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ESSAYS ON SOURCING DECISIONS: A BEHAVIORAL PERSPECTIVE

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ESSAYS ON SOURCING DECISIONS: A BEHAVIORAL PERSPECTIVE

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Management

by
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December 2012

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ABSTRACT

Hall, David C., Essays on Sourcing Decisions: a Behavioral Perspective

Thesis directed by Professor Aleda V. Roth

This dissertation examines how managers make and perceive supply chain governance decisions. A plethora of supply chain management literature suggests that managers will a priori choose a governance form that will manage risks while pursuing benefits. A number of theories have been used to inform this view: agency, resource-based view and transaction cost economics. Agency theory, the resource-based view and transaction cost economics all share the common assumption that a manager is considering both the risks and benefits of their decisions. In addition each of these perspectives assumes managers are boundedly rational. Taken together these two assumptions suggest managers have imperfect information, the inability to explicate the perfect contract, or limits on their ability to process relevant information when they consider risks and benefits. Yet, other than suggesting that managers have limited cognitive ability (bounded rationality), these perspectives are silent about the influence of cognitive processes on managers consideration of risks, benefits, and ultimately their decision-making. Thus there is a gap in the extant supply chain management literature of our understanding of how cognitive processes such as attention, emotions, feeling, memory or social context may result in a cognitive or decision-making bias. Specifically, evidence from psychology suggests that managers may inadvertently overlook or

misperceive risks and benefits because of biased attention and memory (i.e., availability and salience), emotions and feelings, and social considerations (e.g., bandwagon pressure). As a result of a gap in our understanding, supply chains may be overly risky (costly), while not receiving offsetting benefits (value creation).

Our two essays seek to fill this gap in the operations management and supply chain management literature using two theory-based models of how managers make supply chain governance decisions. We empirically test these models using data collected from an experiment that involved 384 Institute of Supply Management (ISM) members. In the first essay, we examine two related questions that suggest supply chain managers systematically deviate from extant supply chain management theory: 1) Do managers account for supplier opportunism when making their governance decision? 2) Are managers' governance decisions influenced by competitor's actions because of social pressures? We find that 1) managers may be selective in the type of opportunism that influences their governance decision-particularly they seem to be concerned with opportunistic renegotiation but not quality shirking, and 2) managers are socially influenced to jump on the outsourcing bandwagon. In the second essay, explain that managers may assess the risks and benefits of their governance decisions based on their feelings. Moreover, this assessment process may be biased such that risk and benefit are perceived to be negatively, not positively, related. We find support for the "risk as feeling" proposition and additionally find that both cost and quality influence the governance decision but play a different role in how managers perceive risks and

benefits. This finding establishes an important link between psychology and supply chain risk

DEDICATION

To my loving wife and best friend, Tracy.

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CHAPTER ONE

INTRODUCTION

“Anything that gives us new knowledge gives us an opportunity to be more rational.”

-Herbert Simon

1.1 Background

Management, and henceforth supply chain management, is about planning, executing and controlling the cost-benefit relationship in order to efficiently or effectively accomplish some set of goals or objectives. Often the focus in supply chain management is on how to develop or acquire the most effective (Barney, 1999) or efficient source of supply (Williamson, 2008). However, acquisition or development of a source of supply is the result of a decision-making process. Yet, often influences on decision making process are overlooked (Cyert & March; 1963; March, 1993). The decision making process be biased by several influences within the firm such as: 1) competing priorities within the firm (Cyert & March, 1963); 2) the costly, intensive, and imperfect information gathering (Simon, 1957); 3) persistent organizational routines (Nelson & Winter, 1982) and 4) organizational satisficing (March & Simon, 1958). At the same time, the decision-making by managers may be biased because 1) learning may be myopic (Levinthal & March, 1993); 2) individual history, socialization or physiology may influence values, beliefs, memory or cognitive ability (March, 1994), and 3) individuals with limited resources may satisfice (Simon, 1958). Our research focuses on the latter instead of the former because typically supply chain decisions are made individuals within the bounds of organizational constraints. In order to control for

organizational constraints and focus on individual decision-making, we use a scenario based role-playing experiment.

We limit the scope of our research to the managerial perceptions and decision-biases that occur during or after supply chain governance decisions. Governance decisions such as make-buy (Porter 1980; Williamson 1985), partial outsourcing (Parmigiani, 2007) and supplier selection (Choi & Hartley 1996) are fundamental to supply chain management. The common problem faced by organizations and thus managers across these governance decisions is how to *best* structure the production of a good or service (Hayes, Pisano, Upton, & Wheelwright, 2005).

The definition of *best* structure varies across the literature. In general, it falls into three general categories lowest cost, most desirable resources and lowest risk. Best in terms of lowest cost means managers should choose the governance structure that will give them the lowest total costs. Essentially, lowest cost means managers pursue the most efficient transaction structure (Williamson 1985). Pursuit of the most desirable resources emphasizes how managers should acquire or develop resources to be the most effective (Barney 1999). Lastly, the pursuit of lowest risk is tied with both efficiency (lowest transaction costs) and effectiveness (best resources) because disruptions that are caused by risks influence the production and delivery of the end product or service (Craighead, Blackhurst, Rungtusanatham, & Handfield, 2007; Sodhi, Son, & Tang, 2012). Therefore both efficiency and effectiveness may not be attainable if risks are realized. This perspective suggests that managers should minimize potential risks in order to minimize disruptive events (realized risks). Nevertheless, achieving efficiency,

effectiveness or low risks from the governance choice is becoming more complex in part because supply chains, customer demand and comprehension of the environment are becoming more complex. Practically, there is a need to address: how one simultaneously pursues low cost and acquires resources that will give a competitive advantage while minimizing risk?

The work of Simon (1957; 1987) would suggest that in the face of complexity and bounded rationality managers most likely pursue one attribute over another. As a result managers will likely satisfice instead of optimizing. For example, a manager may choose a supply source based on low costs and ignore risks or resource acquisition.

Alternatively, some attributes maybe be order qualifiers where as others could be order winners. However, we know little about how managers satisfice when facing a governance decision. Governance decisions typically entail some degree of concern for low cost, acquiring resources and risks. Our research asks, broadly: How do managers choose to satisfice in governance decisions? We find that, in general, manager's satisfice by pursuing low costs directly at the expense of increasing risks and not acquiring resources that could impact costs. Moreover, managers perceive the pursuit of low cost as being low risk. Ironically, these findings both enhance our understanding by suggest that managers may myopically be pursuing low cost in the short run at the expense of long run costs.

1.2 Theories Informing Extant Sourcing Literature

The extant sourcing literature suggests that managers make decisions based on costs, resources and risks. Essentially every sourcing decision is the outcome of a cost-

benefit¹ analysis where a manager enumerates all the possible outcomes of their decision then multiplies the probability of that outcome and finally assesses if the value of outcomes is acceptable given the costs or level of risks. There are four difference perspectives that inform how managers should look at the cost-benefit also known as risk-benefit: Agency theory, resource-based view, transaction cost economics and supply chain risk management.

1.2.1 Agency Theory

Agency theory describes a contracting situation where there is a principal who wants to have an agent do work on their behalf (Jensen & Meckling, 1976). Within our supply chain context firms or managers are people and typically the buying firm or manager is viewed as the principle and the making firm as the agent. The agent is either the best person for the job (effectiveness) or a lower opportunity cost than if the principal did the job (efficiency). But there is one problem that plagues the principal-agent relationship: the principal and agent are self-interested (Jensen & Meckling, 1976). Moreover, their interests do not align. Deviation from principal-agent goal alignment results in costs (Jensen & Meckling, 1978). In addition the agent is risk and effort averse (Levinthal, 1988), thus principals have to figure out how to govern the relationship such that the agent does what the principal wants. In other words, agency theory provides insight that advises how a should work with a supplier to get the benefits from using the supplier (agent) at the lowest cost or risk.

¹ See Ratchford (1982) for a discussion of how costs and risks are really the same thing.

1.2.2 Transaction Cost Economics

Transaction cost economics describes how to most efficiently structure a transaction given certain characteristics (Williamson, 1985). Transactions have three important characteristics: specific assets, behavioral uncertainty and frequency (Williamson, 1985). Frequency refers to how often a transaction occurs. At one extreme on a continuum of frequency is a one-time deal and at the other an ongoing transaction that has no foreseeable end. Most transactions in supply chains are in between these two extremes but tend to be a reoccurring discrete transaction with a foreseeable end. Therefore, frequency tends not to be a variable that supply chain studies examine. Asset specificity refers to the degree of redeployability associated with investments that must be made in order to conduct the transaction (Williamson, 1985). Asset specificity occurs across a continuum at one extreme is completely redeployable assets at the other entirely unique assets that cannot be repurposed. Once the investment in specific asset is made the transaction is subject to the classical hold-up problem allowing for opportunistic behavior. Lastly, behavioral uncertainty refers to the ability of the firm to determine the potential supplier's contractual behaviors or outcomes (Williamson, 1985). Transactions lie on a continuum where firm's at one end are completely able to determine what is occurring in the transaction and at the other end they are completely unable. Essentially, managers should choose to internalize any transaction that has high asset specificity and high behavioral uncertainty because the risks and costs of outsourcing (externalizing) are large and thus inefficient (Williamson, 1985). Otherwise, managers should externalize transaction as it minimizes bureaucracy, internal coordination and obsolescence costs

(Williamson, 1985). As the focus of transaction cost economics is efficiency, it is often supplemented by resource-based view which deals with how effective use of resources influence the boundaries of the firm (Leiblein, 2003).

