFit04* is IPC's 2004 evaluation of a distributor's strategic fit in the distribution network. *%IPCVolume* is the percentage of the distributor's overall lubricant volume that is IPC products. *Geographic Control* is an indicator that equals one when the distributor is located in the eastern half of the U.S., and zero otherwise. *Renew07* is an indicator that equals one when IPC decides to renew the distributor's contract in 2007, and zero otherwise. Wald χ^2-statistics are presented in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Renew07	Renew07	Renew07	Renew07	Renew07	Renew07	Renew07
Intercept	1.963 ***	-0.158	-3.605 **	-4.327 ***	-3.165	-2.092	-2.563
	(49.51)	(0.03)	(4.94)	(6.58)	(2.45)	(0.97)	(1.40)
ProcessAlign07		0.746 **		0.802 **		1.125 **	
		(5.99)		(5.99)		(4.93)	
ProcessChange							1.486 ***
							(8.34)
InfoExch07		0.038		0.060		-0.183	
		(0.04)		(0.08)		(0.61)	
InfoExchChange							-0.148
							(0.44)
SalesGrow07	4.146 ***	2.926 **			2.797 **	2.305 *	2.344 *
	(12.96)	(5.68)			(5.22)	(3.44)	(3.66)
SalesProd07			1.116 ***	0.778 **			
			(10.12)	(4.86)			
Profit07					0.455 **	0.084	0.434 *
					(4.35)	(0.07)	(3.31)
SFit04					0.078	0.113	0.077
					(0.18)	(0.35)	(0.16)
%IPCVolume					2.101 **	2.404 **	3.005 ***
					(5.09)	(5.66)	(7.71)
Geographic Control	Y	Y	Y	Y	Y	Y	Y
Likelihood Ratio	18.53 ***	26.11 ***	12.94 ***	20.69 ***	23.10 ***	28.57 ***	34.56 ***
Pseudo-R sqr	0.19	0.26	0.14	0.22	0.23	0.28	0.34
n	156	156	156	156	156	156	156

***, **, * Indicates significance at the 1 percent, 5 percent, 10 percent (two-tailed), respectively.

Columns 2, 4 and 6 of Table 5 examine the emphasis placed on nonfinancial performance measures in the contract renewal evaluation, after controlling for current supply chain financial performance. Consistent with Hypothesis 3, the results indicate that higher measures of process alignment increase the likelihood that a distributor will have their contract renewed for an additional three-year period ($p < 0.05$ in each model). Including *ProcessAlign* as an independent variable in the logistic regressions improves the explanatory power of the models. For example, comparing Column 5 (excludes *ProcessAlign*) with Column 6 (includes *ProcessAlign*) indicates

that *ProcessAlign* increases pseudo-R squareds from 0.23 to 0.28. The importance of this nonfinancial performance measure in the contract renewal evaluation is consistent with results presented in subsection 2.4.2, which indicated that *ProcessAlign* is significantly associated with measures of future supply chain financial performance.

Columns 2, 4 and 6 of Table 5 also examine the use of detailed information exchange in the contract renewal evaluation. The results indicate that higher measures of detailed information exchange are not related to the likelihood that a distributor will have their contract renewed for an additional three-year period. While this result is inconsistent with Hypothesis 3, the result is consistent with evidence presented in subsection 2.4.2, which indicated that *InfoExch* is not consistently associated with measures of future supply chain financial performance. Collectively, the evidence in Columns 2, 4 and 6 of Table 5 indicates that nonfinancial performance measures, particularly measures of process alignment, are an important input into the supply chain performance evaluation and rewards process.

Table 5 also investigates the association between various measures of financial performance and the contract renewal evaluation. Interestingly, Column 5 reports statistically significant coefficients on sales growth (*SalesGrow07*), relationship profitability (*Profit07*), and the percentage of a distributor's lubricant volume comprised of IPC lubricants (*%IPCVolume*). This evidence suggests that supply chain relationships which experience sales growth, that are more profitable and distributors that rely more on IPC lubricants are more likely to have their contracts renewed.[26] While these relationships appear reasonable, these measures of financial performance are not explicitly incorporated in the supply chain performance measurement process (see Table 1 for the measures included in the performance measurement process).

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[26] Replacing *%IPCVolume* with an indicator variable that equals one if a distributor sells only IPC lubricants provides statistically consistent results.

Consistent with prior literature (e.g., Ittner, Larcker and Meyer 2003), this evidence indicates that the manufacturer includes factors outside of the performance measurement process in the supply chain performance evaluation and rewards process.

2.5.4 Nonfinancial Performance Measures and Performance Evaluations

As previously discussed, Hypothesis 4 predicts that higher assessments of process alignment and detailed information exchange will increase the likelihood that a supply chain partner will receive higher performance evaluations. Table 6 presents results from estimating equations (5) and (6), which examines the likelihood of receiving higher strategic fit (*SFit*) and growth orientation (*GOriented*) performance evaluations based on measures of process alignment, detailed information exchange and several measures of supply chain financial performance. Evidence supporting Hypothesis 4 would show a positive and significant coefficient on *ProcessAlign07* and *InfoExch07*.

Table 6. Ordered Logit Regressions Examining the Relationship between Process Alignment, Information Exchange and Performance Evaluations in 2007**.**

The table presents ordered logistic regressions which examine the relationship between contemporaneous measures of *ProcessAlign*, *InfoExch* and supply chain performance evaluations in 2007. I use distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply chain performance from 2001-03 and 2004-06, respectively. *ProcessAlign07* is the distributor's average score across performance measures number 2 through 13 in Table 1 during the 2004-06 contract period. *ProcessChange* is the change in the distributor's average score across performance measures number 2 through 13 in Table 1 between the 2001-03 and the 2004-06 contract periods. *InfoExch07* is the distributor's score on performance measure number 14 in Table 1 during the 2004-06 contract period. *InfoExchChange* is the change in the distributor's average score on performance measure number 14 in Table 1 between the 2001-03 and the 2004-06 contract periods. *SalesGrow07* is the growth in non-national account lubricant volume during the 2004-06 contract period. *SFit04* is IPC's 2004 evaluation of a distributor's strategic fit in the distribution network. *GOriented04* is IPC's 2004 evaluation of a distributor's orientation towards sales growth. *%IPCVolume* is the percentage of the distributor's overall lubricant volume that is IPC products. *Geographic Control* is an indicator that equals one when the distributor is located in the eastern half of the U.S., and zero otherwise. *SFit07* is IPC's 2007 evaluation of a distributor's strategic fit in the distribution network.

GOriented07 is IPC's 2007 evaluation of a distributor's orientation towards sales growth. Wald χ^2-statistics are presented in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)
	SFit07	*SFit07*	*SFit07*	*GOriented07*	*GOriented07*	*GOriented07*
ProcessAlign07		1.409 ***			1.300 ***	
		(70.40)			(75.31)	
ProcessChange			0.513 ***			0.651 ***
			(10.59)			(18.66)
InfoExch07		-0.212 **			0.202 **	
		(5.08)			(5.25)	
InfoExchChange			0.010			0.132 *
			(0.01)			(2.69)
SalesGrow07	0.673 *	-0.277	0.463	1.748 ***	1.478 ***	1.671 ***
	(3.73)	(0.67)	(1.82)	(22.74)	(15.52)	(20.81)
SFit04	0.157 **	0.053	0.139 **			
	(5.74)	(0.49)	(4.05)			
GOriented04				-0.077	-0.056	-0.030
				(1.30)	(0.61)	(0.19)
%IPCVolume	-0.377	0.108	-0.316	-0.226	-0.132	-0.162
	(0.97)	(0.06)	(0.66)	(0.40)	(0.11)	(0.20)
Geographic Control	Y	Y	Y	Y	Y	Y
Likelihood Ratio	12.79 ***	106.25 ***	28.37 ***	39.13 ***	163.07 ***	78.51 ***
Pseudo-R sqr	0.29	0.55	0.19	0.23	0.68	0.41
n	156	156	156	156	156	156

***, **, * Indicates significance at the 1 percent, 5 percent, 10 percent (two-tailed), respectively.

Columns 2 and 5 of Table 6 examine the use of nonfinancial performance measures in the manufacturer's performance evaluations, after controlling for measures of supply chain financial performance. Consistent with Hypothesis 4, the results indicate that higher measures of process alignment increase the likelihood that a distributor will receive a higher strategic fit and growth orientation evaluation. Columns 3 and 6, which include changes in measures of process alignment between the two contract periods, indicate that *ProcessChange* is positively associated with both *SFit* and *GOriented* evaluations. The importance of this nonfinancial performance

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measure in the performance evaluation process is consistent with results presented in subsection 2.4.2, which indicated that *ProcessAlign* is significantly associated with measures of future supply chain financial performance.

Column 5 of Table 6 also reports that that higher measures of detailed information exchange increases the likelihood of that a distributor will receive a higher growth orientation evaluation. In contrast to the positive relationship between *InfoExch* and *GOriented*, Column 2 evidence suggests that higher measures of detailed information exchange is associated with a lower strategic fit evaluation. Column 3, which includes changes in measures of detailed information exchange (*InfoExchChange*), indicates that the information exchange results weaken.

Table 5 evidence suggested that measures outside of the performance measurement process were used in the contract renewal evaluation. Similarly, Columns 1 and 4 of Table 6 indicate that measures of financial performance, in particular sales growth (*SalesGrow07*), are significantly associated with the strategic fit and growth orientation performance evaluations. This evidence suggests that despite a focus on nonfinancial performance measures in the performance measurement process, the manufacturer incorporates aspects of financial performance in the performance evaluation process.

In summary, the results in Tables 5 and 6 indicate that the information contained in nonfinancial performance measures is emphasized in the supply chain performance evaluation and rewards process. In particular, measures of process alignment are consistently related to three important supply chain performance evaluations – contract renewals, strategic fit and growth orientation. However, detailed information exchange is not associated with the contract renewal evaluation, which is the most economically important evaluation in my research setting.

In addition, detailed information exchange is inversely associated with the strategic fit evaluation and positively associated with the growth orientation evaluation. This pattern of results suggests that detailed information exchange does not enter the performance evaluation and rewards process in a consistent manner. Because detailed information exchange is also not consistently related to future measures of supply chain financial performance, such as sales growth and profitability, the manufacturer may not rely on this nonfinancial measure in the contract renewal evaluation. Collectively, the results indicate that nonfinancial measures, particularly measures of process alignment, have an important role in the supply chain performance evaluation and rewards process.

2.5.5   Explanatory Power of Nonfinancial Measures

I extend prior literature by examining whether the relative importance of the same set of performance measures changes as the economic impact of the performance evaluation also changes. In my research setting, measures of process alignment and detailed information exchange are qualitative, nonfinancial measures that are thought to be internal drivers of supply chain performance. In contrast, sales growth, sales productivity and relationship profitability are quantitative, financial measures that are performance outcomes. While there is an extensive literature in economics and psychology that investigates the relative weighting of performance measures in compensation contracts (e.g., see literature review in Ittner et al. 2003), few studies examine the importance of nonfinancial performance measures in non-compensation related performance evaluations and rewards. In this subsection, I examine the incremental contribution of nonfinancial performance measures in the performance evaluation and rewards process.

Table 5 investigates the manufacturer's contract renewal evaluation, which is the most economically important evaluation based on measures of process alignment and detailed information exchange. Incorporating these nonfinancial measures into the regressions increases the pseudo-r squared from 0.23 (Column 5 of Table 5) to 0.28 (Column 6 of Table 5). This result suggests that financial measures provide relatively more explanatory power compared to nonfinancial measures in the contract renewal evaluation.

Table 6 also examines the relative explanatory power of financial and nonfinancial performance measures in the performance evaluation and rewards process. Comparing Column 1 (excludes *ProcessAlign* and *InfoExch*) with Column 2 (includes these variables) of Table 6 indicates that the addition of nonfinancial measures to the regressions increases the pseudo r-squared from 0.29 to 0.55. Similarly, comparing Column 4 (excludes *ProcessAlign* and *InfoExch*) with Column 5 (includes these variables) of Table 6 indicates that the addition of nonfinancial measures to the regressions increases the pseudo r-squared from 0.23 to 0.68. The magnitude of r-squared improvement in both *SFit* and *GOriented* models suggests that nonfinancial measures provide relatively more explanatory power compared to financial measures in the performance evaluation and rewards process. Interestingly, these results are *opposite* of those reported for contract renewals. Because financial measures have relatively more explanatory power in contract renewals, it appears that nonfinancial measures receive relatively less emphasis as the economic importance of the evaluation increases. That is, the manufacturer relies more on measures of financial performance (e.g., sales growth) rather than nonfinancial performance as the economic importance of the evaluation increases.

One potential interpretation for this pattern of results may be attributed to the control of each evaluation. The contract renewal evaluation requires IPC Lubricant Division management

team approval, whereas the strategic fit and growth orientation evaluations are controlled by IPC Sales Support Employees (SSEs). IPC SSEs often have long relationships with the distributors that they monitor, which may give SSEs the incentive to influence contract renewal evaluations by adjusting the nonfinancial performance of certain distributors. To the extent that financial measures are less subject to this influence, financial measures may become relatively more important as the economic impact of the evaluation increases. Because financial performance is more objective and quantifiable, whereas nonfinancial performance measures are less so, financial performance may become increasingly important as the economic impact of the resulting evaluation also increases. To my knowledge, no systematic study investigates how the relative importance of the same set of performance measures may change as the economic impact of the performance evaluation also changes.[27]

2.6   ADDITIONAL ANALYSIS

2.6.1   Exclusivity as a Moderating Variable in Performance Evaluations

Supply chain settings are different from intra-firm settings in important ways, including how one partner may interact with multiple competing supply chain participants. For example, as discussed previously, a distributor typically stocks and promotes competing manufacturers' products. This diversification changes a distributor's reliance on one particular manufacturer. In

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[27] Schiff and Hoffman (1996) provide some evidence consistent with the argument that influence activities may play a role in the relative importance of performance measures in evaluation and reward systems. The authors find that executives tend to emphasize financial information when evaluating business unit performance, whereas they tend to emphasize nonfinancial information when evaluating managers' performance.

this subsection, I assess whether exclusivity of the supply chain relationship has a moderating influence on the supply chain performance evaluation and rewards process.

Exclusive distributors may be held to higher standards by a manufacturer. For example, the customer can more easily distinguish an exclusive distributor as a manufacturer's representative, rather than a general wholesale distributor. This may motivate a manufacturer to more closely monitor exclusive distributor performance, which suggests that performance evaluations for an exclusive distributor would be more sensitive to measures of process alignment and detailed information exchange. Alternatively, in this research setting, IPC prefers to have exclusive distributors throughout the distribution network. Distributors that only promote IPC products may benefit from their exclusivity in the performance evaluation process. Exclusive status may motivate IPC to de-emphasize financial and nonfinancial performance measures, and instead curry favor to an exclusive distributor as a reward for their exclusivity and to persuade the distributor from promoting competitor's products. In addition, the factors that lead to exclusivity (e.g., distributor loyalty) may well cause the distributor to receive good evaluations from the manufacturer. This reasoning suggests that performance evaluations for an exclusive distributor would be less sensitive to measures of process alignment and detailed information exchange.