1.2.3 Resource-based View

The resource-based view (RBV) of the firm describes how managers identify, acquire or build resources that may offer a competitive advantage (Barney, 1991). In supply chain management this often means a manager looks both internally and externally to assemble the right combinations of resources with the emphasis on effectiveness (Barney, 1999). Managers may outsource thus risking supplier opportunism in order to acquire valuable supplier resources (Barney, 1999). While RBV suggests how managers should acquire advantageous resources, it is less clear how they perceive or maintain them. In fact, much of the existing evidence suggests that resources give at best a temporary advantage (Winter 2003). The prevailing view is that dynamic management of resources is necessary to attain or maintain an advantage (Teece, Pisano, & Shuen, 1997). In a dynamic supply chain, managerial perception becomes critical to resource management as it may guide their managerial behaviors (Ajzen, 1991).

1.2.4 Supply Chain Risk Management

Supply chain risk management focuses on managing risks (Sodhi et al., 2012; Zsidisin, 2003). The predominant focus of this literature is to manage risks after a governance decision has been made; although it is worth noting that the governance decision can be used to mitigate risks (Choi & Krause, 2006; Tomlin, 2006). With this in mind the presumption is that risks should be managed to obtain the expected benefit

instead of how to a priori obtain the best risk-benefit combination with the governance decision. However, this literature is divided at how risk is treated. Specifically, this literature views risk as either something that is a priori known (Tomlin, 2006) or based on the perception of managers (Ellis, Henry, & Shockley, 2009; Zsidisin 2003). The dominant view taken in the extant literature assumes the former over the latter, but most supply chain situations are ill-structured such that a priori distributions may not be known. Nonetheless, how to management supply chain risks when perceptions are the main source of risk information is a relatively sparse literature (see for example Ellis et al., 2010; Zsidisin, 2003).

1.3 Gaps in the Sourcing Literature

The theoretical (see for example Fine & Whitney, 1999; Hayes et al., 2005) and analytic literature on the make-buy topic is quite expansive (see for example Anderson & Parker, 2002; Gray, Tomlin, & Roth, 2009). Yet, this literature typically simplifies the complexities of the practical world to explore a particular aspect of sourcing decision making. This literature is clearly helpful for managers analyzing a specific aspect of sourcing and describes how a manager should make a decision in this simplified and ideal situation, but often in the empirical “real” world sourcing decisions are multi-dimensional. Specifically, manager’s face competing priorities and trades offs (Boyer and Lewis, 2002; Skinner 1974). These competing priorities are exacerbated by the cross-functional objectives that supply chain management organizations face (Krause, Pagell & Krukovic, 2001). Moreover, managers may face situations where trade-offs

may not necessarily need to be made (Rosenzweig & Easton, 2010; Schroeder, Shah, & Peng, 2011).

Many existing empirical studies examine intention to make some sourcing decision (Gray et al., 2009; Mantel et al., 2006) or secondary data about outcomes of sourcing decisions (Novak & Eppinger, 2001; Novak & Stern, 2009). Studies that assume that intention is strongly linked with behavior assume that behavior is volitional (Ajzen, 1991). However, intention may not be linked with behavior because of socially desirable responses (Aronson, Ellsworth, Carlsmith, & Gonzales, 1990) or biases may exist such that decisions are not made with willful deliberation (Simon, 1957; Tversky & Kahneman, 1974).

These studies that use secondary data do not directly examine the impact that individual decisions makers play in making the sourcing choice because of difficulties in execution of choice or path dependencies that constrain organizational strategies (Mintzberg, 1978). In addition, secondary studies often fail to examine the counterfactual of buying when firms choose to make instead of buy because it is often unobservable. Often these empirical studies examine only what drives buying. Among the few secondary studies that examine make-buy, they use a proxy for making by examining the degree of vertical integration across firms in a particular industry to get at the make-buy decision (Novak & Eppinger, 2001; Novak & Stern, 2009; Ulrich & Ellison, 2005).

Therefore taken together the theoretical, analytical and empirical sourcing literature often fails to examine managerial biases that may influence managerial choice.

A few notable exceptions specific to sourcing exist: Mantel et al. (2006), Sutcliffe and Zaheer (1998); Verma and Pullman (1998). Verma and Pullman (1998) find factors that managers' report as important and do not necessarily have the same influence on their sourcing choices. Specifically they note that conformance quality is stated to be the most important drive of the sourcing decision, yet when making their choice cost and other factors are more influential than quality.

Sutcliffe and Zaheer (1998) examine the role different types of uncertainty (primary, competitive and supplier) play on sourcing decisions. They defined primary uncertainty as uncertainty introduced by exogenous environmental forces. They define competitive uncertainty as uncertainty introduced by the actions of competitors. Similarly, they defined supplier uncertainty as uncertainty introduced by the supplier. Counter to transaction cost economics that argue uncertainty permits an increase in supplier opportunism and thus managers should in-source more when faced with uncertainty, Sutcliffe and Zaheer (1998) find that primary and competitive uncertainties actually increase outsourcing. The logic that they use is that in high primary uncertainty environments, profit (benefit) is low and thus firms increase their exposure to opportunism to gain more profit (benefit). Also, firms remain flexible avoiding high obsolescence costs (high risks) by outsourcing. They use a similar logic to explain competitive uncertainty by suggesting that firms do not incur high costs of competing in the market place. Yet, supplier uncertainty is viewed as high risk/cost and therefore should be avoided. What is not made clear by these arguments is the relationship between risk and benefit? Seemingly, Sutcliffe and Zaheer (1998) are suggesting that

counter to standard economic theory managers may perceive that risks and benefits are negatively related. Primary, competitive and supplier uncertainties are seen as high risk but not concomitantly opportunities for high benefits. This study is relevant to our research as it suggests managers may make sourcing decisions based on heuristics, managers perception of risk as well as benefits may be complex and uncertainty may lead to more outsourcing.

Lastly, Mantel et al. (2006) look at how the characteristics of the firm (i.e., core competencies), sourcing task and individual influence the likelihood to outsource. They find that firm and task characteristics both significantly influence outsourcing. Moreover, task complexity and core competencies may interact such that managers are less likely to outsource when it is perceived as more complex. They attribute this finding to bias in individuals towards preferring known to unknown.

From these studies we conclude three things about managers sourcing decisions: 1) What managers' report as important may not influence their sourcing decision; 2) Uncertainty may encourage managers to outsource more, and 3) Individual biases may play a significant role in their decision to outsource. While these studies contribute significantly to our understanding, they suggest we don't fully understand how managers make sourcing decisions or how their decisions may bias subsequent management of the supply chain. Specifically, what are the biases that influence a manager's sourcing choice? After a manager's sourcing decision, how does a manager perceive the risks and benefits associated with their decision? Answering these questions will contribute to our understanding of how to make better sourcing decisions. In Essay 1 we examine how a

manager's overconfidence or reliance on bandwagon information increases outsourcing. In Essay 2, we examine how a manager's perception of benefit from their decision may reduce their perception of risks. Lastly, we discuss the broader contributions and implications of this dissertation.

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CHAPTER TWO

ESSAY 1 THE DECISION TO OUTSOURCE PRODUCTION: A BEHAVIORAL STUDY OF SUPPLIER ADVANTAGE, MONITORING AND BANDWAGON PRESSURE

“When everybody in a group is susceptible to similar biases, groups are inferior to individuals, because groups tend to be more extreme than individuals.”

-Daniel Kahneman

Abstract

The past decade has witnessed an unprecedented outsourcing of manufacturing jobs to contract manufacturers (CM). Conventional wisdom in operations strategy advocates that managers from firms with competitive cost or quality capabilities should limit their outsourcing to retain their firm's competitive advantage. Conventional wisdom, also, suggests that managers should pursue outsourcing to gain a competitive advantage if their firm has the ability to monitor the supplier's performance. But what if managers are endangering their competitive capabilities because their decision-making processes are systematically biased to increase outsourcing even when managers are unable to monitor a supplier's performance? Or what if managers increase outsourcing not to gain competitive advantage but simply because others are outsourcing? The extant literature would suggest that such biases may exist. Specifically, we propose that managers may be biased in their beliefs about their ability to control supplier performance or prevent supplier opportunism. Additionally, we propose that managers may be joining an outsourcing bandwagon. These biases could have significant long term unintended

consequences that would be deleterious for the firm. We empirically test whether these managerial biases exist systematically and, if so, provide explanations for such biases using a scenario-based behavioral experiment. Our behavioral results show the conditions under which the managers should be beware of possible bias in their outsourcing decisions.

Keywords: Bandwagon, Outsourcing, Overconfidence

2.1 Introduction

This paper takes a behavioral operations lens in examining the managerial decision to outsource all or part of a firm's production to a contract manufacturer² (hereafter referred to simply as outsourcing) versus producing within its own plants. Our focus here is to investigate the role that a supplier's cost and quality capabilities--relative to the buyer's own internal production abilities--plays in a manager's decision process. With the exception of Gray, Roth and Tomlin (2009a), who investigated a firm's propensity to outsource production, much of the prior empirical research on outsourcing evaluates performance of a given supply chain structure (e.g., contract manufacturing or internal manufacturing) (See for example, Gray et al. 2011, Handley 2012, Handley and Benton 2012, Randall and Ulrich 2001). In contrast, our work informs research and practice on how a manager's outsourcing decision process may be biased both influencing the structure of the supply chains and performance. Specifically, our study provides evidence

² See Gray, Roth and Leiblein, 2011 for a definitions and a discussion of internal production, offshoring; outsourcing and offshoring-outsourcing. In this research, we examine onshore outsourcing; but not offshore outsourcing or offshoring.

that managers may be enabling supplier opportunism or degradation in performance. Our work is motivated by the conundrum revealed in the empirical work of Gray, Roth and Tomlin (2009a), which called for more rigorous research on how the ability to measure capabilities--such as quality--may influence production outsourcing decisions. These authors found that manufacturing managers' propensity to outsource production was influenced by the buyers' strategic intent of low cost, but puzzlingly from an operations strategy view, not quality. Gray et al. (2009a, p. 712-713) conclude:

“The resulting insight (regarding quality priorities): manufacturing managers, on average, may be overconfident regarding their ability to manage quality across organizational boundaries and may not fully understand the unintended consequences of their outsourcing choices...in their make-buy decision making, manufacturing managers are apt to weigh measurable, direct low-cost benefits, which in turn shapes their propensity toward outsourcing. Managers are less consistent in their consideration of quality when deciding whether or not to outsource, possibly because the risks and benefits associated with quality in outsourcing are often difficult to assess...However, the cost of poor quality can have a deleterious influence on the business and the brand, which may not be immediately evident.”