Table 7 reports results on whether exclusivity moderates the role of performance measures in supply chain performance evaluations. To assess the sensitivity of exclusive distributor's performance evaluations to measures of nonfinancial and financial performance, I interact *ProcessAlign*, *InfoExch* and *SalesGrow* with an indicator variable, *AllIPC*, which equals one when the distributor sells IPC products exclusively (100 percent of the distributor's lubricant sales are IPC products), and zero otherwise. Consistent with prior results reported in Column 2

of Table 6 (these results are repeated in Column 1 of Table 7), Column 2 of Table 7 reports that *ProcessAlign07* is positively associated with the strategic fit (*SFit07*) performance evaluation (p < 0.01). In addition, Column 2 of Table 7 reports that *InfoExch07* is negatively associated with the strategic fit (*SFit07*) performance evaluation (p < 0.01).

Interestingly, the evidence in Column 2 of Table 7 suggests that an exclusive distributor's strategic fit performance evaluation is *less* sensitive to measures of process alignment (*ProcessAlign07AllIPC*, β = -0.735, p < 0.01). This result indicates that exclusive distributors benefit from their status in the performance evaluation process by receiving higher strategic fit evaluations with lower measures of process alignment. In addition, the evidence in Column 2 of Table 7 suggests that an exclusive distributor's strategic fit performance evaluation is *more* sensitive to measures of detailed information exchange (*InfoExch07AllIPC*, β = 0.338, p < 0.08). While it appears that an exclusive distributor may benefit from their status by receiving higher strategic fit performance evaluations despite lower measures of process alignment, IPC places more emphasis on detailed information exchange. This suggests that IPC may view non-exclusive distributors as both sources of information about the competitive marketplace and sources of information leakage to industry competitors. IPC may prefer to exchange detailed information with exclusive distributors who potentially have less opportunity to leak information to the competition.

Table 7. Ordered Logit Regressions Examining the Relationship between Process Alignment, Information Exchange and Performance Evaluations Moderated by Supply Chain Partner Exclusivity.

The table presents ordered logistic regressions which examine the relationship between contemporaneous measures of *ProcessAlign*, *InfoExch* and supply chain performance evaluations in 2007. I use distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply chain performance from 2001-03 and 2004-06, respectively. *AllIPC* is an indicator that equals one when 100 percent of a distributor's lubricant sales are IPC products, and zero otherwise.

ProcessAlign07 is the distributor's average score across performance measures number 2 through 13 in Table 1 during the 2004-06 contract period. *ProcessAlign07*ALLIPC* is the interaction between *ProcessAlign07* and *ALLIPC*. *InfoExch07* is the distributor's score on performance measure number 14 in Table 1 during the 2004-06 contract period. *InfoExch07*ALLIPC* is the interaction between *InfoExch07* and *ALLIPC*. *SalesGrow07* is the growth in non-national account lubricant volume during the 2004-06 contract period. *SalesGrow07*ALLIPC* is the interaction between *SalesGrow07* and *ALLIPC*. *SFit04* is IPC's 2004 evaluation of a distributor's strategic fit in the distribution network. *GOriented04* is IPC's 2004 evaluation of a distributor's orientation towards sales growth. *Geographic Control* is an indicator that equals one when the distributor is located in the eastern half of the U.S., and zero otherwise. *SFit07* is IPC's 2007 evaluation of a distributor's strategic fit in the distribution network. *GOriented07* is IPC's 2007 evaluation of a distributor's orientation towards sales growth. Wald χ^2-statistics are presented in parenthesis.

	(1)	(2)	(3)	(4)
	SFit07	*SFit07*	*GOriented07*	*GOriented07*
AllIPC		0.403		0.542
		(0.93)		(2.13)
ProcessAlign07	1.409 ***	1.827 ***	1.300 ***	1.536 ***
	(70.40)	(54.06)	(75.31)	(52.16)
ProcessAlign07*AllIPC		-0.734 ***		-0.475 *
		(6.08)		(3.39)
InfoExch07	-0.212 **	-0.341 ***	0.202 **	0.120
	(5.08)	(7.47)	(5.25)	(1.14)
InfoExch07*AllIPC		0.338 *		0.039
		(3.03)		(0.05)
SalesGrow07	-0.277	-0.151	1.478 ***	0.704 **
	(0.67)	(0.15)	(15.52)	(4.35)
SalesGrow07*AllIPC		-0.889		1.457 **
		(1.29)		(3.93)
SFit04	0.053	-0.069		
	(0.49)	(0.82)		
GOriented04			-0.056	-0.058
			(0.61)	(0.66)
Georgraphic Control	Y	Y	Y	Y
Likelihood Ratio	106.25 ***	116.00 ***	163.07 ***	159.53 ***
Pseudo-R sqr	0.55	0.58	0.68	0.66
n	156	156	156	156

***, **, * Indicates significance at the 1 percent, 5 percent, 10 percent (two-tailed), respectively.

Table 7 also reports whether exclusivity moderates the role of performance measures in the growth orientation performance evaluation (*GOriented07*). The evidence reported in Column

4 of Table 7 again suggests that an exclusive distributor's performance evaluation is *less* sensitive to measures of process alignment (*ProcessAlign07AllIPC*, β = -0.475, p < 0.07). This result is consistent with exclusive distributors benefiting from their status in the performance evaluation process. In addition, there is evidence that the growth orientation evaluation is more sensitive to sales growth for exclusive distributors (*SalesGrow07AllIPC*, β = 1.457, p < 0.05).

In summary, the evidence reported in Table 7 indicates exclusivity in supply chain relationships moderates the importance of nonfinancial performance measures in the performance evaluation process. The strategic fit and growth orientation performance evaluations are less sensitive to measures of process alignment. In addition, the strategic fit evaluation is more sensitive to detailed information exchange, while the growth orientation evaluation is more sensitive to sales growth for exclusive distributors. This is an important result for the design of supply chain performance evaluation and reward systems. Practitioner studies that recommend implementing nonfinancial performance measurement practices in supply chain relationships have generally ignored the potential moderating role of various contextual factors specific to supply chain settings, such as whether or not the supply chain is an exclusive or nonexclusive relationship. The results indicate that supply chain exclusivity is an important factor in understanding the role of nonfinancial measures in supply chain performance evaluation and reward systems.

2.6.2   Sales Processes, Operational Processes and Supply Chain Financial Performance

As previously discussed, IPC encourages distributors to align its sales and operations processes with IPC's recommendations. In this subsection, I assess whether aligning sales and operations processes differentially affect supply chain financial performance. I define *SalesAlign* as the

distributor's average score across nine performance measures from Table 1: Develops Sales Plan, Develops Strategy, Management Involvement, Sales Management Focus, Supports IPC Marketing Strategy, Average Number of Sales Staff, Offers Total Line of IPC Lubricant Products, Sales Proficiency and Offers Fee-Based Services. I define *OpsAlign* as the distributor's average score across the three performance measures from Table 1: Physical Asset Sufficiency, Ensures IPC Product Quality and Repackaging Ability. As *SalesAlign* and *OpsAlign* increase, IPC evaluates the distributor as more aligned with IPC's recommended sales and operations processes. I expect that sales process alignment and operational process alignment will be positively associated with future supply chain sales growth, sales productivity and relationship profitability.

Table 8 presents the results of this analysis by estimating three models similar to equations (1), (2) and (3), replacing *ProcessAlign* with its components - *SalesAlign* and *OpsAlign*. All condition indices in Table 8 are less than the recommended maximum of 30 (Freund and Littell 2000), and all variance inflation factors are below 10, which indicates that multicollinearity does not adversely affect the results. The results in Columns 1 and 2 of Table 8 indicate that *SalesAlign* is positively associated with future sales growth ($\beta = 0.095$, $p < 0.02$), as expected. However, *OpsAlign* is not associated with future sales growth ($\beta = -0.017$, $p < 0.66$). The results in Columns 3 and 4 suggest a similar pattern, with *SalesAlign* positively associated with future sales productivity ($\beta = 0.305$, $p < 0.01$), but *OpsAlign* is not associated with future sales productivity ($\beta = -0.179$, $p < 0.23$). Columns 5 and 6 also indicate that *SalesAlign* is associated with future relationship profitability ($\beta = 0.385$, $p < 0.01$), while after including

SalesAlign, OpsAlign is not associated with future relationship profitability (β = -0.021, p <

0.69).[28]

Table 8. Ordinary Least Squares Regressions Examining the Relationship between Past Sales Alignment,

Operational Alignment and Information Exchange and Future Supply Chain Financial Performance after controlling

for Past Financial Performance.

The table presents OLS regressions which investigate the relationship between *SalesAlign, OpsAlign* and *InfoExch*, and measures of supply chain future financial performance. I use distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply chain performance from 2001-03 and 2004-06, respectively. *SalesAlign04* is the distributor's average score across performance measures number 2 through 10 in Table 1 during the 2001-03 contract period. *OpsAlign04* is the distributor's average score across performance measures number 11 through 13 in Table 1 during the 2001-03 contract period. *InfoExch04* is the distributor's score on performance measure number 14 in Table 1 during the 2001-03 contract period. *Past Dep. Variable (2004)* is the past dependent variable from the 2004 performance evaluation. *Geographic Control* is an indicator that equals one when the distributor is located in the eastern half of the U.S., and zero otherwise. *SalesGrow07* is the growth in non-national account lubricant volume during the 2004-06 contract period. *SalesProd07* is the natural logarithm of the number of gallons of IPC lubricants sold (in thousands) per full-time-equivalent salesperson assigned to promote IPC products, excluding national account volume, during the 2004-06 contract period. *Profit07* is IPC's gross margin per gallon of lubricant sold to a distributor during the 2004-06 contract period. T-statistics (two-tailed) are presented in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)
	SalesGrow07	SalesGrow07	SalesProd07	SalesProd07	Profit07	Profit07
Intercept	-0.299 **	-0.297 **	0.346	0.395	0.489 *	0.918 ***
	(-2.17)	(-2.19)	(0.82)	(0.96)	(1.72)	(3.36)
SalesAlign04	-	0.095 **	-	0.305 ***	-	0.385 ***
		(2.39)		(2.91)		(5.29)
OpsAlign04	0.039	-0.017	0.001	-0.179	0.161 ***	0.021
	(1.28)	(-0.44)	(0.07)	(-1.08)	(2.64)	(0.35)
InfoExch04	0.041	0.018	0.242 ***	0.172 **	-0.012	-0.1 **
	(1.54)	(0.64)	(3.19)	(2.22)	(-0.26)	(-2.18)
Past Dep. Variable (2004)	0.089 **	0.086 **	0.752 ***	0.745 ***	0.852 ***	0.742 ***
	(2.27)	(2.23)	(45.13)	(45.51)	(22.82)	(18.50)
Georgraphic Control	Y	Y	Y	Y	Y	Y
F-stat	3.75 ***	4.24 ***	551.97 ***	467.94 ***	204.56 ***	199.3 ***
Adj. R-sqr	0.07	0.10	0.94	0.95	0.83	0.87
n	156	156	156	156	152	152

***, **, * Indicates significance at the 1 percent, 5 percent, 10 percent (two-tailed), respectively.

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[28] As a robustness check, I repeat the analysis using factor scores output from a factor analysis of the process alignment nonfinancial performance measures in Table 1. The factor scores are readily interpreted as sales process alignment and operational process alignment factors. The results are statistically similar.

Taken together, these results suggest that the alignment of sales processes across the supply chain is the main driver of the association between measures of process alignment and future supply chain financial performance reported in Table 4.

2.7   ROBUSTNESS TESTS

2.7.1   Factor Scores

IPC uses the average of all nonfinancial performance measures included in Table 1 to evaluate supply chain performance. I follow this use of averages throughout much of the empirical analysis. To examine the robustness of the results to an alternative measure, I use factor analysis (with oblique rotation) to extract factors based on the nonfinancial performance measures in IPC's scorecard. This procedure yields two factors. The first factor, identified as *SalesFactor*, loads on the performance measures associated with sales process alignment (Cronbach's alpha = 0.9030).   The second factor, identified as *OpsFactor*, loads on the performance measures associated with operational process alignment (Cronbach's alpha = 0.7146).   I use these standardized factor scores as the component measures for process alignment and repeat the analysis presented in Tables 5, 6 and 7.

To assess the robustness of using average process alignment scores, Table 9 repeats the analysis presented in Table 8. Multicollinearity does not adversely affect the results presented in Table 9 because all condition indices and variance inflation factors remain below their recommended maximums. Robust results would show statistically similar results between Table

9 and Table 8. The results in Column 2 of Table 9 indicate that *SalesFactor* is positively associated with *SalesGrow07* ($\beta = 0.071$, $p < 0.03$), as expected, while *OpsFactor* is not related to future sales growth ($\beta = -0.001$, $p = 0.98$), which is consistent with the results from Table 8. The results in Column 4 suggest a similar pattern, as *SalesFactor* is positively associated with *SalesProd07* ($\beta = 0.311$, $p < 0.01$), but *OpsFactor* is not related to future sales productivity ($\beta = -0.196$, $p < 0.14$). Column 6 also indicates that *SalesFactor* is associated with *Profit07* ($\beta = 0.329$, $p < 0.01$), but *OpsFactor* is not related to future relationship profitability. Collectively, these results are statistically similar to the results reported in Table 8, which are based on averages of the nonfinancial performance measures.

Table 9. Ordinary Least Squares Regressions Using Factor Scores Examining the Relationship between Past Sales Alignment, Operational Alignment and Information Exchange and Future Supply Chain Financial Performance after controlling for Past Financial Performance.

The table presents OLS regressions which investigate the relationship between *SalesAlign, OpsAlign* and *InfoExch*, and measures of supply chain future financial performance. I use distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply chain performance from 2001-03 and 2004-06, respectively. *SalesFactor04* and *OpsFactor04* are factors from an oblique rotation factor analysis of the performance measures number 2 through 13 in Table 1 during the 2001-03 contract period. *InfoExch04* is the distributor's score on performance measure number 14 in Table 1 during the 2001-03 contract period. *Past Dep. Variable (2004)* is the past dependent variable from the 2004 performance evaluation. *Geographic Control* is an indicator that equals one when the distributor is located in the eastern half of the U.S., and zero otherwise. *SalesGrow07* is the growth in non-national account lubricant volume during the 2004-06 contract period. *SalesProd07* is the natural logarithm of the number of gallons of IPC lubricants sold (in thousands) per full-time-equivalent salesperson assigned to promote IPC products, excluding national account volume, during the 2004-06 contract period. *Profit07* is IPC's gross margin per gallon of lubricant sold to a distributor during the 2004-06 contract period. T-statistics (two-tailed) are presented in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)
	SalesGrow07	*SalesGrow07*	*SalesProd07*	*SalesProd07*	*Profit07*	*Profit07*
Intercept	-0.120 **	-0.053	0.447	0.757 **	1.526 ***	2.289 ***
	(-1.07)	(-0.45)	(1.23)	(2.01)	(4.45)	(6.20)
SalesFactor04	-	0.071 **	-	0.311 ***	-	0.329 ***
		(2.20)		(2.59)		(4.32)
OpsFactor04	0.059 **	0.001	0.067	-0.196	0.257 ***	0.043
	(1.99)	(0.02)	(0.79)	(-1.50)	(4.05)	(0.55)
InfoExch04	0.030	0.016	0.221 ***	0.161 **	-0.048	-0.120 **
	(1.09)	(0.53)	(2.84)	(2.02)	(-1.05)	(-2.57)
Past Dep. Variable (2004)	0.086 **	0.087 **	0.749 ***	0.743 ***	0.804 ***	0.741 ***
	(2.22)	(2.25)	(45.16)	(45.37)	(20.34)	(18.49)
Georgraphic Control	Y	Y	Y	Y	Y	Y
F-stat	4.38 ***	4.05 ***	554.68 ***	464.08 ***	204.56 ***	200.27 ***
Adj. R-sqr	0.08	0.09	0.94	0.94	0.83	0.87
n	156	156	156	156	152	152

***, **, * Indicates significance at the 1 percent, 5 percent, 10 percent (two-tailed), respectively.

To assess whether using factor scores yields statistically similar results regarding the use of nonfinancial performance measures in the performance evaluation and rewards process, I repeat the analysis presented in Tables 5 and 6. For brevity, I combine the robustness checks for key results presented in Tables 5 and 6 into Table 10. Table 10 presents evidence consistent with prior results reported in the paper. Specifically, sales process alignment (*SalesFactor*) continues to be positively associated with contract renewals, strategic fit and growth orientation performance evaluations. Detailed information exchange continues to be statistically insignificant in the contract renewal evaluation and positively associated with the growth orientation performance evaluation. Column 2 of Table 10 reports that detailed information exchange is not related to the strategic fit performance evaluation, in contrast to its negative and significant association with the strategic fit performance evaluation in Table 6. The results using factor scores are, in general, statistically similar to the results reported in Tables 9 and 10, which are based on average of the nonfinancial performance measures.

Table 10. Logistic and Ordered Logit Regressions Using Factor Scores Examining the Relationship between Sales

Process Alignment, Operational Process Alignment, Information Exchange and Supply Chain Contract Renewals

and Performance Evaluations in 2007**.**

The table presents logistic and ordered logistic regressions which investigate the relationship between *SalesAlign, OpsAlign* and *InfoExch*, and contract renewals and performance evaluations. I use distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply chain performance from 2001-03 and 2004-06, respectively. *SalesFactor07* and *OpsFactor07* are factors from an oblique rotation factor analysis of the performance measures number 2 through 13 in Table 1 during the 2004-06 contract period. *InfoExch07* is the distributor's score on performance measure number 14 in Table 1 during the 2004-06 contract period. *SFit04* is IPC's 2004 evaluation of a distributor's strategic fit in the distribution network. *GOriented04* is IPC's 2004 evaluation of a distributor's orientation towards sales growth. *%IPCVolume* is the percentage of the distributor's overall lubricant volume that is IPC products. *Geographic Control* is an indicator that equals one when the distributor is located in the eastern half of the U.S., and zero otherwise. *Renew07* is an indicator that equals one when IPC decides to renew the distributor's contract in 2007, and zero otherwise. *SFit07* is IPC's 2007 evaluation of a distributor's strategic fit in the distribution network. *GOriented07* is IPC's 2007 evaluation of a distributor's orientation towards sales growth. Wald χ^2-statistics are presented in parenthesis.

	(1)	(2)	(3)
	Renew07	*SFit07*	*GOriented07*
Intercept	0.432	-	-
	(0.17)		
SalesFactor07	1.156 ***	0.578 ***	0.547 ***
	(7.05)	(10.35)	(10.54)
OpsFactor07	-0.111	0.261	0.072
	(0.09)	(1.80)	(0.16)
InfoExch07	-0.166	0.115	0.432 ***
	(0.56)	(2.02)	(27.79)
SalesGrow07	2.188 *	0.183	-0.085
	(3.39)	(0.29)	(1.47)
SFit04	0.116	0.129 *	
	(0.37)	(3.26)	
GOriented04			-0.085
			(1.47)
%IPCVolume	2.370 **	-0.425	-0.679 *
	(5.46)	(1.05)	(3.07)
Geographic Control	Y	Y	Y
Likelihood Ratio	33.18 ***	64.55 ***	105.87 ***
Pseudo-R sqr	0.32	0.38	0.51
n	156	156	156

***, **, * Indicates significance at the 1 percent, 5 percent, 10 percent (two-tailed), respectively.

2.7.2 Endogeneity

Throughout the paper, I use past measures of process alignment and detailed information exchange (measured during the 2001-03 contract period) as predictors of future supply chain financial performance (measured during the 2004-06 contract period). This empirical design lends support to the argument that these nonfinancial performance measures are leading indicators of future supply chain financial performance. However, it is possible that causality runs the opposite direction - higher supply chain financial performance may lead to improvements in the measures of process alignment and detailed information exchange. That is, measures of process alignment and information exchange may be endogenous in the analysis.

An alternative empirical design that can investigate causality is to examine whether future measures of process alignment and detailed information exchange are associated with past measures of supply chain financial performance. [29] The prior analysis examines whether past measures of process alignment and detailed information exchange are leading indicators of supply chain financial performance. If endogeneity is not a concern, then model specifications that regress *future* nonfinancial performance measures on *past* measures of supply chain financial performance should not exhibit statistical significance. Specifically, *ProcessAlign* and *InfoExch* should not be associated with past measures of supply chain financial performance when using the following models:

$$SalesGrow_t = \alpha + \beta_1 ProcessAlign_{t+1} + \beta_2 InfoExch_{t+1} + \beta_3 SalesGrow_{t+1} + Controls + \varepsilon_t \quad (7)$$

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[29] I thank Dan Givoly and Jim McKeown for suggesting this robustness check.

$$SalesProd_t = \alpha + \beta_1 ProcessAlign_{t+1} + \beta_2 InfoExch_{t+1} + \beta_3 SalesProd_{t+1} + Controls + \varepsilon_t \quad (8)$$

$$Profit_t = \alpha + \beta_1 ProcessAlign_{t+1} + \beta_2 InfoExch_{t+1} + \beta_3 Profit_{t+1} + Controls + \varepsilon_t \quad (9)$$

The right-hand sides of equations (7), (8) and (9) represent information available at the end of year $t+1$ for predicting supply chain financial performance during the *prior* contract period. This information includes future measures of process alignment and detailed information exchange, as well as future distributor financial performance. If past measures of nonfinancial performance are leading indicators of supply chain financial performance, then I expect *ProcessAlign* and *InfoExch* exhibit no explanatory power in each model ($\beta_1 = \beta_2 = 0$).

I estimate equations (7), (8) and (9) in Columns 1, 2 and 3 of Table 11, respectively. Column 1 results indicate that future measures of process alignment and detailed information exchange are not associated with past sales growth (*SalesGrow*). Evidence in Columns 2 and 3 suggest that these future nonfinancial measures are not related to prior sales productivity (*SalesProd*) or relationship profitability (*Profit*). Collectively, the results in Table 11 indicate that future measures of process alignment and detailed information exchange are not associated with past measures of supply chain financial performance. This strengthens the prior conclusion that these nonfinancial performance measures are leading indicators of supply chain financial performance.

Table 11. Ordinary Least Squares Regressions Examining the Relationship between Future Process Alignment and Information Exchange and Past Supply Chain Financial Performance after controlling for Future Financial Performance.

The table presents OLS regressions which investigate the relationship between future measures of *ProcessAlign* and *InfoExch* and past measures of supply chain financial performance. I use distributor performance evaluation data from the U.S. lubricant division of International Petroleum Corporation (IPC), a leading manufacturer of petroleum products. This study incorporates IPC's 2004 and 2007 distributor performance evaluations, which assess supply

chain performance from 2001-03 and 2004-06, respectively. *ProcessAlign07* is the distributor's average score across performance measures number 2 through 13 in Table 1 during the 2004-06 contract period. *InfoExch07* is the distributor's score on performance measure number 14 in Table 1 during the 2004-06 contract period. *Future Dep. Variable (2004)* is the future dependent variable from the 2007 performance evaluation. *Geographic Control* is an indicator that equals one when the distributor is located in the eastern half of the U.S., and zero otherwise. *SalesGrow04* is the growth in non-national account lubricant volume during the 2001-03 contract period. *SalesProd04* is the natural logarithm of the number of gallons of IPC lubricants sold (in thousands) per full-time-equivalent salesperson assigned to promote IPC products, excluding national account volume, during the 2001-03 contract period. *Profit04* is IPC's gross margin per gallon of lubricant sold to a distributor during the 2001-03 contract period. T-statistics (two-tailed) are presented in parenthesis.

	(1)	(2)	(3)
	SalesGrow04	*SalesProd04*	*Profit04*
Intercept	0.218 **	-0.792 **	0.341
	(1.18)	(-2.04)	(0.81)
ProcessAlign07	-0.021	-0.063	-0.076
	(-0.34)	(-0.57)	(-0.65)
InfoExch07	-0.017	-0.115	-0.061
	(-0.41)	(-1.45)	(-1.11)
Future Dep. Variable (2007)	0.419 **	1.269 ***	0.999 ***
	(2.44)	(43.85)	(12.76)
Georgraphic Control	Y	Y	Y
F-stat	1.56	523.69 ***	100.73 ***
Adj. R-sqr	0.01	0.94	0.72
n	156	156	152

***, **, * Indicates significance at the 1 percent, 5 percent, 10 percent (two-tailed), respectively.

Consistent with prior literature (e.g., Banker and Mashruwala 2007), I use past supply chain financial performance as a control variable in the main empirical analysis. By adopting this approach, I control for any correlated omitted variables that do not change significantly across sample periods. For example, because a large fraction of a distributor's revenue is from the sales of lubricants to large manufacturing facilities, the composition of the distributor's sales territory is likely to remain similar between contract periods. I control for these effects by including past financial performance as an independent variable in the regression analysis, which implicitly assumes that variables such as demographics influence past and future supply chain

performance in a similar fashion. I also estimate a changes model using changes in the measures of process alignment and detailed information exchange to examine the association with future supply chain financial performance.

The results (untabulated) from this analysis are qualitatively similar to those obtained from the levels analysis previously reported. The coefficient on the change in process alignment is significantly positive for sales growth ($p < 0.01$) and relationship profitability ($p < 0.01$), but is insignificant for sales productivity. In addition, Tables 5 and 6 indicate that the change in process alignment is positively associated with contract renewals, strategic fit, and growth orientation performance evaluations. Somewhat weaker results are obtained from changes in detailed information exchange. In particular, the change in detailed information exchange is not significantly associated with any measure of future supply chain financial performance, and is only positively associated with the growth orientation performance evaluation. In general, the results from the changes analysis suggests that nonfinancial performance measures, particularly measures of process alignment, are leading indicators of supply chain financial performance and are emphasized in the performance evaluation and rewards process.

2.8   CONCLUSIONS

In this paper, I assess whether the potential benefits of two supply chain initiatives, the extent of process alignment between supply chain partners ("process alignment") and the exchange of detailed information between these firms ("detailed information exchange"), are nonfinancial indicators of future supply chain financial performance. In addition, I examine whether information contained in these measures is emphasized in supply chain performance evaluations.

The analysis uses six years of performance measurement data from a leading international manufacturer regarding its contractual arrangements with 156 independent distributors. Given the growing literature that documents the economic importance of supply chain relationships (Randall and Ulrich 2001; Gosman, Kelly, Olsson and Warfield 2004; Hendricks and Singhal 2005), it is important to understand how firms design management control systems to monitor and evaluate supply chain performance.

Consistent with prior literature, which finds that nonfinancial measures are associated with future firm performance, I find that measures of process alignment are nonfinancial indicators of future supply chain performance. In particular, the results indicate that measures of process alignment are consistently associated with future measures of supply chain productivity, sales growth and profitability. These results suggest that productivity improvements from aligning processes across supply chain partners may enable the supply chain to offer lower prices in the marketplace, which enhances sales growth. Importantly, the supply chain is able to retain a share of the productivity gains, which enhances profitability.

The association between measures of detailed information exchange and future supply chain financial performance is less conclusive. Consistent with predictions that detailed information exchange will reduce total supply chain costs (Chen 1998, Cachon and Fisher 2000), I find that measures of detailed information exchange are positively associated with supply chain productivity. However, in my research setting, I find that detailed information exchange is not associated with measures of sales growth or profitability. These result suggests that the exchange of detailed customer demand and inventory information within the supply chain is associated with the efficient use of resources (more gallons of lubricant sold per salesperson), but these gains do not necessarily translate into enhanced sales or profitability. This is consistent

with prior studies that document mixed evidence on the benefits of information exchange within the supply chain (Ittner, Larcker, Nagar and Rajan 1999; Kulp et al. 2004).

I extend the nonfinancial performance measure literature by investigating whether the information contained in these measures is emphasized in the supply chain performance evaluation and rewards process. I find that measures of process alignment and detailed information exchange are associated with at least one supply chain performance evaluation. However, while measures of process alignment are associated with *all* performance evaluations in my research setting, measures of detailed information exchange are associated with only the least economically important evaluation (whether the distributor is oriented towards future sales growth). The limited role of detailed information exchange in the performance evaluation and rewards process may partially reflect firms' concerns that supply chain partners may manipulate this information (Lee et al. 1997; Cachon and Lariviere 2001; Ozer and Wei 2006). Collectively, my results suggest that nonfinancial measures, particularly measures of process alignment, are leading indicators of future supply chain performance, and that the information contained in these measures are important inputs into the performance evaluation and rewards process between firms.

I extend prior literature by examining the relative explanatory power of financial and nonfinancial measures in the performance evaluation and rewards process. Interestingly, I find that the relative importance of financial and nonfinancial performance measures varies with the economic importance of the evaluation. The results indicate that financial measures, such as sales growth, have greater relative explanatory power in supply chain contract renewal evaluations, which represent the most economically important evaluation in my research setting. In contrast, nonfinancial measures, such as measures of process alignment, have greater relative

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explanatory power in the least economically important supply chain performance evaluations (e.g., the distributor's strategic fit in the manufacturer's distribution network). These results are particularly interesting because the financial measures are not formally incorporated into the manufacturer's scorecard, which suggests information outside of the formal performance measurement process ultimately enters into the determination of evaluations and rewards.

The supply chain setting provides a unique opportunity to examine how contextual factors may affect the role of nonfinancial measures in the performance evaluation and rewards process between firms. I find that exclusive distributors (distributors that promote only one manufacturer's products) receive performance evaluations that are consistently less sensitive to measures of process alignment. This suggests that exclusive status provides a benefit to distributors in the performance evaluation process by reducing the distributor's need to engage in process alignment activities. This result highlights how contextual factors, such as whether the relationship is exclusive or non-exclusive, are important considerations in the design of supply chain performance measurement practices.

My results are subject to at least two important limitations. First, the results may not generalize to all supply chain settings because the analysis draws its conclusions from a large sample of contractual relationships from single research site. In particular, the research setting focuses on a manufacturer that operates in a mature product market. Future research could investigate supply chain performance measurement practices in more dynamic product markets. In a dynamic product market, such as the retailer-apparel relationship, it is reasonable to expect that detailed information exchange will play a larger role in performance evaluations because partners may rely more heavily on information gathered from supply chain partners. An apparel

manufacturer may find it less acceptable to work with a "silent" retailer because rapidly changing clothing trends may increase the importance of supply chain communication.