As a result, unintended, often hidden, costs surface for the firm due to manager's underweight quality risks, supplier quality shirking and opportunistic renegotiation. We conjecture that managers underweight these sources as they are confident in their ability to monitor and subsequently manage supplier performance. Confidence in the ability to monitor supplier performance would manifest itself in the outsourcing decision. Thus, we ask: Do managers overlook the ability to monitor supplier performance when outsourcing?

More traditionally, the supply chain management literature proposes broader strategic management and economic schemas, such as production outsourcing as a decision that is determined by the macro characteristics of the competitive environment (Porter 1985), the supplier (Barney 1999) or the transaction (Williamson 2008). Accordingly, the rational, focal firm (buyer) must determine how production should be governed in order to minimize costs and opportunistic behavior (Barney 1999, Williamson 2008, Handley and Benton 2012, Handley 2012). The focal firm (buyer) may decide to make versus buy (Williamson 1975) or partially outsource the production requirements (Anderson and Parker 2002, Gray et al., 2009b). In practice, these supply chain decisions are based on the key assumptions that managers, who actually make the outsourcing decision for firms, 1) have the foresight to anticipate opportunistic behavior and choose the governance structure that appears to provide the greatest competitive advantage (Williamson 1975, 1985) and 2) are wealth maximizing and are not influenced by social utilities (Camerer and Thaler 1995). Yet the supply chain literature is silent on how the managers' individual outsourcing behaviors, caused by bounded rationality (Mantel et al. 2006) and/or individual characteristics (March 1994), may be biased; and in turn, may actually increase opportunistic behavior and decrease competitive advantage. Lastly, it is clear that social utility influences supply chain dynamics (Griffith et al. 2006, Handley and Benton 2012, Maloni and Benton 2000). Nonetheless, managers either do not know how to appropriately manage or remain unaware of social influences (Griffith et al. 2006, Handley and Benton 2012, Maloni and Benton 2000). Arguably, ignorance

of these influences may result in outsourcing decision biases that exacerbates what Benton (2010) calls “hidden supply chain costs.”

Our study advances prior related supply chain strategy literature and practice by examining empirically two outsourcing decision biases identified by Gray et al. (2009a) that may influence outsourcing: managers may be confident in their ability to manage supplier capabilities and influenced by bandwagon pressure to outsource. Specifically we investigate how ability to monitor supplier performance and bandwagon pressure moderates the relationship between relative supplier advantage (i.e., cost and quality) and outsourcing. The ability to monitor supplier performance may affect the relationship between relative advantage (i.e., cost and quality) and outsourcing in two seemingly contradictory ways. First, a rational theory of behavior would propose this: the less able to monitor supplier performance, the more effort will need to be expended to overcome difficulties in determining performance. Increased effort used to determine supplier performance should increase the direct costs incurred (e.g., auditing) (Eisenhardt 1985). Thus the impact of any supplier advantage on outsourcing should be diminished because the advantage is more costly to monitor or opportunistic supplier behavior (e.g., shirking) will reduce the realization of the supplier’s advantage. Alternatively, if the firm is unable to easily determine supplier performance, but managers believe they can, also known as overconfidence, then the relationship between supplier advantage and outsourcing will not be impacted by the ability to monitor supplier performance. Overconfidence occurs when people overestimate their level of control, their performance or the accuracy of their predictions (Moore and Healy 2008). Notably, research in behavioral economics,

psychology and management indicates that overconfidence is ubiquitous in managerial decision-making. To date, however, Gray et al.'s (2009a) conjecture--that managers may be increasing outsourcing because they are overconfident in their ability to manage supplier advantage (i.e., managers overestimate their ability to control supplier behavior, believe performance will not be impacted by inability to monitor supplier performance, and believe they are accurate in their assessment about suppliers) --has not been established empirically. In order to test this conjecture, we ask two related questions: Do managers outsource less (more) to a supplier with a cost advantage when unable (able) to monitor the supplier's performance? Do managers outsource less (more) to a supplier with a quality advantage when unable (able) to monitor the supplier's performance?

Thus, the first major contribution of this study is to employ a rigorous behavioral experiment to help resolve the alternative perspectives. The practical implications of managers' systematic overestimation of their ability to monitor and control contract manufacturer's actions on sourcing decisions--especially for difficult to measure capabilities, like quality-- is potentially significant. Conceivably, much more "risky" outsourcing would occur than if managers' choices were more calibrated to suppliers' potential for opportunism. We note that managerial confidence is domain specific (West and Stanovich 1997), such that managers may be overconfident about their ability to control or manage some supplier behaviors (e.g., quality shirking), but not others (e.g., opportunistic renegotiation). Specifically, managers may perceive (incorrectly) that cost performance is easier to monitor than quality (Crosby 1979, Deming 1986). Accordingly, we would expect a manager to emphasize quality and the

ability to monitor supplier performance when outsourcing, then cost. However, this may not be the case because managers may be overconfident about quality (Gray et al. 2009a). Thus, we evaluate how ability to monitor supplier performance may behaviorally affect managers' outsourcing choices with respect to both a supplier's cost and quality advantage and find contradictory results. Specifically, we find that managers outsourcing decisions are influenced by the ability to monitor supplier cost performance but not quality. This finding broadens our understanding by demonstrating that 1) *cost is king* and 2) managers are confident about supplier quality, so much so that they may be encouraging shirking by not being concerned with monitoring quality performance.

In addition, Gray et al. (2009a) posited that managers may feel pressure join the outsourcing bandwagon in order to acquire supplier advantages, especially those advantages that they perceive to reduce costs. This conjecture leads to our second question: Does bandwagon pressure moderate the relationship between relative supplier advantage (i.e., cost and quality) and outsourcing, leading managers to increase the percentage of outsourced? Or are managers directly influenced by bandwagon pressure?

The extant literature suggests that managers may be influenced by bandwagon pressure for irrational, rational and rationalized reasons as well as it may both directly influence outsourcing and moderate the relationship between supplier advantage and outsourcing. Bandwagon pressure may irrationally and directly influence managers to outsource by 1) reduce a manager's perception of responsibility (Cialdini 2009) for outsourcing; 2) urge a manager to respond socially acceptable manner (Cialdini 2009, Cialdini and Goldstein 2004) and 3) inform a manager about what is right (Cialdini

2009). These reasons are commonly referred to as social influence. Yet, social influence may depend on context or situational cues (Cialdini and Goldstein 2004, Wood and Bandura 1989), thus we would expect bandwagon pressure's influence to depend in-part on the advantages offered by a supplier. This may be the case because a specific supplier advantage (i.e., cost or quality) may be perceived to diffuse responsibility, signal socially acceptable situations or reinforce what a manager already believes to be right.

Additionally, bandwagon pressure may encourage managers to rationalize outsourcing in order to become more similar or compete with other organizations that are outsourcing. Managers' rationalization may be driven by institutional coercive, mimetic or normative pressures to conform (DiMaggio and Powell 1983). Similar to social influence, the institutional or competitive reasons for bandwagon pressure may depend on the specific supplier advantage. This moderating effect is plausibly a direct result of institutional values or competitive priorities. For example, if an institution values or has a priority of low cost, is considering outsourcing to a low cost supplier and a manager is subject to feel bandwagon pressure, then a manager may increase outsourcing as bandwagon pressure may remind the manager of an institutional norm or of the competitive environment.

Contrastingly, managers may rationally respond to bandwagon pressure because they believe joining the bandwagon 1) may increase a manager's safety and reduce risks (Hamilton 1971); 2) pay-off externalities create incentives to outsource (Devenow and Welch 1996) and 3) cascading information from better informed managers indicates that outsourcing is optimal (Devenow and Welch 1996). Again, these rational reasons for

bandwagon pressure may depend on the supplier's advantage. While rational, each of these reasons assumes information asymmetries among decision-makers, but allows for observation of a public decision (i.e., outsourcing). As the specific details of a competitor's outsourcing decision remains private, a manager is left to infer why. This inference depends on the manager's beliefs as well as attributes of the outsourcing decision (i.e., supplier cost and quality advantage). It is easier for a manager to believe that joining the bandwagon increases safety, increases a manager's pay-off because of externalities (see for example Cachon and Harker 2002) or that better informed managers are acting optimally.

These three views of bandwagon pressure are not incommensurate. In fact, managers may join the outsourcing bandwagon for social, institutional and rational reasons. While we believe bandwagon pressures may drive managers to increase outsourcing, there is dearth of evidence at the micro level in the supply chain management and strategy literatures about whether bandwagon pressure systematically influences managers. Thus a major contribution of this research is to empirically validate that at the micro level, outsourcing decisions are positively impacted *directly* by bandwagon pressures. Yet, curiously we find that bandwagon pressure does not moderate the relationship between supplier cost or quality advantage and outsourcing.

We contend, but do not test in this study, that these results and contributions suggest managers are making the wrong outsourcing choices. Making the wrong choices may lead to unintended consequences, including the loss of sourcing leverage due to a deterioration of the firm's manufacturing and learning competencies (Anderson and

Parker 2002, Gray et al. 2009, Handley 2012). Further, these challenges and associated hidden costs and quality risks associated with knowledge transfer to contract manufacturers (Gray et al. 2012), as well as a degradation of its innovation capabilities, are often linked to internal manufacturing prowess (Council on Competitiveness 2011, Pisano and Shih 2009, Roth et al. 2010).