A second limitation is that a distributor may be able to anticipate that its distribution contract will not be renewed. Knowing this, the distributor may reduce its process alignment and detailed information exchange activities during the final stage of the contract. This behavior could lead to the appearance that distributors with lower measures of process alignment and detailed information exchange are associated with contract terminations. Additional analysis suggests that the causality appears to run from past nonfinancial performance measures to future supply chain financial performance. This analysis provides some statistical support for the argument that nonfinancial measures are leading indicators of supply chain financial performance. Discussions with IPC indicate that terminated distributors generally do not fully anticipate the non-renewal decision, which mitigates, to some degree, this potential limitation.

An interesting area of future research would be to examine whether one supply chain partner's incentive arrangement includes performance measures deemed important by another partner. For example, if aligning with the manufacturer's recommended processes improves the distributor's performance evaluations (as assessed by the manufacturer), then does the distributor's *internal* incentive arrangement incorporate the alignment with manufacturer's processes as a performance measure? Another interesting area of future research would be to examine the relationship between relative bargaining power and supply chain performance. In my research setting, the manufacturer holds relatively more bargaining power than their distributors, yet both parties experience enhanced performance. This is an interesting result because it suggests that the distributors are able to retain some efficiency gains from their relationships with a relatively more powerful manufacturer.

3.0 BUYER BARGAINING POWER AND SUPPLIER PERFORMANCE: EVIDENCE FROM THE APPAREL INDUSTRY

3.1 INTRODUCTION

The concept of relative bargaining power has an important role in theoretical analysis of strategic interactions between firms because power can potentially influence firm performance. Related literature frequently argues that relatively more powerful buyers ("strong" buyers) will use their superior bargaining power to increase their financial performance by extracting a larger proportion of the gains to trade from interactions with their relatively weaker suppliers (e.g., Bain 1951; Ravenscraft 1983; Balakrishnan, Linsmeier and Venkatachalam 1996; Gosman, Kelly, Olsson and Warfield 2004; Cooper and Slagmulder 2004). For example, this bargaining power perspective suggests that a strong buyer may influence contract terms to secure substantial price concessions from a relatively weaker supplier.[30] As a consequence, such actions by the buyer may adversely affect the supplier's financial performance. Interestingly, empirical studies of the bargaining power perspective find both a positive and negative association between buyer bargaining power and supplier performance.

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[30] Cooper and Slagmulder (2004, 8) argue that a more powerful buyer has the "responsibility to distribute the profits, as it was the most powerful firm in the [supply chain] relationship and therefore could legislate the split to the other firms." Similarly, Kraljic (1983, 113-4) suggests that when a buyer plays a dominant market role and suppliers' power is low, the buyer should pursue a "reasonably aggressive [purchasing] strategy ("exploit")" to enhance profits by negotiating favorable prices and contract terms.

While the bargaining power perspective suggests that buyers will exploit suppliers to enhance buyer profitability, other studies suggest that buyer-supplier collaboration is an important driver of both buyer and supplier performance (e.g., Kulp et al. 2004) and suppliers may take actions that improve their internal efficiency. Proponents of the firm-efficiency hypothesis (e.g., Demsetz 1973; Mancke 1974; Cool and Henderson 1998) argue that firm performance reflects the economic rents which accrue from a set of unique assets, such as superior cost management ability or advanced inventory management capabilities. In this view, better performance is due to the superior efficiency of some firms within an industry compared to other firms. For example, the firm-efficiency hypothesis predicts that suppliers who have a strong buyer react to relationship rigidity (i.e., lower negotiated prices) by enhancing their technological capabilities, such as adopting Just-in-Time (JIT) production to enhance inventory management (Balakrishnan et al. 1996, 188), and strengthening efforts to collaborate with their strong buyer to identify cost reduction opportunities.[31]

This chapter contributes to this on-going debate by investigating whether buyer bargaining power increases or decreases supplier financial and operational performance. Consistent with the bargaining power perspective, I find that strong buyers, as measured by the existence of major customers and the percentage of total revenue the supplier derives from their major customers, are associated with significantly lower supplier gross margins (as a percentage of sales). This evidence is consistent with prior literature (e.g., Ravenscraft 1983; Kelly and Gosman 2000) and suggests that strong buyers impose some combination of additional costs while receiving lower prices from their suppliers. For example, strong buyers may require a

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[31] Specifically, Balakrishnan et al. (1996, 188) state that "some captive firms [i.e., firms with major customers] may even be adopting JIT manufacturing at their customers' urging as a mechanism to combat the adverse effects of current and anticipated price concessions."

supplier to build additional, but underutilized, production capacity, to incur costly delivery fees due to last-minute orders, or to purchase unnecessarily expensive raw materials to fulfill required functional specifications (Cooper and Slagmulder 2004), while simultaneously negotiating lower prices for their supplier's goods.

While strong buyers may pressure their supplier's gross margins, I find that suppliers, in turn, exhibit enhanced efficiency. I adopt an organizing framework for supplier performance measurement that examines two fundamental elements of firm profitability: profit margin and asset turnover. An improvement in either measure without a decline in the other will enhance return on invested capital. Profit margin and asset turnover are common measures of firm performance used in both managerial and financial accounting textbooks to evaluate managers and better understand the drivers of firm profitability (i.e., Horngren and Foster 1987; Stickney and Weil 2006). This approach is important because prior literature has primarily investigated the association between buyer bargaining power and supplier gross margin without considering the profit margin and asset turnover elements of supplier performance.

Using this organizing framework, I analyze the relationship between retail buyer bargaining power and apparel supplier performance. Contrary to the bargaining power perspective, I find that suppliers who have a strong buyer report higher profit margins, as measured by operating return on sales. This suggests that suppliers experience significant cost reduction benefits from their interactions with a strong buyer. In particular, apparel suppliers who have a strong buyer are able to reduce selling, general and administrative (SG&A) expenses by an amount large enough to more than offset declines in gross margin. Suppliers may reap benefits that reduce SG&A expenses in several ways. For example, suppliers may capitalize on the buyers' advertising campaigns, reduce promotional expenses due to the longer-term nature of

strong buyer contracts and leverage such relationships to attract other customers, each of which would contribute to lower SG&A expenses.[32] Collectively, this evidence indicates that suppliers who have a strong buyer are able to retain a share of efficiency gains via cost reductions.

In addition to higher profit margins, I find that apparel suppliers who have a strong buyer report higher asset turnover, as measured by the supplier's inventory turnover ratio and the percentage of total assets held in inventory. One interpretation of this result is that suppliers obtain valuable information from strong buyers regarding future demand for the supplier's products. This demand information, in turn, enhances the supplier's ability to monitor and control their production and inventory management process.[33] This result is also consistent with strong buyers providing more direct production and inventory management assistance to their suppliers. For example, Wal-Mart Stores, Inc. provides suppliers with business planning software, helps suppliers improve their EDI capabilities and jointly develops production lead-time requirements.[34] This result also complements Balakrishnan et al. (1996) who find that JIT adopters who report a major customer relationship (i.e. strong buyer) experience post-adoption enhancements in inventory utilization.

Collectively, the results suggest that strong buyers are associated with financial and operational benefits for their relatively weaker suppliers. While this evidence is inconsistent

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[32] Retailers and manufacturers frequently use cooperative advertising campaigns, in which manufacturers rely on retailers to advertise the manufacturer's products in the retailer's market (see, for example, Nagler 2006 and the references included therein).

[33] Evidence from supplier's proxy statements suggests major customers routinely provide performance-enhancing information to their suppliers. For example, the apparel company Bernard Chaus describes in their 2007 proxy statement the information that they receive from their major customers: "The Company's largest customers discuss with the Company retail trends and their plans regarding their anticipated levels of total purchases of Company products for future seasons. These discussions are intended to assist the Company in planning the production and timely delivery of its products."

[34] Interestingly, the publicly available information about becoming a supplier to Wal-Mart Stores describes the Wal-Mart-supplier relationship as a "partnership process" in which Wal-Mart works "closely with our [i.e., Wal-Mart's] suppliers to drive out unnecessary costs…to…enhance your [i.e., supplier's] overall business development." Wal-Mart states that it seeks to use their "size and leverage to create companies of significant size and stature."

with prior arguments based on the apparent adverse affects strong buyers have on supplier gross margin, the evidence is consistent with the detailed analysis presented in Chapter 2 regarding the supply chain activities between IPC and their U.S. lubricant distributor network. Chapter 2 empirical evidence indicates that both IPC and their distributors benefit from the alignment of processes across firm boundaries. IPC encourages their distributors to align various marketing, sales and operations activities with IPC standards. These processes appear to benefit distributors, rather than impose costs such as incurring late delivery fees or carrying unnecessary levels of lubricant inventory. Evidence in Chapter 2 complements the results presented in Chapter 3, and enables my dissertation to provide both a detailed and larger-sample analysis that documents potential performance benefits available to supply chain partners.

While these results suggest important financial and operational efficiency benefits may accrue to suppliers who have a strong buyer, additional analysis suggests these benefits may not accrue to all suppliers. Specifically, I find that suppliers to *multiple* strong buyers report lower profit margins and lower asset turnover. One interpretation of these results is that such suppliers are unable to manage effectively the demands of multiple strong buyers because these demands are not synchronized. The additional stochasticity induced in the suppliers' environment may contribute to declines in asset turnover and lower profit margins.

This paper contributes to the existing literature that investigates the influence buyer bargaining power may have on supplier financial and operational performance. Using a sample of apparel suppliers, I find that prior results which depend on supplier gross margins to argue that strong buyers adversely affect supplier financial performance may not fully reflect the potential efficiency benefits that accrue to suppliers in other aspects of their business. These results complement and extend prior accounting research that assumes suppliers achieve

performance benefits from more intensive buyer-supplier interactions (Kulp et al. 2004) or does not directly examine the value and performance implications for those suppliers in strong buyer-supplier relationships (Gosman et al., 2004). The results complement prior accounting research that suggests suppliers to strong buyers may experience inventory management benefits after adopting JIT production methods (Balakrishnan, Linsmeier and Venkatachalam 1996). In addition, I provide some of the first evidence that suggests the number of strong buyers may have an affect on supplier performance. Finally, while prior literature has largely focused on the association between aggregate measures of industry profitability and industry concentration, I use the supplier's FAS 131 major customer relationship disclosure as a proxy for the existence and extent of buyer bargaining power.[35] This enables a more direct investigation of the relationship between buyer bargaining power and supplier performance by using firm-level measures of both relative buyer power and supplier performance, and adds to the expanding literature that uses FAS 131 disclosures to examine buyer-supplier relationships (e.g., Fee and Thomas 2004; Fee, Hadlock and Thomas 2006; Hertzel et al. 2008).

The remainder of the chapter is organized as follows. Section 3.2 reviews related literature and develops the hypotheses. Section 3.3 describes the sample, while Sections 3.4 and 3.5 present the empirical results and robustness tests, respectively. Section 3.6 concludes.

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[35] In 1976 the Financial Accounting Standards Board (FASB) issued Statement of Financial Accounting Standards No. 14 (FAS 14). FAS 14 introduced "major customer relationship" to the disclosure language and, for the first time, required firms to disclose information regarding the existence of major customers. The FASB defined that a major customer relationship existed when (FAS 14, paragraph 39) "10 percent or more of the revenue of an enterprise is derived from sales to any single customer." However, FAS 14 did not specify whether firms were required to disclose the identity of the major customer. FAS 30, entitled "Disclosure of Information about Major Customers", superseded FAS 14 in 1979. While the main theme of FAS 14 was preserved in FAS 30, the Statement clarified FAS 14 by specifying that (FAS 30, paragraph 6) "[t]he identity of the major customer need not be disclosed, but the identity of the industry segment or segments making the sales shall be disclosed." In 1997, FAS 131 superseded FAS 30, with the requirements for the major customer relationship disclosure unaffected.

3.2   LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

3.2.1   Relative Bargaining Power and Performance

Prior literature that examines whether the exercise of buyer bargaining power adversely affects supplier financial performance generally concludes that industry-level measures of buyer bargaining power are associated with lower supplier-industry gross margin. Bain's (1951) influential study examines the relationship between buyer bargaining power and supplier performance using measures of industry concentration (such as the percentage of industry output from the eight largest firms) and industry profitability (such as the price-cost margin), and finds a positive association between an industry concentration ratio of at least 70 percent and aggregate industry profitability.[36] Related work also finds similar results. For example, Lustgarten (1975) reports that supplier-industry price-cost margin is adversely affected by buyer-industry concentration. Similarly, Ravenscraft (1983) finds that supplier-industry price-cost margins are (somewhat) adversely associated with buyer-industry concentration (p-value < 0.15). Galbraith and Stiles (1983) find similar results. Collectively, this evidence supports the bargaining power perspective because buyers with relatively more bargaining power appear to exercise their power to enhance their own performance at the expense of their relatively weaker suppliers.

In contrast to these results, when the analysis shifts from measurement of power and performance at the industry-level to measurement of these variables at the firm-level, the empirical evidence regarding the association between buyer power and supplier performance is less conclusive. For example, Ravenscraft (1983) finds that buyer concentration is positively

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[36] Price-cost margin is typically defined as the industry Census value of total shipments minus the cost of material, payroll, advertising, R&D and depreciation divided by the value of shipments (Ravenscraft 1983, 30).

and significantly associated with supplier operating income, which is inconsistent with the bargaining power perspective. In related work, Cowley (1986) uses the number of buyers that comprises 50 percent of a supplier's revenue as a proxy for buyer bargaining power (fewer customers indicates more powerful buyers). In his analysis, Cowley (1986) finds that the association between buyer bargaining power and supplier operating income is not significant.

Interestingly, evidence in both Ravenscraft (1983) and Cowley (1986) suggests suppliers may experience efficiency gains through cost reductions in the presence of fewer buyers. For example, Cowley (1986) reports a negative association between the number of buyers that comprises 50 percent of a supplier's revenue (i.e., buyer bargaining power) and the supplier's total marketing, research and development, and overhead costs. This result suggests that a supplier who has *fewer* customers (i.e., interacts with strong buyers) is potentially associated with *lower* marketing costs.

Consistent with these potential efficiency gains, anecdotal evidence suggests that suppliers may experience significant cost reductions when interacting with strong buyers. These cost reductions may be particularly acute for suppliers who sell their products directly to retailers. Retailers and their suppliers frequently use cooperative advertising campaigns, in which suppliers rely on retailers to advertise the supplier's products in the retailer's market (see, for example, Nagler 2006 and the references included therein). Such cooperative advertising campaigns may reduce a supplier's advertising and marketing expenses. In the apparel industry, apparel suppliers frequently value relationships with a strong buyer because suppliers are able to gain access to the buyer's significant and wide-reaching marketing expertise (Textiles Intelligence, 2007). Furthermore, suppliers to strong buyers may be able to reduce promotional expenses due to the longer-term nature of strong buyer contracts. In addition, suppliers may be

able to leverage their strong buyer relationships to attract other customers, furthering reducing selling expenses. Reductions in selling and marketing expenses would not affect supplier gross margin, but would influence other measures of supplier financial performance, such as supplier operating income.

In addition to these potential cost reductions, suppliers to strong buyers may experience enhancements in asset turnover. Recent accounting literature documents the potential value of buyer-supplier collaboration and technology transfers in improving supplier inventory management. Kulp, Lee and Ofek (2004), using survey data from the food and consumer packaged goods industry, find a positive association between the extent of buyer-supplier inventory management collaboration and buyer profit margins. This result suggests that exchanging supplier inventory information with a buyer enhances buyer performance. Kulp et al. (2004) assume that suppliers will benefit from such collaboration, but data limitations prevent the authors from testing this assumption.

Similarly, Gosman, Kelly, Olson and Warfield (2004) find that relatively more powerful buyers achieve higher levels of profitability and profitability persistence when compared to relatively less powerful buyers. Gosman et al. (2004) argue that this evidence is consistent with strong buyers benefiting from their position as a powerful buyer in the supply chain. Their analysis does not investigate the financial and operational performance of the suppliers who interact with these powerful buyers. Balakrishnan, Linsmeier and Venkatachalam (1996) find that suppliers who voluntarily disclose the adoption of JIT production and interact with a major customer (i.e., strong buyer) experience post-adoption enhancements in inventory utilization. This result is consistent with the potential asset turnover benefits that may accrue to suppliers who have a strong buyer.

In summary, prior literature that examines the association between buyer bargaining power and supplier performance arrives at mixed conclusions. One the one hand, studies that focus on measures of supplier gross margin generally report that more powerful buyers adversely affect supplier gross margins. On the other, the relatively few studies that examine measures of supplier financial performance other than gross margin suggest that strong buyers may actually enhance supplier profitability at the overall operating level. Evidence suggests that suppliers who have strong buyers may reap cost reductions benefits, particularly reductions in selling and marketing expenses. In addition, related work suggests that suppliers who have strong buyers may experience enhancements in asset turnover. An improvement in either profit margin or asset turnover may lead to overall efficiency gains for the supplier irrespective of the pressures that strong buyers may have on supplier gross margins. In the next section, I provide evidence that suppliers to strong buyers experience lower gross margins, but also report higher profit margins and higher asset turnover.[37]

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[37] This evidence suggests that both the buyer and supplier achieve performance benefits. Consistent with this argument, I report evidence in Chapter 2 that a relatively more powerful manufacturer and their weaker distributors experience performance benefits (e.g., sales growth, higher levels of sales productivity, higher profitability) from the alignment of processes between firms ("process alignment"). This result is consistent with the firm-efficiency hypothesis and suggests strong buyers may encourage their suppliers to enhance efficiency, perhaps because of reductions in supplier gross margin. For example, in the IPC-distributor relationship, IPC did not want to lower their wholesale prices in order to support higher distributor profitability. Instead, IPC worked with their distributors to identify ways for the distributor to improve profits by operating their business more efficiently.

3.3   SAMPLE SELECTION AND RESEARCH METHODOLOGY

3.3.1   Bargaining Power and FAS 131 Major Customer Disclosures

I investigate the relationship between buyer bargaining power and supplier financial and operational performance for apparel industry suppliers (SIC 2300-2390) and their buyer/retailer customers. Apparel suppliers are a suitable sample because these suppliers are known to derive a portion of their revenues from strong buyers (Kelly and Gosman 2000). Apparel suppliers are commonly viewed as having little bargaining power compared to the significantly larger retailers with which they do business, such as Target Corp., JCPenney and Wal-Mart Stores. Evidence suggests that apparel suppliers may be unable to increase their prices in response to an increase in their own manufacturing costs, which indicates that suppliers are in a relatively weaker bargaining position vis-à-vis their larger retail customers.[38] Another example of retailers' expanding bargaining power is the increasing role of consignment, in which suppliers retain title to their goods even when these products are on the retailers' shelves (Gosman and Kelly 2003). Collectively, these factors suggest that apparel suppliers likely operate with relatively little bargaining power.

I collect apparel supplier financial information from Compustat for the five-year period from 2002-2006. After excluding observations for suppliers missing relevant financial data, the sample consists of 250 firm-year observations from 56 publicly-traded apparel suppliers. Table 12, Panel A reports that the sample has somewhat fewer apparel suppliers in 2006 compared to 2003, which may be partially attributable to recent consolidation in the apparel industry. Table

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[38] Foroohar (1995) indicates that apparel manufacturers, facing an increase in dye costs, were unable to increase prices for goods shipped to Wal-Mart Stores, Inc.

12, Panel B shows that the number of observations within each four-digit SIC classification is more concentrated in the "Apparel and Other Finished Products of Fabrics" sector.

Table 12. Sample Distribution by Year and Industry.

I identify firms in the apparel industry by using Compustat and extracting all firms in the SIC code 2300-2390. After eliminations due to missing financial performance data, my final sample consists of 250 apparel-firm year observations for 56 publicly-traded apparel firms. The table shows distributions of observations by year and 4-digit SIC industry classification.

Panel A: Observations per year		N	Percent of Sample
	2002	52	20.8
	2003	56	22.4
	2004	51	20.4
	2005	47	18.8
	2006	44	17.6
	Total	250	100.0

Panel B: Sample firm industries			
SIC Code	Description	N	Percent of Sample
2300	Apparel and other finished products of fabrics	95	38.0
2320	Men's and Boys' furnishings, work clothes and allied garments	60	24.0
2330/2340	Women's, Misses' and Juniors Apparel	67	26.8
2390	Undergarments and Misc Apparel	28	11.2
	Total	250	100.0

I identify the existence and the percentage of an apparel supplier's revenue attributable to their major retail customers using FAS 131 disclosure requirements. FAS 131 requires suppliers to disclose all customer relationships that account for at least 10 percent of their total revenue. Prior empirical investigations of the association between buyer bargaining power and supplier performance have been somewhat restricted by a lack of sufficient proxies for measuring buyer power (Cowley 1986, Kelly and Gosman 2000). One potential proxy for the extent of buyer bargaining power over their suppliers is the amount of revenue the supplier receives from strong buyer purchases.

The percentage of revenue a supplier obtains from a retailer reasonably reflects the retailer's bargaining power, and is consistent with Porter's (1980) notion that directing larger volume orders to fewer suppliers may alter the supplier's view of their buyer's importance. Revenue-derived bargaining power suggests that the retailer may be in a position to exert influence over supplier contract pricing decisions, inventory holding and product return policies, advertising expenditures, as well as influence the supplier's own investment and contracting decisions that may ultimately affect supplier operating and financial performance. For example, Levi-Strauss & Co. indicate in their 2002 10-K filing that strong buyer decisions to reduce the advertising of Levi-Strauss products in retailer's stores can have wide-ranging negative affects on the supplier's business.[39]

I use Compustat data to define measures of supplier financial performance. As discussed previously, supplier gross margin is one of the most prominent measures of supplier financial performance examined in prior literature. I define *GrossMargin_Rev* as the supplier's gross margin as a percentage of revenue. Gross margin represents the supplier's total revenue less cost of goods sold, defined as the supplier's beginning inventory balance, plus the sum of all costs allocated to the production and acquisition of goods, including raw materials, direct labor and overhead, plus any storage and delivery costs, minus the ending balance of inventory.

Because suppliers who have strong buyers may experience lower selling and marketing costs and enhancements in asset turnover, I consider other measures of supplier financial and operational performance. Specifically, I examine the association between buyer bargaining power and supplier operating return on sales (*OROS*), defined as the supplier's operating income

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[39] Specifically, Levi-Strauss & Co. state (2002 10-K): "A decision by a major customer, whether motivated by competitive considerations, strategic shifts, financial requirements or difficulties, economic conditions or otherwise, to decrease its purchases from us, to reduce the floor space, assortments, fixtures or advertising for our products or to change its manner of doing business with us, could adversely affect our business and financial condition."

after depreciation as a percentage of revenue. The bargaining power perspective suggests that buyer bargaining power will adversely affect supplier *OROS*. In addition, I examine two measures of supplier operational performance that may be affected by strong buyers. First, supplier inventory turnover (*Inv_Turn*) measures the supplier's cost of goods sold divided by the average inventory during the period. *Inv_Turn* represents the number of times the supplier sells the average inventory during the accounting period. Second, *Inv_Held* represents the percentage of a supplier's assets that are held in inventory. Strong buyers, seeking to maximize their own profitability, may require suppliers to stock enough inventory so that the buyer has sufficient quantities available in the event of high customer demand (Ozer and Wei 2006).

3.3.2   Descriptive Statistics

Table 13 reports sample descriptive statistics. On average, 63 percent of apparel supplier observations indicate that at least one buyer comprises a minimum of 10 percent of supplier revenue (i.e., the existence of a strong buyer). The mean (median) number of such strong buyers is 1.40 (1.00), indicating that some apparel suppliers have multiple strong buyers.[40] Mean (median) supplier revenue from these buyers is substantial, representing 25 (21) percent of supplier revenue. The largest buyer accounts for an average (median) of 16 (14) percent of supplier revenue, while the remaining strong buyers represent a mean (median) of 9 (0) percent of revenue. This evidence indicates that apparel suppliers frequently interact with strong buyers, and that strong buyer relationships likely have important economic consequences for suppliers.

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[40] During the sample period, 26 suppliers report zero major customers, 15 report one major customer, 19 report two major customers, 16 report three major customers, 3 report four major customers, 1 reports five major customers, 2 report six major customers and 1 reports seven major customers. A supplier may report a different number of major customers from year-to-year.

Table 13. Descriptive Statistics for Selected Variables**.**

I identify firms in the apparel industry by using Compustat and extracting all firms in the SIC code 2300-2390. After eliminations due to missing financial performance data, my final sample consists of 250 apparel-firm year observations for 56 publicly-traded apparel firms. The table shows distributions of observations by year and 4-digit SIC industry classification. The first subsample includes the 164 observations that have a major customer relationship disclosure (MCR = Y). The second subsample includes the 86 observations that do not have a major customer relationship disclosure (MCR = N). FAS131 MCR Disclosure equals one when the supplier discloses in its 10-K annual report any customer relationship that accounts for at least 10 percent of its revenues. Number of MCRs (#) is the number of major customer relationships disclosed by the supplier in a particular 10-K filing. Revenue from MCRs is the percentage of the supplier's revenue generated by the major customer disclosures. Revenue from Largest MCR (Revenue from Other MCRs) is the percentage of revenue generated by the largest (remaining) major customers. Total Assets (Total Revenues) is the book value of assets (revenue) reported in Compustat. Total Liabilities/Total Assets is the ratio of total current liabilities to book value of assets. *GrossMargin_*Rev is the ratio of gross margins to total revenue. OROS is the ratio of operating income after depreciation scaled by total revenue. Market Share is the percentage of revenues from the firm divided by total revenues in the firm's primary 4-digit SIC code. Inv_Turn is the ratio of cost of goods sold to average inventory. Inventory Held is the ratio of total inventory to total book value of assets. Results for the difference in means tests, using a two-tailed test, as shown for the MCR = Y subsample, where the difference between the subsample and its complement (MCR = N) is significant at either the 10 percent, 5 percent or 1 percent level (*, **, and ***, respectively). Results for the difference in medians tests, using a Wilcoxon two-sample test, as shown for the MCR = Y subsample, where the difference between the subsample and its complement (MCR = N) is significant at either the 10 percent, 5 percent or 1 percent level (*, **, and ***, respectively).

Variable	Full Sample (N=250)		MCR = Y (N=164)		MCR = N (N=86)	
	Mean	Median	Mean	Median	Mean	Median
Major Customer Relationships (MCR)						
FAS131 MCR Disclosure	0.63	1.00	--	--	--	--
Number of MCRs (#)	1.40	1.00	2.11	2.00	--	--
Revenue from MCRs	0.25	0.21	0.38	0.32	--	--
Revenue from Largest MCR	0.16	0.14	0.25	0.20	--	--
Revenue from Remaining MCRs	0.09	0.00	0.13	0.11	--	--
Buyer Characteristics (N = 20)						
Total Assets ($B)	12.19	5.13	--	--	--	--
Total Revenue ($B)	24.79	8.31	--	--	--	--
Supplier Financial Characteristics						
Total Assets ($B)	1.08	0.24	0.82**	0.24	1.58	0.24
Total Revenue ($B)	1.14	0.38	1.06	0.33	1.28	0.43
Total Liabilites / Total Assets	0.45	0.39	0.52 ***	0.42 ***	0.33	0.32
GrossMargin_Rev	0.36	0.38	0.33 ***	0.32 ***	0.42	0.42
OROS	0.07	0.07	0.07	0.07	0.07	0.08
Market Share	0.08	0.03	0.09	0.03	0.07	0.02
Supplier Operational Characteristics						
Inv_Turn	4.89	4.03	5.57 ***	4.37 ***	3.61	3.42
Inv_Held (% of Total Assets)	0.25	0.23	0.24 **	0.22 *	0.28	0.25

Table 13 provides descriptive statistics regarding the financial characteristics of both apparel suppliers and the 20 strong buyers identified by the suppliers as their significant major customers. The mean (median) strong buyer has $12.19 ($5.13) billion in total assets and $24.79 ($8.31) billion in total revenues. These strong buyers include large discount retailers (e.g., Wal-Mart Stores, Target Corp., JCPenney) and department stores (e.g., Macy's, Inc.). This difference among strong buyers may be important because the quality of apparel offered by these buyers is likely to vary. This suggests that the sample of apparel suppliers may produce varying qualities of apparel products, which may be associated with apparel firm financial performance.

For apparel suppliers, the mean (median) supplier has $1.08 ($0.24) billion in total assets and $1.14 ($0.38) billion in total revenues. Compared to their strong buyers, apparel suppliers have substantially smaller total assets and total revenues, on average. The mean (median) supplier has gross margin of 36 (38) percent of revenue, while mean (median) operating return on sales (OROS) for these suppliers is 7 (7) percent. Apparel suppliers possess relatively low mean (median) market share of 8 (3) percent. Combined, these descriptive statistics suggest that apparel suppliers likely possess relatively less bargaining power compared to their substantially larger strong buyers.

Table 13 also reports descriptive statistics regarding supplier inventory management capability. Mean (median) inventory turnover (*Inv_Turn*), which measures the rate of inventory movement from the supplier to the buyer, is 4.89 (4.03). Converted to days' inventory outstanding, these statistics indicate that the average supplier holds approximately 75 days of inventory. The percentage of assets held in inventory (*Inv_Held*) represents an average (median) of 25 percent (23 percent) of the supplier's total assets. That is, 25 percent of the average supplier's book value of assets consists of merchandise inventory held for sale. Because a

substantial portion of the supplier's total assets are held in inventory, this descriptive evidence suggests that efficient inventory management may be particularly important for apparel suppliers.

3.3.3   Buyer Bargaining Power and Supplier Characteristics

Table 13 also provides evidence on the differences between the subsample of apparel supplier observations that do (MCR = Y) and do not (MCR = N) report at least one strong buyer. For the subsample of 164 observations with a strong buyer, the mean (median) number of such buyers is 2.11 (2.00), and represents an average (median) of 38 (32) percent of their supplier's revenue. The largest strong buyer accounts for an average (median) of 25 (20) percent of their supplier's revenue, while the remaining strong buyers represent an average (median) of 13 (11) percent of revenue. These descriptive statistics reinforce the general perspective that apparel suppliers and their strong buyers have an economically important relationship.

Table 13 also reports differences in financial characteristics between the subsample of observations with a strong buyer compared to the subsample that does not have such a buyer. The mean supplier to a strong buyer has $0.82 billion in total assets, which is significantly smaller ($p < 0.05$) than those suppliers who do not have such a relationship ($1.58 billion). However, this difference is not significant when comparing the median book value of assets, which are $0.24 billion for both suppliers who do and do not have a strong buyer. Suppliers who have a strong buyer report significantly higher leverage, on average, compared to those who do not have such a buyer ($p < 0.01$). This suggests there may be an important association between supplier financial distress and the presence of a strong buyer. For example, struggling suppliers

may have a strong buyer because the supplier has a declining customer base. I control for measures of supplier size and financial distress in the multivariate analysis.