We investigate our questions using a scenario-based role playing experiment (Rungtusanatham et al. 2011). We use a volunteer sample of 304 experienced Institute of Supply Management (ISM) members to capture implicitly the complexities and nuances of sourcing decisions. Following Gray et al. (2011, 2012), the context for our study is the pharmaceutical sector³. We design the decision-making scenarios so that a single manager has all the relevant outsourcing information about the supplier's cost and quality advantage, the ability to monitor supplier performance, and bandwagon (competitive) pressures. The use of scenario-based role-playing experiments may enable the isolation of individual decision-maker characteristics and biases that may influence their outsourcing decision (Mantel et al. 2006) or decision-making process (Rungtusanatham et al. 2011).

We extend prior research on supply chain management and governance in three ways. First, we investigate if the managers are concerned about their firm's ability to monitor supplier performance. We find that when outsourcing managers may be concerned with monitoring supplier cost performance but not with monitoring supplier

³ According to Gray and co-authors, pharmaceutical products (excluding devices) are not 100% testable. At the plant level, quality risks have been associated with contract manufacturing, but not at the decision-making level.

quality performance. Ironically, the latter will influence the former. As a direct result, managers may be increasing their firm's exposure to quality-based morale hazards such as shirking. Second, we investigate if managers are joining the outsourcing bandwagon to pursue cost or quality based competitive advantage, which is often the stated reason for outsourcing. We find that managers do not join the bandwagon to gain supplier cost or quality advantage. Instead, we find a direct effect between bandwagon pressure and outsourcing suggesting that managers join the outsourcing bandwagon regardless of supplier advantage. Third, we investigate these phenomena using a scenario-based roleplaying experiment, which allows us to control for contextual factors or randomly distribute unobserved factors that could impact outsourcing.

The rest of the paper proceeds as follows. First, we review the partial outsourcing literature and our theory-based, hypotheses and model. Next, we discuss our scenarios-based role-playing experiment. Third, we discuss our results. Lastly, we conclude with the implications for academia and practice with suggestions for future research.

2.2 Model and Hypotheses

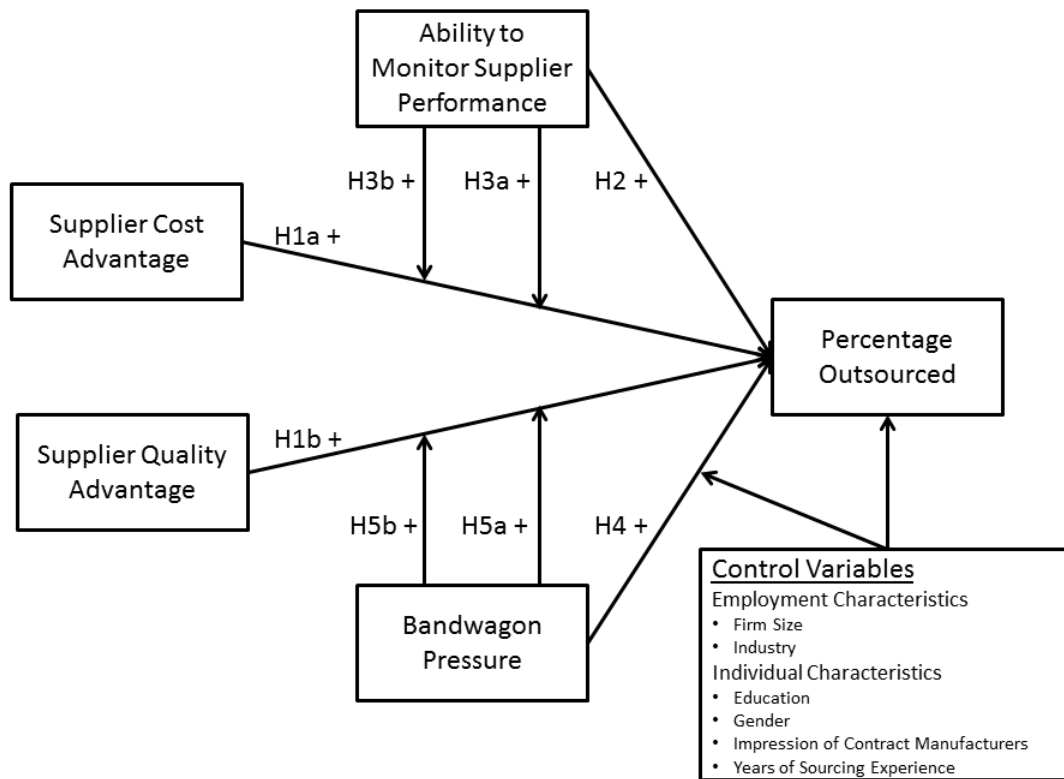
Our hypothesized model is depicted in Figure 2.1. We begin with a discussion of the percentage of production outsourced, and then develop the hypotheses leading to outsourcing decisions.

2.2.1 Percentage Outsourced

The percentage outsourced is the percentage of production outsourced to a contract manufacturer. The percentage outsourced definition allows for partial outsourcing. Partial outsourcing occurs when a manager allocates production such that their firm

simultaneously makes and buys (Anderson and Parker 2002, Gray, et al. 2009b). We allow for partial outsourcing because the decision to outsource “need not be a binary decision (Mantel et al. 2006 p. 835),” and therefore, make or buy are “endpoints of a *continuum* of sourcing strategies (Heriot and Kulkarni 2001 p. 18).” Moreover, partial outsourcing is a commonly used strategy in practice (Hennart 1993, Heriot and Kulkarni 2001, Parmigiani 2007).

Figure 2.1 Essay 1 Hypothesized Model



2.2.2 Supplier Advantage

Outsourcing to acquire supplier expertise (Leiblein and Miller 2003) or partially outsourcing to access supplier expertise (Parmigiani 2007, Parmigiani and Mitchell 2009)

while developing internal expertise is well established. This literature stream generally treats supplier expertise as an absolute advantage or disadvantage (Leiblein and Miller 2003, Parmigiani and Mitchell 2009). However, competitive advantage is heterogeneous across firms and relative; and thus, a supplier may have a competitive advantage in one operational area (e.g. cost) and a disadvantage in another (e.g., quality). Thus, it is important to examine the difference in operational capabilities between the firm and a potential supplier, also known as relative capability position (McIvor 2009).

In this study, we limit our investigation to relative supplier cost and quality advantage and disadvantage because low cost and conformance quality are fundamental concerns in the structuring of production (Hayes et al. 2005). Supplier cost advantage (disadvantage) occurs when a potential supplier has a low cost production capability that is lower (higher) than the firm. Similarly, supplier quality advantage (disadvantage) occurs when a potential supplier has a conformance quality production capability that is higher (lower) than the firm. Moreover, low cost and conformance quality are often motives for considering outsourcing (Moschuris 2007) or are stated competitive priorities when outsourcing (Gray et al. 2009a). That said, the positive relationship between supplier cost and quality advantage and the percentage of outsourcing is consistent with the extant outsourcing literature (i.e., Barney 1999, Gray et al. 2009a, Leiblein and Miller 2003, Parmigiani and Mitchell 2009), which draws on the resource-based view (RBV) of the firm. The logic is simply that managers act to increase the percentage of outsourcing to a supplier who provides an advantage either in terms of cost or quality. Therefore:

H1a: Supplier cost advantage (disadvantage) relative to the buying firm has a positive (negative) influence on the percentage outsourced, ceteris paribus.

H1b: Supplier quality advantage (disadvantage) relative to the buying firm has a positive (negative) influence on the percentage outsourced, ceteris paribus.

2.2.3 Ability to Monitor Supplier Performance

The literature is mixed as to whether or not managers will be influenced by the ability to monitor supplier performance. The dominant view suggests that managers will account for the ability to monitor a potential supplier's performance when outsourcing (Heide 2003, Mayer and Salomon 2006). The analytic and economic literature proposes that supplier opportunism may be contingent upon the ability of the firm to monitor supplier performance (Kaya and Ozer 2009, Eisenhardt 1985, Jensen and Meckling 1976). The ability to monitor supplier performance correlates with the costs of monitoring and enforcing the adherence to contractual terms (Williamson 1975, 1985, 2008), observing behaviors that may lead to the desired outcomes, measuring outcomes and subsequently the rewarding or punishment of performance (Eisenhardt 1985, Eisenhardt 1989, Jensen and Meckling 1976). Therefore, we would expect managers to prefer less outsourcing when their firm is unable to monitor a potential supplier's performance because more intricate and costly control systems are required to measure performance outcomes (Eisenhardt 1985).

An alternative perspective suggests managers may be overconfident in their ability to monitor and control supplier behavior (Gray et al. 2009a). This minority view is supported by literature that suggests when managers believe that they can control

outcomes they will often overlook factors that they cannot control (Camerer and Lovallo 1999, Malmendier and Tate 2005, 2008). As a result we believe managers may overlook the ability to monitor supplier performance because the managers believe they can control supplier outcomes. In other words, managers may be overconfident. Typically, overconfidence results in excessive risks that may harm performance (Camerer and Lovallo 1999, Malmendier and Tate 2005, 2008). When may managers be overconfident? Managers are more confident in a familiar domain (West and Stanovich 1997). Moreover, familiarity and the resulting confidence may result in an illusion of control when in fact managers may have little to no influence over events or outcomes (Langer 1975). Again, if managers believe that they can control supplier outcomes or malfeasance, they may overlook the ability or inability to monitor supplier performance when outsourcing. Thus we hypothesize that:

H2: The ability (inability) of the buying firm to monitor supplier performance has a positive (negative) influence on the percentage outsourced, ceteris paribus.

2.2.4 The Moderating Effect of the Ability to Monitor Supplier Performance on Supplier Advantage

Supplier cost and quality advantage are important for establishing initial production costs, but they require monitoring as the supplier can under bid to win a contract then raise prices in renegotiation (Gray et al. 2012; Gray et al 2009a) or shirk on quality (Gray et al. 2011). The greater the inability in monitoring supplier performance that results in information asymmetry about a supplier's behavior, the more the threat of opportunism reduces the appeal of acquiring a supplier's advantage (Heide 2003), and in turn, acts to

reduce outsourcing. In this case, managers can be expected to pursue more insourcing because the benefits of the planned allocation of production to the supplier may not be fully realized. Yet, it is not clear if managers behave differently based on the type of supplier opportunism. The extant literature suggests that type of supplier opportunism may depend on the potential supplier's advantage in cost (Williamson 1975, 1985) or quality (Kaya and Ozer 2009). For example, suppliers may misrepresent changes in their cost structure or cost advantage in order to opportunistically renegotiate contractual terms, while supplier quality advantage is ripe for shirking.

Moreover, the literature is also mixed as to whether or not managers may act differently when presented with different forms of opportunism. The dominant perspective--in the realm of economics—contends that managers will be concerned with opportunistic behavior whether it is opportunistic renegotiation *or* quality shirking (Eisenhardt 1985, Jensen and Meckling 1976). This view suggests managers should prefer less outsourcing when unable to monitor the potential supplier's performance as there is less exposure to opportunistic renegotiation or quality shirking as the percentage of outsourcing decreases. In contrast, managers should choose a higher percentage of outsourcing when a supplier has an advantage and they are able to monitor supplier performance because they can capture the benefits of the supplier's advantage (Barney 1999). The minority view posited by Gray et al. (2009a) suggests that managers may be overconfident and as a result overlook the ability to monitor supplier performance or detect opportunism when outsourcing. This rationale is supported by the psychology literature, whereby managers may be overconfident in one domain (i.e., quality

management) and not another (i.e., cost management) (West and Stanovich 1997). Accordingly, it is plausible that managers are prone to the “illusion of control” over certain supplier behaviors, leading to quality shirking, but not others leading to opportunistic renegotiation. Hence the attractiveness of supplier cost or quality advantage may be contingent upon the firm’s ability to monitor their performance.

Both a supplier cost and quality advantage represent supplier-specific assets and capability (Hayes et al. 2005). Supplier opportunism may be a result of the leverage over the purchasing firm that these supplier-specific assets and capabilities provide (Williamson 1975). However, supplier cost or quality disadvantage represent a lack of supplier-specific assets or capability and as a result the supplier lacks leverage. Nonetheless, the existing theory fails to address how managers may differentially react to supplier cost or quality advantage enabled opportunism.

Specifically, supplier cost advantage may be subject to the well-known “hold-up” problem where it is common for suppliers to bid below cost order to win a contract, and then to act opportunistically upon contract renegotiation due to asset specificity or high costs of switching (Aron et al. 2005). The hold-up problem leads managers to place effort in accurately assessing a supplier’s cost advantage prior to outsourcing and during the on-going transaction. Moreover, opportunistic renegotiation doesn’t only occur at the beginning or end of a contract. Opportunistic renegotiation can occur anytime when there are high switching costs and incomplete or unenforceable contracts in a transaction (Williamson 1975, 1985). For example, a supplier that files for Chapter 11 bankruptcy protection is allowed to renegotiate its contracts, such as observed recently in the

opportunistic renegotiation within the automotive industry. Moreover, renegotiation may occur without bankruptcy. For example, Ford Motor Co. received contract concessions without declaring bankruptcy (Dolan 2009, Ingrassia 2009). Ironically, these concessions were made in-part by threats not facts (Ingrassia 2009). Clearly, the actual facts may be unable to be verified. Therefore, the ability to monitor supplier cost performance can help the firm avoid opportunistic renegotiation by establishing or verifying facts as well as detecting changes in the supplier's cost structure. Thus, we hypothesize that:

H3a: The positive relationship between supplier cost advantage and the percentage outsourced is reduced (increased) when the buying firm's ability to monitor supplier performance is low (high).

Similarly, suppliers have incentives to offer high quality initially and then to allow quality to diminish over time (Roth et al. 2008). In this case, suppliers may not benefit from continued investment in maintaining quality (Kaya and Ozer 2009). Moreover, a supplier may not realize the impact of poor quality (e.g., reduced customer loyalty, increased warranty costs) (Deming 1986)--and unless the poor quality is detected and the supplier is held responsible, quality shirking may persist (Kaya and Ozer 2009). Hence, the supplier's quality advantage must be monitored for shirking behavior. If the ability to monitor supplier quality performance is low, then a manager will fear quality shirking. So even if the supplier is highly capable, the manager will be hesitant because of the lack of monitoring ability. On the flip side, a high ability to monitor supplier quality performance assures a manager that they will realize the benefits of a supplier's quality advantage. Thus, we hypothesize that:

H3b: The positive relationship between supplier quality advantage and the percentage outsourced is reduced (increased) when the buying firm's ability to monitor supplier performance is low (high).

2.2.5 Bandwagon Pressure

Bandwagon pressure is the informational (Devenow and Welch 1996), institutional (DiMaggio and Powell 1983), or social influence (Cialdini and Goldstein 2004, Cialdini 2009) to adopt the same course of action as other managers or organizations. We consider these three sources as having rational, rationalized or irrational influence, respectively on managers' decisions and discuss their effects individually below⁴. Nonetheless, the result of bandwagon pressure or the bandwagon effect has been observed in a wide variety of management situations including acquisitions (McNamara et al. 2008), adoption of management techniques (Staw and Epstein 2000) and technology adoption (Rohlf's 2003). Bandwagon outsourcing occurs if managers are influenced by bandwagon pressure to outsource.

At the same time, bandwagon pressure and subsequently bandwagons may be rationalized by managers who fear their firm's loss of competitive advantage or opportunity (Abrahamson and Rosenkoff 1993, McNamara et al. 2008).

Bandwagon behavior may be considered rational if managers discern that there is a competitive advantage associated with the trend in the supply market (Porter 1985). However, managers will rarely know why a competitor made a particular outsourcing

⁴ We recognize that these effects may be additive or multiplicative. However, our main concern in this paper is influence of bandwagon pressure on outsourcing not the discrimination of all the possible causes of bandwagon pressure.

decision; they just may know what the outcome of the outsourcing decision-making process. Thus, managers may face a decision-making situation where they have their own private information, no access to the competitors private information but access to public information about their choice to outsource. This public information constitutes the competitor's opinion and may apply bandwagon pressure through social influence. A manager may be socially influenced by bandwagon pressure to increase outsourcing because they feel: 1) social pressure (Asch 1955); 2) informed about the decision through subjective information (Festinger 1950) and 3) social proof of the correct course of action (Cialdini and Goldstein 2004, Cialdini 2009). Peer opinion (i.e., the competitor's decision to outsource) exerts social pressure on the decision maker to conform to the perceived peer group's norms (Asch 1955). We are suggesting that the competitors outsourcing behavior may signal that outsourcing is the accepted norm, thus bandwagon pressure would encourage a manager to outsource. Alternatively, "If everybody else is outsourcing," then the manager may alter their beliefs to believe their peers possess relevant information, which is unavailable to the manager (Festinger 1950) but at the same time the competitor's outsourcing behavior implies a belief that it is the correct outsourcing decision. Thus, a manager that makes the same choice as their competitors (peers) has social proof of the "correctness" of their choice (Cialdini and Goldstein 2004). Moreover, the manager may feel that they may diffuse their responsibility by giving into any of these social influences (Wallach et al. 1964) as a result managers may reduce internal and external criticism of a given choice by imitating the competition.

Managers may rationalize outsourcing in the face of bandwagon pressure because they feel institutional coercive, mimetic or normative pressures to do so (DiMaggio and Powell 1983). Bandwagon outsourcing may be the result of institutional coercion as managers may fear their firms of loss of competitive advantage or opportunity (Abrahamson and Rosenkoff 1993, McNamara et al. 2008). Managers facing an outsourcing decision face uncertainty created by information asymmetries between the buyer and potential supplier as well as the competitive environment. Imitation (Alchian 1950) or pressure to mimic other firms is motivated by uncertainty surrounding a decision (DiMaggio and Powell 1983). Specifically, manager's will imitate as a result of uncertain outcomes and the resulting search for solutions to the problem encourages managers to duplicate what organizations which are perceived as successful have already done to address the same problem (DiMaggio and Powell 1983). As a result of decision uncertainty, we believe managers face a non-trivial bandwagon pressure to imitate or outsource. Lastly, managers may feel bandwagon pressure to outsource as a result of institutional norms such.

Selfish herd theory, rational herding and information cascades suggest that bandwagon pressure may rationally inform managers and subsequently encourage more outsourcing. Selfish herd theory suggests by following the crowd that a manager's job is safer (Hamilton 1971). Specifically, a manager is safer by avoiding having their reputation damaged by herding (Devenow and Welch 1996). Rational herding may occur when pay-off externalities (i.e., the utility of the manager's outsourcing decision depends on the decisions of others) exist (Devenow and Welch 1996). In other words, other

managers or organizations outsourcing may create positive externalities for outsourcing production (e.g., economies of scale or scope) or negative externalities (e.g., reduction of profit, cost advantage or external investment) for producing in-house. Lastly, boundedly rational managers abandon or update their private information by observing the actions of better informed managers who are acting rationally⁵ resulting in an information cascade (Bikchandani et al. 1992, Devenow and Welch 1996, Newell et al. 1958). The information cascade informs a manager's outsourcing decision by signaling the rational and optimal choice. These models of rational responses to bandwagon pressure are predicated on the reasonable assumption that there is imperfect and asymmetric information such that managers have their own private information and may only observe other managers or organizations public information when making a decision. Moreover, the publically available information is assumed to be explicitly based on optimal decision-making and implicitly based on the assumption that the conditions that make the decision optimal apply to the manager's current decision-making situation. As a result, these models depend on the beliefs or inferences about the publically available information of the manager, who makes the outsourcing decision. Ironically, the reliance on a manager's beliefs suggests that rational reasons for succumbing to bandwagon pressure have much in common with the rationalized institutional and irrational social reasons.