Consistent with the bargaining power perspective, which suggests that strong buyers adversely affect supplier financial performance, Table 13 reports that gross margin as a percentage of revenue (*GrossMargin_Rev*) for the subsample of suppliers who have a strong buyer is significantly lower ($p < 0.01$) than for those suppliers who do not have such a buyer. On average, gross margin is nearly 10 percentage points lower (33 percent of revenue) for suppliers with a strong buyer than for suppliers who do not have such a buyer (42 percent of revenue). This suggests that strong buyers may impose a combination of additional costs on the supplier's production and purchasing process, such as using their bargaining power to require suppliers to possess excess capacity in the event that demand for the buyer's products are higher than anticipated, while negotiating lower prices for the supplier's apparel goods. Taken together, this combination of lower prices and/or higher costs contributes to significantly lower ($p < 0.01$) gross margins for these suppliers.

Interestingly, Table 13 also reports that suppliers who do and do not have a strong buyer report statistically similar operating return on sales (*OROS*). Both suppliers who do and do not have a strong buyer report mean OROS of 7 percent of revenue. This evidence suggests that suppliers who do and do not have a strong buyer experience different costs between gross margin and operating income. In particular, suppliers with a strong buyer may have lower SG&A expenses because, for example, suppliers may capitalize on the buyers' advertising campaigns, reduce promotional expenses due to the longer-term nature of strong buyer contracts and leverage such relationships to attract other customers, each of which would contribute to lower SG&A expenses. Consistent with this argument, untabulated evidence suggests that such

suppliers report significantly lower ($p < 0.01$) SG&A expense as a percentage of revenue. The mean (median) SG&A expense for these suppliers is 24 (25) percent of revenue, nearly 10 percentage points lower than the SG&A expenses for those suppliers who do not have a strong buyer (33 percent of revenue at the mean and median). Consistent with the firm-efficiency hypothesis, this evidence suggests that suppliers who have a strong buyer appear to benefit from efficiency gains. This suggests that cost reductions, particularly, for SG&A expenses, may help offset gross margin declines, which yields statistically similar supplier profitability among those suppliers who do and do not have a strong buyer.

Table 13 also reports differences in operational characteristics between suppliers who do and do not have a strong buyer. Interestingly, supplier inventory turnover is significantly higher ($p < 0.01$), while the percentage of a supplier's assets held in inventory is significantly lower ($p < 0.05$), for those suppliers who have a strong buyer compared to those suppliers who do not have a strong buyer. Inventory turnover for suppliers who have a strong buyer is 5.57 (4.37) compared to 3.61 (3.42) for those suppliers who do not have a strong buyer. This indicates that an average supplier to a strong buyer holds 66 days of inventory, compared to the 101 days of inventory held by those suppliers who do not have such a buyer. The average (median) percentage of a supplier's assets held in inventory is 24 (22) percent of total assets for suppliers who have a strong buyer compared to an average of 28 (25) percent for suppliers who do not have a strong buyer. Consistent with the firm efficiency hypothesis, this evidence suggests that strong buyers may enhance their supplier's inventory management capabilities.

In summary, while there is evidence that suggests strong buyers adversely affect supplier gross margins, these suppliers also exhibit several important performance benefits. First, these suppliers report statistically similar operating return on sales compared to suppliers who do not

have a strong buyer. It appears that significantly lower SG&A expenses help to offset gross margin declines for suppliers who have a strong buyer. This suggests that there are efficiencies in working with a strong buyer through reductions in selling, advertising and marketing costs. Second, suppliers to strong buyers appear to exhibit enhanced inventory management capabilities. These suppliers report higher levels of inventory turnover and hold a lower percentage of total assets in inventory. Collectively, this evidence suggests that buyer bargaining power does not necessarily adversely affect supplier financial and operational performance. Instead, strong buyers may enhance important aspects of supplier performance.

In the next section, I present multivariate results which indicate that suppliers who have a strong buyer experience both financial and operational benefits from these relationships.

3.4 EMPIRICAL RESULTS

3.4.1 Buyer Bargaining Power and Supplier Financial Performance

Table 14 presents results from ordinary least squares regressions estimating the relationship between buyer bargaining power and supplier financial performance. In particular, Table 14 presents results from estimating the following models:

$GrossMargin\_Rev_t = \alpha + \beta_1 MCR_t + \beta_2 MCR1Broadline_t + \beta_3 PremiumSupplier_t + \beta_4 MarketShare_t + Controls + \varepsilon_t$ (1)

$OROS_t = \alpha + \beta_1 MCR_t + \beta_2 MCR1Broadline_t + \beta_3 PremiumSupplier_t + \beta_4 MarketShare_t + Controls + \varepsilon_t$ (2)

These regression models incorporate three measures of the relative bargaining power of buyers. First, *MCR* is an indicator variable equal to one when the supplier reports the existence of a major customer relationship. Second, I replace *MCR* with *MCRTotalRev*, which measures the total revenue the supplier receives from their major customer relationships. Third, I replace *MCR* with *MCR1Rev* and *RemainingMCRRev*, which measure the total revenue the supplier receives from their largest and remaining major customers, respectively.[41]

I include several additional variables in models (1) and (2) that may be associated with supplier financial performance. *MCR1Broadline* is an indicator variable equal to one when the supplier's largest strong buyer is particularly successful, as measured by whether or not the buyer is a top-10 firm in the Dow Jones U.S. Broadline Retailer Index.[42] Strong buyers that perform better than their peers may be more adept at managing their supply chain to benefit their own performance. As discussed previously, some apparel suppliers in my sample (i.e., Polo Ralph Lauren, Liz Claiborne) provide their apparel goods to department stores rather than to mass market discount retailers. This difference in supplier apparel quality may be associated with different levels of supplier financial and operational performance. To account for any potential difference, models (1) and (2) include an indicator variable equal to one when the apparel supplier identifies their largest strong buyer as a department store (*PremiumSupplier*).

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[41] In untabulated results, I replace *MCR* with the number of strong buyers the supplier discloses in their annual 10-K. All reported results remain statistically similar. In addition, because some suppliers disclose relationships that do not meet the FAS 131 disclosure requirements (e.g., the percentage of revenue the supplier derives from the strong buyer is less than the 10 percent rule), I replace *MCR* with all disclosures included in the supplier's annual 10-K. All reported results remain statistically similar. I also replace the amount of revenue derived from the remaining strong buyers with an indicator variable that equals one when the supplier has more than on strong buyer. All reported inferences are unaffected.

[42] The Dow Jones U.S. Broadline Retailer Index tracks the market performance of approximately 30 large retailers that offer a wide array of consumer goods in their stores. The top-10 performing firms during the sample period (2002-06) include Sears, Wal-Mart Stores, Costco, BJ's Wholesale, Big Lots, JCPenney and Target Corp. The worst performing firms include Family Dollar, The Bon-Ton Stores and Marks & Spencer.

Prior literature (i.e., Ravenscraft 1983, Cool and Henderson 1998) demonstrates that supplier bargaining power is positively associated with supplier financial performance, particularly supplier gross margin. I include the supplier's market share (*MarketShare*), measured as the ratio of supplier revenue to the total revenue of the supplier's 4-digit SIC code, as a control variable. Because evidence presented in Table 13 suggests that the presence of a strong buyer is associated with suppliers who have higher leverage, I include in both models three measures of supplier financial distress which Ohlson (1980) finds to be important predictors of firm bankruptcy. Specifically, I include *CashFlowOps_CurrentLiab*, measured as the ratio of cash flow from operations to current liabilities, *WorkingCap_Assets,* measured as difference between current assets and current liabilities divided by total assets, and *TLTA*, measured as the ratio of total liabilities to total assets. The regressions also incorporate the natural log of total assets to control for supplier size, and indicator variables to control for 4-digit SIC classifications in the apparel industry and potential year effects. All standard errors are adjusted for potential clustering within the sample.

3.4.1.1 Supplier Financial Performance: Gross Margin

Columns 1, 2 and 3 of Table 14 investigate the relationship between buyer bargaining power and supplier gross margins, *GrossMargin_Rev.* Consistent with the bargaining power perspective, as well as prior literature, Column 1 reports that suppliers who have a strong buyer (*MCR*) report significantly lower gross margins ($p < 0.03$). The coefficient on *GrossMargin_Rev* in Column 1 suggests that suppliers who have a strong buyer report approximately 17 percent (-0.06/0.36 = 17%) lower gross margin compared to the average supplier in the sample. For those suppliers who interact with a particularly successful strong buyer (*MCR1Broadline*), gross margin is directionally lower, but this result is not significant ($p < 0.19$). Suppliers who produce premium

apparel products report no significant difference in gross margin compared to those suppliers who produce products for mass market discount retailers (*PremiumSupplier*, p < 0.80). Consistent with prior literature, supplier bargaining power, measured by the supplier's market share in their 4-digit SIC industry (*Marketshare*), is associated with higher supplier gross margin (p < 0.10).

Column 2 of Table 14 provides additional evidence consistent with the bargaining power perspective. Column 2 reports that the total revenue suppliers receive from their strong buyers (*MCRTotalRev*) is negatively and significantly associated with gross margins (p < 0.00). For those suppliers who interact with a particularly successful strong buyer (*MCR1Broadline*), gross margin is directionally lower, but this result is not significant (p < 0.29). Suppliers who produce premium apparel products report no significant difference in gross margin compared to those suppliers who produce products for mass market discount retailers (*PremiumSupplier*, p < 0.93). Consistent with prior literature, supplier bargaining power (*Marketshare*) is associated with higher supplier gross margin (p < 0.08). These results are consistent with those reported in Column 1.

Table 14. Ordinary Least Squares Regressions Examining the Relationship between Buyer Bargaining Power and

Supplier Financial Performance**.**

This table examines the relationship between buyer bargaining power and measures of supplier financial performance. I identify suppliers in the apparel industry by using Compustat and extracting all firms in the SIC code 2300-2390. After eliminations due to missing financial performance data, my final sample consists of 250 apparel-firm year observations for 56 publicly-traded apparel suppliers. There are 164 observations that have a FAS 131 major customer relationship disclosure and 86 observations that do not have a major customer relationship disclosure. *GrossMargin_Rev* is the ratio of gross margins to total revenue. *OROS* is the ratio of operating income after depreciation scaled by total revenue. *MCR* equals one when the supplier discloses in its 10-K annual report any customer relationship that accounts for at least 10 percent of its revenues. *MCRTotalRev* is the percentage of the supplier's revenue generated by major customers. *MCR1Rev* is the percentage of the supplier's revenue generated by the largest major customer. *RemainingMCRRev* is the percentage of revenue generated by the remaining major customers. *MCR1Broadline* equals one when the major customer is a member of the Dow Jones Broadline Retailer index. *PremiumSupplier* equals one when the apparel supplier identifies a department store as their largest major customer. *Marketshare* is the ratio of supplier revenue to the total revenue of the supplier's 4-

digit SIC industry. *lnAssets* is the natural log of book value of assets reported in Compustat. *TLTA* is the ratio of total current liabilities to book value of assets. *CashFlowOps_CurrentLiab* is the ratio of supplier cash flow from operations to current liabilities, while *WorkingCap_Assets* is the ratio of supplier working capital to total assets. P-values (two-tailed) are reported in parentheses below the coefficient estimate.

	(1)	(2)	(3)	(4)	(5)	(6)
	GrossMargin_Rev	GrossMargin_Rev	GrossMargin_Rev	OROS	OROS	OROS
MCR	-0.06	-	-	0.04	-	-
	(0.03)			(0.01)		
MCRTotalRev	-	-0.16	-	-	0.07	-
		(0.00)			(0.05)	
MCR1Rev	-	-	-0.14	-	-	0.13
			(0.06)			(0.06)
RemainingMCRRev	-	-	-0.20	-	-	-0.05
			(0.01)			(0.41)
MCR1Broadline	-0.04	-0.03	-0.03	-0.01	-0.01	-0.01
	(0.19)	(0.29)	(0.26)	(0.76)	(0.79)	(0.59)
PremiumSupplier	-0.01	-0.01	-0.01	-0.05	-0.04	-0.04
	(0.80)	(0.93)	(0.89)	(0.00)	(0.00)	(0.00)
MarketShare	0.30	0.31	0.31	0.06	0.05	0.03
	(0.10)	(0.08)	(0.09)	(0.35)	(0.43)	(0.68)
lnAssets	0.01	-0.01	-0.01	0.02	0.02	0.02
	(0.64)	(0.60)	(0.64)	(0.01)	(0.00)	(0.00)
TLTA	-0.01	-0.03	-0.03	0.02	0.03	0.02
	(0.80)	(0.44)	(0.42)	(0.35)	(0.31)	(0.31)
CashFlowOps_CurrentLiab	0.05	0.05	0.05	0.05	0.06	0.05
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
WorkingCap_Assets	0.01	-0.04	-0.04	0.03	0.04	0.03
	(0.86)	(0.47)	(0.41)	(0.50)	(0.25)	(0.48)
4-digit SIC Indicator Variables	Y	Y	Y	Y	Y	Y
Year Indicator Variables	Y	Y	Y	Y	Y	Y
Intercept	0.37	0.45	0.45	-0.06	-0.08	-0.08
	(0.00)	(0.00)	(0.00)	(0.20)	(0.09)	(0.09)
Adj. R-sqr	0.37	0.41	0.41	0.34	0.34	0.38
n	250	250	250	250	250	250

Column 3 of Table 14 provides additional evidence which is consistent with Columns 1 and 2. Specifically, Column 3 reports that the total revenue suppliers receive from their largest strong buyer (*MCR1Rev*) is negatively and significantly associated with gross margins (p < 0.06). In addition, the total revenue suppliers receive from their remaining strong buyers

(*RemainingMCRRev*) is also negatively and significantly associated with gross margins (p < 0.01). For those suppliers who interact with a particularly successful strong buyer (*MCR1Broadline*), gross margin is directionally lower, but this result is not significant (p < 0.26). Suppliers who produce premium apparel products report no significant difference in gross margin compared to those suppliers who produce products for mass market discount retailers (*PremiumSupplier*, p < 0.89). Consistent with prior literature, supplier bargaining power (*Marketshare*) is associated with higher supplier gross margin (p < 0.09). Collectively, the results in Columns 1-3 of Table 14 suggest that strong buyers adversely affect supplier gross margins, which is consistent with prior literature and the bargaining power perspective.

3.4.1.2 Supplier Performance: Profit Margin

Columns 4, 5, and 6 of Table 14 extend prior literature by investigating whether buyer bargaining power affects aspects of supplier financial performance other than gross margins. As discussed previously, the firm-efficiency hypothesis predicts that the presence of a strong buyer will be associated with enhanced supplier efficiency. Consistent with suppliers reaping benefits from their strong buyer relationships, and contrary to the bargaining power perspective, Column 4 reports that suppliers who have a strong buyer (*MCR*) report significantly higher operating return on sales (p < 0.01), defined as supplier operating income after depreciation scaled by total revenues, compared to those suppliers who do not have such a buyer. The coefficient on *OROS* in Column 4 suggests that suppliers who have a strong buyer report approximately 57 percent (0.04/0.07 = 57%) higher OROS compared to the average supplier in the sample. This result suggests that suppliers who have a strong buyer experience significantly lower SG&A expense compared to suppliers who do not have a strong buyer. This result is not affected by whether the buyer is particularly successful (*MCR1Broadline,* p < 0.76) or the supplier's bargaining power

(*MarketShare*, p < 0.35). However, apparel suppliers who produce higher quality goods report significantly lower OROS (p < 0.00), perhaps because these suppliers maintain significant selling, marketing and promotional expenses even when interacting with strong buyers.