As such, we believe that the informational, institutional, or social pressures are not incommensurate and may work in tandem to encourage managers to outsource. Thus

⁵ By rational we mean that decisions are the result of rational expectations. See Muth (1961) for a discussion of rational expectations and rationality.

we postulate that bandwagon pressure will have a positive influence on outsourcing.

Formally, we posit:

H4: Bandwagon pressure has a positive influence on the percentage outsourced, ceteris paribus.

2.2.6 The Moderating Effect of Bandwagon Pressure on Supplier Advantage

Supplier advantage may be enhanced by the presence of bandwagon pressure for several reasons (DiMaggio and Powell 1983, McNamara et al. 2008, Staw and Epstein 2000). First, popular management techniques (e.g., outsourcing), which are presumed to increase performance at least in the short run, may lead to increased imitation (Staw and Epstein 2000). Second, increasing outsourcing in order to gain some advantage is a fundamental premise underlying the resource based view in supply chain management (Barney 1999, Hayes et al. 2005)); therefore, institutionalized norms may exist that put pressure on managers to pursue supplier advantages (DiMaggio and Powell 1983). Third, managers may face competitive pressure to outsource to gain supplier advantage (Gray et al. 2009a, McNamara et al. 2008). Specifically, managers may feel pressure from coercion to follow the bandwagon if they assume everyone else is outsourcing to gain an advantage. However, they may feel a normative pressure since pursuing supplier that is what is expected of them or they may feel a mimetic pressure to imitate other firms' successes (DiMaggio and Powell 1983). In short, managers may be conforming because they "fear missing out on competitive opportunities that early adopters appear to be seizing" (McNamara et al. 2008, p. 116). Consequently, managers may overlook formal analyses

of the risks and benefits associated with their decision and jump on the bandwagon (McNamara et al. 2008).

Alternatively, managers may assume that cost or quality supplier advantages are enhanced (i.e. positive externalities exist) by joining the outsourcing bandwagon. For example, managers may believe that joining the bandwagon may increase supplier economies of scale or scope, thus the supplier's cost advantage (economies of scale) or quality advantage (economies of scope) may be enhanced. For these reasons, the effect of supplier advantage on the percentage of outsourcing will be increased in the presence of bandwagon pressure. Thus we hypothesize that:

H5a: The positive relationship between supplier cost advantage and the percentage outsourced is increased when bandwagon pressure increases.

H5b: The positive relationship between supplier quality advantage and the percentage outsourced is increased when bandwagon pressure increases.

2.3 Research Methods

Our research questions require an examination of managerial decision-making processes. Experimentation is an approach for such an examination since it allows for a high degree of control over data collection and a mechanism to reduce extraneous influences. Traditional laboratory experiments are, typically, not appropriate for complex research questions such as ours, where the problem context requires subjects with specialized domain knowledge (Mantel et al. 2006, Rungtusanatham et al. 2011). Conversely, controlled field experiments are unlikely to yield a sufficient sample of managers since subjects would be hesitant to participate in manipulating real aspects of their operations

or supply chains (Fisher 2007). Because of these dual challenges, a scenario-based role-playing experiment is well-suited for collecting data to examine our research questions (Rungtusanatham et al. 2011). Scenario-based role-playing experiments are widely accepted in general management research (Tomlinson et al. 2004) and marketing (Song and Zinkhan 2008). These types of experiments are gaining popularity in supply chain management research (Mantel et al. 2006, Sutcliffe and Zaheer 1998, Verma and Pullman 1998, Tangpong et al. 2010).

This study uses a scenario-based role-playing experiment to examine differences in outsourcing decisions that can be attributed to supplier cost advantage, supplier quality advantage, ability to monitor supplier performance, and bandwagon pressure, while simultaneously considering the impact of differences in individual characteristics. In our scenario-based role-playing experiment, we manipulate supplier cost advantage, supplier quality advantage, and ability to monitor supplier performance as between-subject factors at two levels (HIGH versus LOW) and bandwagon pressure as a within-subject factor also at two levels (ABSENT versus PRESENT). The four-factors, repeated-on-three-factors design matrix is shown in Table 2.1.

2.3.1 Subjects

Our target population is supply managers, who have experience making outsourcing decisions. As such, we invited 470 Institute of Supply Management (ISM) members from 18 ISM Chapters throughout the United States to participate in the experiment. Of them 383 accepted our invitation (75 percent response rate). Of the 383 subjects, 310 had prior sourcing experience, completed our experiment, and provided

useable responses. Of the 310 subjects, only six indicated having a doctorate degree. Given the small subset and the inability to draw inferences from this small number, we do not include these six subjects in our subsequent analyses⁶. Table 2, detailing the profile of the 304 sample, reveals that these subjects are highly experienced, middle aged, predominantly male, well educated, employed across a variety of industries, and primarily from large firms.

Table 2.1 Repeated-Measures Design Matrix

Scenario	Between-subjects factors			Within-subjects factor	
	Supplier Cost Advantage (SCA)	Supplier Quality Advantage (SQA)	Ability to monitor supplier performance (AMSP)	Bandwagon pressure (BP)	
				Treatment 1	Treatment 2
A	Inferior	Inferior	Unable	Absent	Present
B	Inferior	Inferior	Able	Absent	Present
C	Inferior	Superior	Able	Absent	Present
D	Inferior	Superior	Unable	Absent	Present
E	Superior	Superior	Able	Absent	Present
F	Superior	Inferior	Unable	Absent	Present
G	Superior	Inferior	Able	Absent	Present
H	Superior	Superior	Unable	Absent	Present

We compared our sample, to a voluntary sample collected by ISM from the Results of the 2009 Membership Needs Survey (Institute of Supply Management 2009) to assess the degree to which our sample may be biased. We assess the potential sample bias by constructing contingency tables and making a simple chi-square test for differences. While we are unable to compare age, we find that our sample may be

⁶ Notably, preliminary analysis of our respondents indicated that subjects with doctoral degrees had significantly different responses than those with master's degrees; and hence, could not be collapsed into a 'graduate' degree category. Assessing the influence of higher education on outsourcing decision-making is a key area for future research

representative of ISM membership in terms of education, firm size, gender and years of sourcing experience, but may differ by industry (See table 2). Specifically, our sample may be over representative of managers from manufacturing industries and under representative of service industries.

2.3.2 Experimentation Procedure

To recruit subjects for our research, we contacted 42 ISM affiliates in the United States and offered to make presentation related to outsourcing as part of their monthly meetings. 15 ISM affiliates accepted the offer, including: Augusta, GA; Baltimore, MD; Dallas, TX; Grand Rapids, MI; Indianapolis, IN; Madison, WI; Philadelphia, PA; Reading, PA; San Antonio, TX; Springfield, MO; Teneva, TN; Triad, NC and Wichita, KS. These 15 ISM affiliates ranged from small to large in terms of membership and included both major metropolitan and rural locations. The subject details by ISM affiliate can be found in Appendix A.

Before attendees arrived to the meeting, we distributed the eight scenarios randomly among the available seats provided for the meeting; each seat received one of the eight scenarios. The meeting began with a brief introduction (about 5 minutes) as to the potential prosperity and peril of outsourcing and how little is known about how managers actually make their outsourcing decisions. We then invited the attendees to voluntarily participate in our pen-and-paper scenario-based role-playing experiment. Participants were then instructed to read the scenario to which they to assume the role of a sourcing manager and sole decision-maker, consider the advantages and disadvantages of outsourcing in the scenario, and finally asked to make their outsourcing decision.

Initially, subjects made a choice about the percentage to be outsourced. Subjects were then informed that competitors were choosing to outsource (the bandwagon pressure cue) and allowed to change their decision based on the new information, if they so choose. At the conclusion of the experiment, we debriefed the subjects and engaged in a brief discussion with all participants regarding how they made their decision.

To test the effect of our researcher or interactional experimenter effects on our results (see Rosenthal and Rosnow 1991 for a discussion), we supplemented our initial data collections with data collections from the Kansas City, MO; St. Louis, MO and Chicago, IL where we remove the possibility of artifacts between the experimenter and our subjects. The procedure for these three locations was notably different from the other 15 in that the scenario-based experiment was given as a supplement to the meeting by a local ISM member. We did not find any significant differences in our results suggesting that they are not an artifact of experimenter or experimenter-subject interaction. Moreover, our results are robust to including or excluding the data collected at these locations.

2.3.3 Scenario Design

2.3.3.1 Dependent Variable

For our scenarios, we use an 11-point reference-based scale for the response or dependent variable, *percentage outsourced*, which gives higher item response rate than open-ended questions. On this 11-point scale, zero reflects complete insourcing, with each unit increase demarcated from 1=0% “completely in-house, 2= 10% outsourced, 3= 20% outsourced, etc. and with 11 = 100% “completely outsourced”.