Columns 5 and 6 of Table 14 provide additional evidence consistent with the firm efficiency hypothesis. Column 5 reports that the total revenue suppliers receive from their strong buyers (*MCRTotalRev*) is positively and significantly associated with higher operating return on sales (p < 0.05). Interestingly, Column 6 reports that this result is driven primarily by the supplier's largest strong buyer (*MCR1Rev*, p < 0.06), while the revenue from the supplier's remaining strong buyers is not significantly associated with operating return on sales (*RemainingMCRRev*, p < 0.41). While these results support the viewpoint that suppliers who have a strong buyer experience significantly lower SG&A expense compared to suppliers who do not have a strong buyer, such efficiency gains appear most prominent when the supplier has one, rather than multiple, strong buyers. This result is not affected by whether the buyer is particularly successful (*MCR1Broadline,* p < 0.79, p < 0.59 in Columns 5 and 6, respectively) or supplier bargaining power (*MarketShare*, p < 0.43, p < 0.68). Consistent with Column 4, apparel suppliers who produce higher quality goods report significantly lower OROS (p < 0.00 in both columns). One interpretation of this result is that these suppliers (e.g., Polo Ralph Lauren) maintain higher levels of SG&A expenses (e.g., continuing national advertising campaigns) even when interacting with strong buyers.

In summary, the evidence in Table 14 extends prior literature by examining the association between buyer bargaining power and multiple measures of supplier financial performance. Consistent with the bargaining power hypothesis, strong buyers are associated with lower supplier gross margins. This evidence indicates that these suppliers experience a

combination of higher production costs and lower sales prices. This combination of higher costs and lower prices significantly reduces supplier gross margin. Interestingly, suppliers who have a strong buyer also report significantly higher operating return on sales. This indicates that suppliers benefit from lower SG&A expenses which more than offsets gross margin declines. However, suppliers who have multiple strong buyers appear unable to reap sufficient SG&A reductions to offset declines in gross margins. This leads to significantly lower OROS for these suppliers. Overall, the evidence suggests that, while strong buyers may take a share of efficiency gains via supplier gross margins, suppliers are able to retain a share of these gains through lower operating expenses. In the next subsection, I further extend prior literature by examining the association between buyer bargaining power and supplier operational performance.

3.4.2 Buyer Bargaining Power and Supplier Operational Performance

Table 15 investigates the association between buyer bargaining power and supplier operational performance. In particular, Table 15 presents results from estimating the following models:

$$OpsPerf_t = \alpha + \beta_1 MCR_t + \beta_2 MCR1Broadline_t + \beta_3 PremiumSupplier_t + \beta_4 MarketShare_t + Controls + \varepsilon_t \qquad (3)$$

OpsPerf represents two measures of supplier operational performance defined previously – *Inv_Turn,* and *Inv_Held*. Consistent with models (1) and (2), regression model (3) replaces *MCR* with *MCRTotalRev*, and *MCR1Rev* and *RemainingMCRRev* as alternative measures of buyer bargaining power relative to their supplier. The remaining independent variables are identical to those included in models (1) and (2).

3.4.2.1 Supplier Performance: Asset Turnover

Columns 1, 2 and 3 of Table 16 investigate the relationship between buyer bargaining power and supplier inventory turnover, *Inv_Turn*. As discussed previously, *Inv_Turn* measures the rate of movement of goods from the apparel supplier to their buyers, with a higher rate of turnover preferred to a lower rate. Results in Column 1 indicate that suppliers who have a strong buyer (*MCR*) report significantly higher inventory turnover ($p < 0.03$). The coefficient on *Inv_Turn* in Column 1 suggests that suppliers who have a strong buyer report a 20 percent higher (60 days/75 days = 20%) rate of inventory turnover compared to the average supplier in the sample.

In addition, when the supplier's largest strong buyer is particularly successful (*MCR1Broadline*) the supplier's inventory turnover is significantly higher ($p < 0.06$). This suggests that the forecast information obtained from these buyers, which are the best performers in the Dow Jones U.S. Broadline Retailer Index, possesses particularly valuable information for managing the supplier's production and inventory process compared to those suppliers who have strong buyers who are not members of the top 10 performers on this index. Suppliers frequently indicate that their strong buyers provide information in advance of other customers, which enables the supplier to enhance the coordination of their manufacturing and purchasing processes. The results in Column 1 suggest that this information may provide inventory control benefits to the supplier and that successful strong buyers provide particularly valuable demand information. The results indicate that supplier inventory turnover is not associated with the quality of the supplier's products or supplier bargaining power ($p < 0.70$, $p < 0.61$, respectively). The evidence presented in Column 1 suggests that suppliers who have a strong buyer experience higher levels of inventory turnover.

Table 15. Ordinary Least Squares Regressions Examining the Relationship between Buyer Bargaining Power and

Supplier Operational Performance**.**

This table examines the relationship between buyer bargaining power and measures of supplier operational performance. I identify suppliers in the apparel industry by using Compustat and extracting all firms in the SIC code 2300-2390. After eliminations due to missing financial performance data, my final sample consists of 250 apparel-firm year observations for 56 publicly-traded apparel suppliers. There are 164 observations that have a FAS 131 major customer relationship disclosure and 86 observations that do not have a major customer relationship disclosure. *Inv_Turn* is the ratio of cost of goods sold to average inventory. *Inv_Held* is the ratio of total inventory to total book value of assets. *MCR* equals one when the supplier discloses in its 10-K annual report any customer relationship that accounts for at least 10 percent of its revenues. *MCRTotalRev* is the percentage of the supplier's revenue generated by major customers. *MCR1Rev* is the percentage of the supplier's revenue generated by the largest major customer. *RemainingMCRRev* is the percentage of revenue generated by the remaining major customers. See Table 14 for definitions of the remaining independent variables. P-values (two-tailed) are reported in parentheses below the coefficient estimate.

	(1) Inv_Turn	(2) Inv_Turn	(3) Inv_Turn	(4) Inv_Held	(5) Inv_Held	(6) Inv_Held
MCR	1.15 (0.03)	-	-	-0.05 (0.07)	-	-
MCRTotalRev	-	7.19 (0.00)	-	-	-0.17 (0.00)	-
MCR1Rev	-	-	11.06 (0.00)	-	-	-0.24 (0.00)
RemainingMCRRev	-	-	1.04 (0.77)	-	-	-0.03 (0.70)
MCR1Broadline	2.69 (0.06)	2.03 (0.07)	1.97 (0.05)	-0.01 (0.74)	-0.01 (0.88)	0.00 (0.89)
PremiumSupplier	0.28 (0.70)	-0.46 (0.49)	-0.29 (0.64)	0.04 (0.15)	0.05 (0.05)	0.04 (0.07)
MarketShare	-1.30 (0.61)	-1.99 (0.40)	-3.37 (0.20)	0.22 (0.04)	0.24 (0.02)	0.27 (0.01)
lnAssets	-0.88 (0.01)	-0.35 (0.25)	-0.26 (0.39)	-0.03 (0.00)	-0.04 (0.00)	-0.04 (0.00)
TLTA	-1.57 (0.03)	-1.06 (0.11)	-1.50 (0.10)	0.09 (0.01)	0.08 (0.01)	0.09 (0.01)
CashFlowOps_CurrentLiab	1.59 (0.05)	1.56 (0.03)	1.42 (0.01)	-0.06 (0.00)	-0.06 (0.00)	-0.06 (0.00)
WorkingCap_Assets	-4.53 (0.01)	-1.87 (0.23)	-2.85 (0.12)	0.19 (0.00)	0.14 (0.02)	0.16 (0.01)
4-digit SIC Indicator Variables	Y	Y	Y	Y	Y	Y
Year Indicator Variables	Y	Y	Y	Y	Y	Y
Intercept	9.91 (0.00)	5.31 (0.01)	5.36 (0.01)	0.36 (0.00)	0.45 (0.00)	0.45 (0.00)
Adj. R-sqr	0.25	0.37	0.37	0.42	0.46	0.47
n	250	250	250	250	250	250

Columns 2 and 3 of Table 15 provide additional evidence which indicates that suppliers experience efficiency gains in the presence of a strong buyer. Specifically, Column 2 reports that the total revenue suppliers receive from their strong buyers (*MCRTotalRev*) is positively and significantly associated with supplier inventory turnover ($p < 0.00$). Interestingly, Column 3 reports that this result is driven primarily by the supplier's largest strong buyer (*MCR1Rev*, p <

0.00), while the revenue from the supplier's remaining strong buyers is not significantly associated with inventory turnover (*RemainingMCRRev*, p < 0.77). This insignificant relation suggests that inventory turnover benefits accrue to the presence of the first strong buyer. Suppliers may not learn valuable new information about the demand for its products from the forecasts of multiple strong buyers. Thus, possessing one buyer's demand forecast provides the information necessary to enhance inventory control, but additional information may not enable the supplier to further enhance inventory management capabilities.

Columns 2 and 3 of Table 15 also report that suppliers who interact with a particularly successful strong buyer (*MCR1Broadline*) have significantly higher asset turnover (p < 0.07 and p < 0.05, respectively). This suggests that the forecast information obtained from these buyers, which are the best performers in the Dow Jones U.S. Broadline Retailer Index, possesses particularly valuable information for managing the supplier's production and inventory process compared to those suppliers who have strong buyers who are not members of the top 10 performers on this index. Suppliers who produce premium apparel products report no significant difference in inventory turnover compared to those suppliers who produce products for mass market discount retailers (*PremiumSupplier*, p < 0.49, p < 0.64). Supplier bargaining power (*Marketshare*) is also insignificant (p < 0.40, p < 0.20). Overall, the presence of a strong buyer is associated with the supplier's ability to manage their rate of inventory turnover.

Columns 4, 5 and 6 of Table 15 examine whether strong buyers are associated with the book value of inventory that suppliers hold (*Inv_Held*). Evidence consistent with an association between a strong buyer and supplier inventory management efficiency would show that such suppliers hold a lower percentage of total assets in inventory. Results in Column 4 indicate that suppliers who have a strong buyer (*MCR*) report a significantly lower percentage of inventory

held (p < 0.07) compared to a supplier who does not have such a buyer. The coefficient on *Inv_Turn* in Column 4 suggests that suppliers who have a strong buyer hold 20 percent (-0.05/0.25 = 20%) less inventory compared to the average supplier in the sample. Based on the average value of inventory held by apparel suppliers, this result suggests suppliers who have a strong buyer hold approximately $40 million less in inventory.

Consistent with Column 4, Column 5 reports that the total revenue suppliers receive from their strong buyers (*MCRTotalRev*) is positively and significantly associated with supplier inventory turnover (p < 0.00). Interestingly, Column 3 reports that this result is driven primarily by the supplier's largest strong buyer (*MCR1Rev*, p < 0.00), while the revenue from the supplier's remaining strong buyers is not significantly associated with the percentage of assets held in inventory (*RemainingMCRRev*, p < 0.70). This insignificant relation suggests that inventory management benefits accrue to the presence of the first strong buyer. Suppliers may not learn valuable new information about the demand for its products from the forecasts of multiple strong buyers. Thus, possessing one buyer's demand forecast provides the information necessary to enhance inventory control, but additional information may not enable the supplier to further enhance inventory management capabilities.

Columns 5 and 6 also report that suppliers of premium apparel report significantly higher percentages of assets held in inventory (p < 0.05, p < 0.07, respectively). Several of the premium apparel suppliers in the sample include suppliers who also have their own retail outlets (e.g., Polo Ralph Lauren, Guess Inc., Levi-Strauss & Co.) It is possible that these suppliers may hold a larger percentage of assets in inventory because of the differing demands of supplying their strong buyers compared to their own retail outlets. Columns 5 and 6 also report that

supplier bargaining power (*Marketshare*) is also positively associated with the percentage of assets held in inventory ($p < 0.02$, $p < 0.01$, respectively).

In summary, the evidence in Table 15 extends prior literature by examining the association between buyer bargaining power and measures of supplier asset turnover. Consistent with the potential benefits available to suppliers from strong buyer relationships, suppliers who have a strong buyer report enhanced inventory management capabilities. One interpretation of these results is that strong buyers provide their suppliers with valuable information regarding future demand for the supplier's products. This information, in turn, enhances the supplier's ability to manage the production and inventory management process. However, for suppliers who have multiple strong buyers, there appears to be no additional inventory efficiency benefits from dealing with multiple strong buyers.

3.5   ROBUSTNESS TESTS

The sample used in the prior analysis contains observations for all apparel suppliers present in Compustat for at least one year during the five year sample period. Consolidation in the apparel industry, along with general competitive pressures, has contributed to the exit of several apparel suppliers from the industry. These suppliers may be systematically different from those suppliers who survive. For example, suppliers who are acquired or exit the apparel industry may be unable to control inventory levels, or may rely extensively on revenue from multiple strong buyers.

I exclude from my analysis five suppliers who are present in the sample for fewer than three years. These suppliers account for 10 observations, resulting in an adjusted sample

consisting of 240 (rather than 250) firm-year observations. I re-estimate all regression models reported in Tables 14 and 15 to examine whether the results previously reported are unduly influenced by suppliers who are likely to have either been acquired or exited the apparel industry during the sample period. All reported inferences remain unaffected.

3.6   LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

This chapter extends prior literature by examining the association between buyer bargaining power and supplier financial and operational performance beyond supplier gross margins. I adopt an organizing framework for supplier performance measurement that examines two fundamental elements of firm profitability: profit margin and asset turnover. An improvement in either measure without a decline in the other will enhance return on invested capital. Using the supplier's FAS 131 major customer disclosure as a proxy for the presence of a relatively more powerful buyer ("strong" buyer), I find that strong buyers are associated with efficiency gains for their suppliers via lower supplier SG&A expenses and enhancements in inventory management capabilities. In addition, while strong buyers capture a share of these gains through lower supplier gross margins, suppliers also retain a share of these gains, which yields higher overall supplier financial performance.

Interestingly, the available efficiency gain for suppliers is not strictly increasing in the number of strong buyers. I find that suppliers to multiple strong buyers are unable to achieve gains that are large enough to offset lower gross margins. I also find that suppliers to multiple strong buyers are unable to incrementally obtain inventory management efficiencies. One interpretation of these results is that such suppliers are unable to manage effectively the demands

of multiple strong buyers because these demands are not synchronized. The additional stochasticity induced in the suppliers' environment may contribute to declines in asset turnover and lower profit margins. Overall, the evidence indicates that strong buyers do not extract all the gains to trade from their relatively weaker suppliers, while suppliers to multiple strong buyers are unable to achieve sufficient efficiency gains to offset gross margin declines.

The sample in this chapter is based on buyer-supplier relationships from the apparel industry, which possesses important characteristics that suggest strong buyers interact with weaker suppliers. This sample construction also controls for potential differences in manufacturing, purchasing and contracting relationships between the buyer, their suppliers and the supplier's downstream supply chain partners. However, as with most studies that focus on one industry, the results may not generalize to other industries. Future research could examine the relationship between buyer bargaining power and supplier performance using a more detailed sample. For example, access to specific contracts from a large sample of buyer-supplier relationships may provide additional insight regarding *how*, rather than *whether*, strong buyers use their bargaining power to extract gains while enhancing supplier efficiency.

4.0 CONCLUDING REMARKS

This dissertation contributes to the existing literature in two fundamental ways. First, Chapter 2 presents evidence that measures of process alignment and detailed information exchange are nonfinancial indicators of future supply chain financial performance. In addition, the chapter indicates that the information contained in these measures is emphasized in the performance evaluation and rewards process. Taken together, these results suggest that despite the potential difficulties in measuring nonfinancial performance between firms, such measures can have an important role in the design of management control systems that monitor and evaluate supply chain performance.

Chapter 2 also presents evidence that evaluators may emphasize the same set of performance measures in different ways depending on the economic importance of the evaluation. In addition, various contextual factors of supply chain relationships, such as relationship exclusivity, may have a moderating affect on the emphasis placed on performance measures in the performance evaluation and rewards process. These results suggest that once management control system designers select a set of performance measures, individual evaluators and contextual factors of the measurement environment may affect how these measures are ultimately emphasized in the performance evaluations and rewards process.

The second fundamental contribution of this dissertation arises from the analyzing whether relative bargaining power among supply chain partners affects supply chain

performance. Chapter 3 extends prior literature by examining the association between buyer bargaining power and supplier financial and operational performance beyond supplier gross margins. I adopt an organizing framework for supplier performance measurement that examines two fundamental elements of firm profitability: profit margin and asset turnover. An improvement in either measure without a decline in the other will enhance return on invested capital. Using the supplier's FAS 131 major customer disclosure as a proxy for the presence of a relatively more powerful buyer ("strong" buyer), I find that strong buyers are associated with efficiency gains for their suppliers via lower supplier SG&A expenses and enhancements in inventory management capabilities. In addition, while strong buyers capture a share of these gains through lower supplier gross margins, suppliers also retain a share of these gains, which yields higher overall supplier financial performance.

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Overall, this dissertation highlights how the supply chain context affects our existing knowledge of the relationship between performance measurement, performance evaluation and rewards, relative bargaining power and supply chain performance.

APPENDIX A

EVOLUTION OF THE LUBRICANT DISTRIBUTION BUSINESS AND THE OPERATION OF LUBRICANT DISTRIBUTOR INCORPORATED

A.1   BACKGROUND

Lubricant products are produced from crude oil. According to the Energy Information Administration, which provides official statistics on behalf of the U.S. Department of Energy, in 2006, the average U.S. refinery produced 0.48 gallons of lubricants from each barrel of crude oil input into the refining process. These lubricants are used in a wide variety of settings by many different industries. Examples of lubricants include oils used in internal combustion engines, turbines and compressors, oils used to facilitate heat transfer or for use in hydraulic pumps, and greases used to lubricate bearings, gears and other machine components. Many lubricants are especially designed for particular industries, including aviation, marine and railroads. The delivery of lubricants to end customers has evolved over time, from a vertically-integrated arrangement in the 1970s known as consignees, to the use of independent distributors, which dominates lubricant delivery today. In this appendix, I discuss the evolution of the lubricant distribution business and describe in detail the operation of a typical lubricant distributor.

A.1.1　Consignees

Prior to the 1970s, most major lubricant manufacturers sold their products directly to end-use customers (i.e., manufacturing facilities, automobile dealerships) and managed the local delivery of package and bulk products via an extensive network of Consignees throughout the U.S.

Consignees were contractors who operated a lubricant distribution facility on behalf of the manufacturer. The consignee did not own the distribution facility. Instead, the manufacturer owned the facility and stocked it with product on consignment. A consignee's primary business may have been 'package-only' or 'package-plus-bulk' delivery. A 'package-only' consignee sold product that was packaged by the manufacturer at its refinery or blending facility. A 'package-plus-bulk' consignee sold packaged product and maintained between two and ten bulk tanks that each contained 3,000 gallons to 6,000 gallons of lubricant. The consignee of a bulk delivery facility typically had a refined fuel tankwagon or bobtail tanker truck (2,000 gallon to 3,000 gallon capacity) to deliver bulk lubricant products and a small truck for package deliveries. The consignee was paid a fee by the manufacturer to operate the distribution facility and deliver lubricants, as directed, to end customer accounts sold by the manufacturer's sales force. The consignee managed and delivered only the manufacturer's branded products, and was not allowed to warehouse or deliver lubricants from competing manufacturers.

A.1.2　From Consignees to Distributors

Throughout the 1970s and into the 1980s, manufacturers sold their consignee locations to the consignees themselves or to an entrepreneur, who became a contractually-authorized distributor of the manufacturers' products.

Distributors, who owned and operated their facility since the transition from the consignee arrangement, purchased lubricant products from the "legacy" manufacturer and sold them to the end customer. Distributors eventually began to expand their business beyond those customers that were migrated from the Consignee arrangement in two important ways. First, the distributors began to sell the legacy manufacturer's products to new customer accounts cultivated by its own sales force. Second, distributors began to sell related, non-lubricant ancillary products (i.e., oil filters, transmission fluids, oil cleanup products, storage tanks, fluid level devices, lubricant dispensing equipment) to its customers. Independent operators started their own lubricant distributorships by either purchasing existing facilities suitable for lubricant storage or building their own facilities. A large distributor in the late 1980s sold approximately 400,000 gallons of lubricants per year. Most manufacturers had well over 1,000 independent distributors throughout the U.S. market alone.

From the late 1980s through the 1990s, the daily management of most distributors was passed from the Principal, who was the original consignee or founder of the business, to the next generation of family members (Gen2). Typical Gen2 management training consisted of working for the distributor, learning operations, dispatching and sales activities, followed by managing one part of the business for several years. This Gen2 manager began overseeing the entire business either when deemed capable by the Principal or when the Principal became unable to manage the business (i.e., advanced age, health issues).

An important shift in lubricant distribution occurred when Gen2 began managing the business. In particular, Gen2 distributors began to migrate away from selling a single manufacturer's brand and began to carry lubricant products from multiple major manufacturers. Brand expansion required significant capital investment to enlarge bulk and package facilities,

add delivery vehicles and increase employment. To achieve a return on their capital investment, Gen2 distributors expanded their geographic territories, enabling them to cover a larger area from one location. In turn, manufacturers, who had relationships with over 1,000 distributors of varying sizes, began to shift their business towards using fewer, higher volume distributors who employed more sales people who could promote the manufacturer's products in the marketplace. These forces contributed to a rapid change in distributor size and scope, with the annual lubricant volume of a large Gen2 distributor reaching 1,250,000 gallons in the 1990s - approximately 300 percent more than the volume of a large distributor only a decade earlier.

Manufacturers began reducing the number of authorized branded distributors beginning in the early 1990s, and this trend continues today. Many of these "displaced" distributors' lubricant businesses were absorbed by geographically contiguous distributors whose success enabled them to expand their business. By 2007, a large distributor sold around 2,000,000 gallons of lubricants per year.

In the next section, I describe the operation of a large lubricant distributor operating in 2007 and highlight the frequent interactions between manufacturer's and their distributors.

A.2   LUBRICANT DISTRIBUTORS INCORPORATED

Lubricant Distributor Incorporated (LDI, disguised name) is a typical distributor of industrial and commercial lubricants. Distributors purchase their products directly from the refining companies and generally sell them to the users of those products (i.e., industrial facilities). In essence, a distributor acts as the "middleman" between the companies that refine the lubricants and those that use them. The LDI facility is located in an industrial park near an interstate highway

approximately two hours from a major east coast city. This location enables LDI to distribute a variety of lubricants, ancillary products, and lubricant-related services and equipment throughout a large geographic footprint, which includes the western region of the state, as well as areas in three neighboring states.

LDI employs approximately 20 people at its facility, divided between salespersons, warehouse personnel and delivery drivers. The largest fraction of workers is salespersons. The sales force is responsible for visiting existing and prospective customer accounts to insure customer satisfaction with existing products. They also attempt to convert potential customers from a competing lubricant to a product that LDI distributes. Major lubricant manufacturers recognize that salespeople require sales support in converting accounts from a competing lubricant to the manufacturer's brand. To support distributor salespeople, manufacturers offer routine sales training, extensive sales literature, lubricant product technical specifications and other direct sales support to assist distributors in their selling efforts. Manufacturers also offer assistance to the distributor with the development of an overall selling and marketing strategy, and encourage the distributor to improve their knowledge of the marketplace and customer base within the distributor's geographic footprint. In total, LDI distributes 1,660,000 million gallons of lubricants per year.

Approximately 80 percent of LDI's lubricant products are purchased from a single major manufacturer. The remaining 20 percent of LDI's lubricants are fragmented between two other major lubricant manufacturers because the company seeks to offer its customer base a suite of high, medium and low-end lubricants. Customers seek a broad range of product quality in their purchasing decisions. For example, some customers prefer to use only the highest quality industrial synthetic lubricants when maintaining their manufacturing, mining or aviation

equipment, while other customers prefer lower-grade lubricants for use in commercial vehicles. Carrying competing manufacturers' lubricants may also provide the distributor with some bargaining power in its working relationships with major manufacturers.

Individual customers may require a mix of both high-grade and lower grade lubricants. For example, an industrial facility may select high-grade synthetics to maintain sensitive gears and bearings, which provides resistance to oxidation, thermal degradation and corrosion (reducing replacement costs, extending filter life) while possessing good demulsibility that permits water and contaminants to separate readily from the oil (improving operating efficiency, lowering operating costs). The same facility may also use general purpose greases to protect equipment that operates in low severity conditions against rust and wear (reduced maintenance and un-scheduled stoppages). Major petroleum manufacturers, such as International Petroleum Corporation (IPC, disguised name), produce a variety of quality lubricants from superior petroleum base stocks that meet most customer's requirements.

IPC's principal oil blending facility is located approximately 150 miles from LDI. The IPC facility blends a full line of lubricants, including synthetics. LDI predominately distributes IPC lubricants because their customer base has grown to rely on the superior performance and reliability of IPC products. Equally important, because LDI is the end customer's supplier of IPC products, the customer base is satisfied with the performance of LDI as their service provider. A significant portion of a distributor's customer base would consider switching lubricant brands in order to continue using the same distributor.

To obtain its lubricants, LDI places an order directly with IPC, which requires a three day lead time. IPC guidelines allow LDI to order up to three different bulk products for a combined minimum volume of 6,000 gallons, and at least 20 pallets of packaged products with the option

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to mix no more than five of these pallets. Each bulk product is 2,000 gallons to 6,000 gallons of a single lubricant and is transported by either a single or a multi-compartment tanker truck to the LDI facility. A mixed pallet is a mix-and-match of lubricant products packaged by the manufacturer in 55 gallon drums, 120 pound barrels, 12 gallon metal or plastic pails and other packaged lubricant products (i.e., passenger car motor oils) that the distributor would like to have in stock, but not in large (bulk) quantities. All orders are transported to the LDI facility by a common carrier. Common carriers are independent firms that operate tanker and delivery trucks to transport products that they do not own in exchange for a flat freight rate payment. Sales of lubricants from IPC to LDI are on a Free On Board blending facility basis (FOB Origin). That is, LDI assumes title and control over the order when the common carrier signs the bill of lading at the blending facility and assumes all risks of transporting the lubricant products. LDI typically submits three bulk orders and two package orders per week with IPC.

When orders arrive at LDI's facility, lubricants are pumped from the common carrier's tanker into LDI's bulk tank operation, which consists of 22 large, dedicated storage tanks that can hold up to 6,000 gallons of lubricant per tank. Each tank is dedicated for a particular type of lubricant product. These designations are important because mixing different types of lubricants or lubricants from different manufacturers can significantly degrade technical specifications and lead to lubricant failure at the customer's premises. IPC has strict storage, handling and monitoring procedures it requests the distributors to follow closely. For example, distributors are requested to routinely inspect tanks for leakage, frequently monitor the water levels in storage tanks, and sample each lubricant to insure that it is not "going stale" in the tank due to low inventory turnover. Improper storage, handling and delivery of IPC's lubricants by a distributor may negatively impact IPC's product quality and damage its reputation in the marketplace.

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LDI makes daily delivery runs throughout its geographic territory. LDI delivers bulk orders to its customers at regularly scheduled intervals (i.e., daily, weekly, bi-weekly) using one of three multi-compartment refined fuel tankwagons that LDI owns and operates. Distributors use metering devices to measure the amount of product loaded into a tankwagon for that portion of the day's delivery schedule. Similar to bulk storage tanks, the tanker compartments are dedicated to specific lubricant product families or ancillary products to preserve product quality. For example, IPC guidelines do not allow any lubricants to be pumped into compartments that previously contained automatic transmission fluid because the fluid's residual red dye discolors any lubricant pumped out of that compartment. Because the distributor would like to minimize lubricant handling, only the exact amount of product required by the customer on a specific delivery run is pumped into the tanker truck. Depending on the volume capacity, number of compartments, and the size and nature (traffic) of the delivery geography, a single truck may make up to three trips daily. Residual lubricants that remain on the truck after each delivery run is complete are pumped back into the proper bulk storage tank. IPC provides written guidelines to LDI on acceptable product staging and delivery procedures.

While it is important for LDI to possess the capabilities for distributing bulk orders, customers also require a large amount of packaged lubricants. LDI has a 25,000 square foot warehouse for storing packaged products on pallets. The facility is equipped with the physical assets necessary to both store manufacturer-packaged lubricants and to re-package lubricants stored in bulk tanks. Re-packaging is a process that transfers lubricant from LDI's bulk storage tanks into 55 gallon drums, 120 pound barrels or 5 gallon plastic or metal pails, whichever the customer prefers. The re-packaging process must adhere to IPC and LDI guidelines for employee safety, environmental assurance, product quality and IPC brand recognition. Once the

re-packaging process is complete, the drums, barrels and pails are briefly stored in the warehouse until picked for a customer's order.

One day before the customer's scheduled delivery date, warehouse employees assemble the packaged and re-packaged products onto pallets to complete a customer order. Customer orders are stage-loaded into delivery trucks with the first order to be delivered staged closest to the door. To deliver these mixed-pallet customer orders, LDI manages a small fleet of delivery trucks. Every morning, these trucks are loaded with pallets of lubricants and ancillary products to be delivered to the customer location. At the end of a delivery run, the trucks return to the facility with any empty drums, kegs or pails that are picked up from the customer premises. LDI sends used packaging to an environmentally licensed recycler who cleans, refurbishes, paints and returns the packaging to LDI for future use.

A.3 DISTRIBUTOR INCENTIVE ARRANGEMENTS

Most manufacturers introduced volume and growth rebates during the 1980's and 1990's. These rebates were typically on a cents-per-gallon (cpg) basis. The rebates were on a sliding scale, with increased cpg rebates for larger volume and growth categories. Manufacturers generally paid the rebates at the end of the calendar year. Many distributors found that they could rotate volume back and forth between different major manufacturers in alternating years to capitalize on the manufacturer's volume and growth rebates. In response to the distributor's behavior, major manufacturers discontinued cpg and growth rebates by 2000. Manufacturers were searching for alternative incentive arrangements that would encourage distributors to expand the manufacturer's business, rather than promote competing manufacturers' volume.

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