2.3.3.2 Manipulation Cues

The four experimental factors of interest in our study are supplier cost advantage, supplier quality advantage, ability to monitor supplier performance and bandwagon pressure. Statements to cue the HIGH versus LOW levels of these factors were designed and validated through the Q-sort methodology described by Menor and Roth (2009) using 17 supply chain managers from our population of interest. For example, supplier cost advantage, defined as the ability of the supplier to compete on cost compared with the contracting firm, was cued with statements indicating whether or not the supplier (XYZ Co) has/does not have a cost advantage relative to the buying firm (Alpha Pharma): “XYZ Co’s manufacturing costs are lower/higher than Alpha Pharma.” For supplier quality advantage, defined as the ability of the supplier to compete on quality compared with the contracting firm, a statement indicating a supplier quality disadvantage/advantage would be: “XYZ Co’s manufacturing function provides inconsistent/consistent quality, while Alpha Pharma does not.” The manipulation cues for both supplier cost advantage and supplier quality advantage are based on extant literature (i.e., Gray et al. 2009a, Rosenzweig et al. 2003). Consistent with Eisenhardt (1985) and Jensen and Meckling (1976), the ability to monitor supplier performance is based on the ease with which the supplier’s actions and behavior can be determined by the contracting firm. A statement cueing this HIGH/LOW level of ability to monitor is: “Evaluating XYZ Co's performance will be primarily a subjective/objective process.”

Lastly, because bandwagon pressure is captured as a within-subjects factor, we cue the factor in terms of PRESENCE/ABSENCE. Subjects are presented with an

opportunity to make the outsourcing decision with bandwagon pressure being absent (i.e., no information about what competitors are doing) and then given information that their competitors are pursuing outsourcing. The full set of manipulation cues and information held constant across treatments are included in Appendix B.

2.3.3.3 Analytical control variables

2.3.3.3.1 Employment characteristics

We control for a manager's employment characteristics, specifically, firm size and industry because these characteristics have been found to influence a firm's decision to outsource (Heriot and Kulkarni, 2001). Firm size or industry may influence learning processes or the level of institutionalization. We believe that both organizational learning as well as institutionalization may bias managers' outsourcing decisions because the organizational environment influences learning processes (Levinthal and March 1993), socialization (March, 1994) and the level of institutionalization within an organization influences the persistence of managerial behaviors (Zucker 1977). In addition, we control for the possibility that firm size or industry may moderate the relationship between bandwagon pressure and the percentage outsourced. Bandwagon pressure may differ based on these employment characteristics because learned bandwagon behavior may be a response to organizational pressures to conform (DiMaggio and Powell 1983) or respond 'correctly' to an uncertain situation (Calidini 2009).

Table 2.2 Sample Characteristics

Our Sample			ISM		
	n	%	n	%	X ² (df)
Age			Age		
Under 30	20	6.6	Under 25	7	1.4
31-40	34	12.2	26-35	54	11
41-50	77	32.6	36-45	109	22
51-60	94	35.9	46-55	189	38.2
61 or better	31	12.2	56 or better	135	27.4
No response	2	0.7			
Total	304	100.0	Total	494	
Gender			Gender		0.17(1)
Female	127	41.8	Female	199	40.3
Male	177	58.2	Male	295	59.7
Total	304	100.0	Total	494	
Education^B			Education^B		0.08(2)
Less than Bachelor's degree	64	21.1	Less than Bachelor's degree	95	19.2
Bachelor's degree	145	47.7	Bachelor's degree	227	45.9
Master's degree	95	31.3	Master's degree	149	30.1
Total	304	100.0	Total	471	95.2
Number of employees (firm size)			Number of employees (firm size)		2.01(1) ^C
Under 1000	133	43.8	Under 900	191	38.7
Over 1000	171	56.3	Over 900	303	61.3
Total	304	100.0	Total	494	100
Industry^D			Industry^D		79.30**(1)
Manufacturing	221	72.3	Manufacturing	199	40.3
Aerospace	25	8.2			
Automotive	42	13.8			
Chemical Mfg.	16	5.3			
Consumer Products	29	9.5			
Hi-Tech	26	8.6			
General Mfg.	70	23.0			
Pharmaceutical	13	4.3			
Services & Other	83	27.3	Services & Other	295	59.7
Total	304	100.0	Total	494	100
Years of sourcing experience			Years of sourcing experience		6.58(4)
Less than 3 years	16	5.3	Less than 3 years	26	5.3
3-8 years	60	19.7	3-8 years	86	17.5
9-15 years	102	33.6	9-15 years	133	26.9
16-24 years	66	21.7	16-24 years	129	26.1
25 or more years	60	19.7	25 or more years	120	24.2
Total	304	100	Total	494	100

*p ≤ 0.05; **p ≤ 0.01; †p ≤ 0.10.

^A The comparison not made because the groups are too different

^B Doctorate is excluded from comparison and analyses

^C This comparison is not precise

^D This comparison can only be made at an aggregated level

2.3.3.3.2 Individual Characteristics

Individual characteristics may influence decision-making. Specifically, March (1994, p.58) states that individual characteristics may shape decisions because “Social systems socialize and educate individuals into rules associated with age, gender, social positions and identities.” As such, we examine the role of managers’ individual characteristics on their outsourcing decision. Specifically, we examine the gender, education, impression of contract manufacturers and years of sourcing experience. Prior decision-making literature has established that these characteristics may influence outsourcing for several key reasons: 1) Gender differences in preferences between men and women may reflect socialization (March 1994) or physiological differences (Atkinson 1957) that may influence decision-making; 2) Education may be inversely related to risk aversion (Shaw 1996); 3) How managers feel about contract manufacturers, in general, may influence their preference (Zajonc and Markus 1982); 4) Experience contributes to the development of expert decision-making skills (Klein 1997, Simon and Chase 1973), which influence how the problem is identified, what alternatives may be considered and the accuracy of their decision (Klein 1997, Simon and Chase 1973).

At the same time, we control for the possibility that these individual characteristics may moderate the relationship between bandwagon pressure and the percentage outsourced. Bandwagon pressure is posited to be an influential force that encourages the manager to conform to the competition’s outsourcing behavior. As such, individual characteristics that directly or indirectly affect conformance through mediating factors (e.g., confidence and group orientation) should be controlled. Gender (Eagly

1978), education (Puri and Robinsion 2007), experience (Griffin and Tversky 1992), and affective disposition (i.e., impressions of contract manufacturers) (Cialdini 2009) may influence conformance and thus the influence of bandwagon pressure.

2.3.4 Analytical Method

The analytical method employed is a function of experimental design and characteristics of our data. To test our hypotheses about how a manager's individual characteristics (i.e., education, gender, and years of sourcing experience) mitigate the bandwagon effect we designed our experiment with a repeated measures of a subject's outsourcing decision both when bandwagon pressure is absent and then again when it is present. These two observations of the outsourcing decision are likely to be correlated because they share a common source of variability, the specific manager. As a result of this, we are likely to violate the independence of residuals assumption used in standard regression analyses. We statistically test for this assumption by examining the degree of nesting or intraclass correlation coefficient (ICC). We find, as expected, that the residuals are highly correlated within-subjects ($ICC=0.81$, $p < 0.001$). Not accounting for correlated residuals inflates Type I error rates (Cohen et al., 2003). Moreover, our subjects are randomly drawn from a population of managers and may have random variations in outsourcing, suggesting a potential violation of the homogeneity of variance assumption of standard regression.

Linear mixed modeling (LMM) or a two-stage random effect model accounts for violations with respect to the independence of residuals and the homogeneity of variance. LMM explicitly models (see Equation 1) for random variability due to differences in

managers and correlated errors of their repeated outsourcing decisions. As a result LMM accurately predicts estimates of our hypothesized relationships (see Equation 2) or fixed effects, which are exactly like regular regression coefficients in that they are a single or ‘fixed’ parameter estimate that applies to all managers (Cohen et al. 2003).

2.3.4.1 Model Specification

Our model specification includes the four factors seen in Table 1. In addition we specify our model to control for employment and individual characteristics as well as other possible relationships among our factors that we did not hypothesize. The individual characteristics in our study are self-reported measures of gender, education and years of sourcing experience. Similarly, we asked subjects to self-report their employment characteristics: firm size and industry. In addition, we specify other possible relationships among our factors of interest (i.e., SCA x SQA and SCA x SQA x AMSP). These relationships are included because we do not want to alias or confound the hypothesized relationships with these extraneous relationships; and by doing so, we are able to reduce spurious effects.

We use notation consistent with Cohen et al. (2003) to analytically model the random effects or variability introduced by subjects in our experiment (see Equation 1), the fixed effects or population estimates of the parameters of subject-level predictors (Supplier Cost Advantage: SCA, Supplier Quality Advantage: SQA, Ability to Monitor Supplier Performance: AMSP, Gender: GDR, Education: ED, Years of Sourcing Experience: YSE, Firm size, and Industry), the interactions of subject-level predictors (SCA x DMSP, SQA x AMSP, SCA x SQA, SCA x SQA x AMSP), “repeated measures

level” fixed predictors (BP) and the fixed interaction between level 1 and 2 predictors (BP x SCA, BP x SQA, BP x AMSP, BP x SCA x SQA, BP x SCA x AMSP, BP x SQA x AMSP, BP x GDR, BP x ED, BP x YSE) as seen in Equation 2. The Level 1 (repeated measures level) equation can therefore be written as:

$$y_{ij} = B_{0j} + r_{ij} \quad (\text{Equation 1})$$

Where repeated measure within a manager, i , is observed twice in our experiment; hence $i = \{1 \text{ or } 2\}$. Subjects are denoted by $j = \{1, 2, 3, \dots, 304\}$. The Level 2 (subject level) equation can be written as:

$$\begin{aligned} B_{0j} = & \gamma_{00} + \gamma_{0,1}(\text{Firm size}_j) + \gamma_{0,2}(\text{Industry } 1_j) + \gamma_{0,3}(\text{Industry } 2_j) + \gamma_{0,4}(\text{Industry } 3_j) \\ & + \gamma_{0,5}(\text{Industry } 4_j) + \gamma_{0,6}(\text{Industry } 5_j) + \gamma_{0,7}(\text{Industry } 6_j) + \gamma_{0,8}(\text{Industry } 7_j) \\ & + \gamma_{0,9}(\text{Education } 1_j) + \gamma_{0,10}(\text{Education } 2_j) + \gamma_{0,11}(\text{Gender}_j) \\ & + \gamma_{0,12}(\text{Impression of contract manufacturers}_j) + \gamma_{0,13}(\text{Years of sourcing experience}_j) \\ & + \gamma_{0,14}(\text{SCA}_j) + \gamma_{0,15}(\text{SQA}_j) + \gamma_{0,16}(\text{AMSP}_j) \\ & + \gamma_{0,17}(\text{SCA x SQA}_j) + \gamma_{0,18}(\text{SCA x AMSP}_j) + \gamma_{0,19}(\text{SQA x AMSP}_j) \\ & + \gamma_{0,20}(\text{SCA x SQA x AMSP}_j) \\ & + \gamma_{1,0}(\text{BP}) + \gamma_{1,1}(\text{BP x Firm size}_j) + \gamma_{1,2}(\text{BP x Industry } 1_j) + \gamma_{1,3}(\text{BP x Industry } 2_j) \\ & + \gamma_{1,4}(\text{BP x Industry } 3_j) + \gamma_{1,5}(\text{BP x Industry } 4_j) + \gamma_{1,6}(\text{BP x Industry } 5_j) \\ & + \gamma_{1,7}(\text{BP x Industry } 6_j) + \gamma_{1,8}(\text{BP x Industry } 7_j) + \gamma_{1,9}(\text{BP x Education } 1_j) \\ & + \gamma_{1,10}(\text{BP x Education } 2_j) + \gamma_{1,11}(\text{BP x Gender}_j) + \gamma_{1,12}(\text{BP x Impression of contract manufacturers}_j) \\ & + \gamma_{1,13}(\text{BP x Years of sourcing experience}_j) + \gamma_{1,14}(\text{BP x SCA}_j) + \gamma_{1,15}(\text{BP x SQA}_j) \\ & + \gamma_{1,16}(\text{BP x AMSP}_j) + \gamma_{1,17}(\text{BP x SCA x SQA}_j) + \gamma_{1,18}(\text{BP x SCA x AMSP}_j) \\ & + \gamma_{1,19}(\text{BP x SQA x AMSP}_j) + u_{0j} \end{aligned} \quad (\text{Equation 2})$$

Dummy variables were created for Industry where 1= Aerospace, 2= Automotive, 3= Consumer Products, 4= Hi-Tech, 5= Pharmaceutical, 6= Chemical Manufacturing and 7= Services & Other and 8= General Manufacturing. “General Manufacturing” is the omitted group. Dummy variables were created for Firm size where 1= Under 1000 Employees and 2= Over 1000 Employees. “Over 1000 Employees” is the omitted group.

Dummy variables were created for education where 1= Less than a Bachelor's degree, 2= Bachelor's degree, 3= Master's degree. "Master's degree" is the omitted group.

We use maximum likelihood (ML) to estimate the parameters from equation 1 and 2. We implement our analyses of these equations in SAS making use of the "GLIMMIX" procedure and the Newton-Raphson algorithm. We use the Newton-Raphson algorithm as it allows for an asymptotic estimate of standard errors and covariance parameters using the observed Hessian matrix, while the alternative expectation-maximization (EM) algorithms are known to provide optimistic estimators (Lindstrom and Bates, 1988). In addition, we use a Kenward-Roger (see Kenward and Roger, 1997) adjustment the degrees of freedom used in tests of statistical significance because unbalanced data that is not independent results in inflated Type I error rates (Kackar and Harville, 1984).

2.3.4.2 Specification of the Random Effects

We examined our data for the possibility for misspecification of our random effects (see Equation 1). We had three plausible forms of random effects in our model. The first plausible model was simply a random intercepts model where managers are allowed to vary on their percentage of outsourcing preference. The second plausible model involved a random intercept for variability across managers and a random slope based upon bandwagon pressure. The third model allows for a random intercept, slope and an interaction between the intercept and slope. We estimated each of these plausible models using Residual Maximum Likelihood Estimation (REML) as REML provides unbiased estimates of the covariance parameters. We then use a likelihood ratio test as described

by Verbeke and Molenberghs (2009) to empirically compare the three plausible covariance structures of our data. We find that the specified model with only a random intercept is the most parsimonious and best fitting model.

We use Generalized Estimating Equations (GEE) as a robustness test of the correct specification of our random component. LMM assumes that the random components are correctly specified, while GEE is robust to misspecification of random components (Hardin and Hilbe, 2002). We believe misspecification to be unlikely, but cannot exclude the possibility. The GEE results mirror the LMM results, providing additional support to our findings.

2.4 Experimental Checks

2.4.1 Manipulation Checks

In order to assess convergent validity, we must determine if the subject's perception of manipulated cues is the same as intended (Perdue and Sommers, 1986). To assess our manipulations, we ask simple "yes" or "no" questions regarding the perception of supplier cost advantage, supplier quality advantage and the ability to monitor supplier performance. We then perform a series of logistic regressions with the manipulation check variable as the dependent variable and the full factorial of the manipulations as the predictor variables. We find that the manipulation check is significantly predicted by only the intended manipulated variable, which is the pattern of the statistical results that suggest convergent validity (Perdue and Sommers, 1986).

2.4.2 Confound Checks

To assess discriminate validity, we examine plausible confounding variables (Wetzel, 1977). We compare our manipulations with the subject's self-reported experience with contract manufacturers as the subject's experience with contract manufacturers is theoretically independent from the factors examined in our research. If confounding is absent then experience with contract manufacturers should not be related to the manipulated factors. To test for confounding, we performed univariate analysis of variance tests with the subject's experience with contract manufacturers as the dependent variables and our manipulations as the independent variables. Subject experiences with contract manufacturers did not depend on any of our manipulations suggesting that confounding may not be present.

2.4.3 Demand Characteristic Checks

Demand characteristics or systematic and uncontrolled cues may bias subject responses (Rosenthal and Rosnow, 1991). We look for these demand characteristics at two different levels: the locations where the experiments were conducted and the scenarios used in the experiment. As a statistical test of location effects we look at the significance of the ICC; we found it to be not significant. We then tested for systematic effects due to our scenarios or Hawthorne effects (Adair 1984; Bachrach and Bendoly, 2011) by comparing subject perceptions as to the realistic nature of the scenario, the extent to which they took their role seriously in the experiment, their level of similarity between issues depicted in the scenario to those they dealt with at work, and their knowledge of the issues depicted in the scenario, which we will use later to perform realism checks.

We use these measures of realism to check for Hawthorne effects as a subject's perception of realism should not depend on which experimental manipulation that they were assigned to. To test for Hawthorne effects, we performed four separate univariate analysis of variance tests with each of the subjects' perceptions as the dependent variable and our manipulations as the independent variables. The manipulations did not differ statistically along these perceptions of realism, role seriousness, similarity between issues depicted in the scenario to those they dealt with at work, and knowledge of the issues.

2.4.4 Realism Checks

As a realism check, subjects were asked to respond to a set of questions developed by Pilling, Crosby and Jackson (1994) to assess the extent to which the scenarios depicted realistic context and issues. The responses to these questions are based on a 5-point Likert scale where 1= Strongly disagree, 3= Neutral and 5= Strongly agree. Subjects, on average, deemed the scenarios to be realistic ($\mu=4.05$, $\sigma=0.52$), took their roles seriously ($\mu=4.02$, $\sigma=0.51$), have dealt with similar issues at work ($\mu=3.49$, $\sigma=0.84$), and were knowledgeable about the issues raised in the scenarios ($\mu=3.79$, $\sigma=0.76$). .

2.5. Results

Table 2.3 provides a summary of the predictions and results. We estimate our hypothesized linear mixed model using maximum likelihood estimation. We report a summary of the statistical results from the LMM regression in Table 2.4.

2.5.1 Direct Effects of Supplier Cost and Quality Advantage

H1a and H1b state that managers will prefer to outsource more when the supplier has a competitive advantage over internal manufacturing operations. As posited parameter

estimates, depicted in Table 2.4, suggest that managers may indeed increase the percentage of outsourcing to suppliers with a cost or quality advantage. Simply put managers, on average, pursue more outsourcing when a contract manufacturer has a cost advantage the ($\gamma_{0,14} = 12.79$, $p < 0.05$). Similarly, managers, on average, pursue more outsourcing when a contract manufacturer has a quality advantage ($\gamma_{0,15} = 20.09$, $p \leq 0.01$). Taken together, our findings support conventional wisdom in operations strategy, as advocated by the resource-based view (Barney 1999, Leiblein and Miller 2003). Namely, managers pursue outsourcing because the supplier provides some production advantage.

Table 2.3 Summary of Hypotheses and Results

Hypothesis	Result
H1a: Supplier cost advantage \rightarrow (+) outsourcing	Supported
H1b: Supplier quality advantage \rightarrow (+) outsourcing	Supported
H2: AMSP \rightarrow (+) outsourcing	Not supported
H3a: AMSP moderated supplier cost advantage \rightarrow (+) outsourcing	Supported
H3b: AMSP moderated supplier cost advantage \rightarrow (+) outsourcing	Not supported
H4: Bandwagon Pressure \rightarrow (+) outsourcing	Supported
H5a: Bandwagon Pressure moderated supplier cost advantage \rightarrow (+) outsourcing	Not supported
H5b: Bandwagon Pressure moderated supplier quality advantage \rightarrow (+) outsourcing	Not supported
AMSP, ability to monitor supplier performance	

2.5.2 Monitoring and Outsourcing Behaviors

2.5.2.1 Does Monitoring Influence the Percentage Outsourced?

H2 predicts that managers will allocate the percentage of production that is outsourced in part due to the ability to monitor supplier performance. Upon examining the parameter estimate ($\gamma_{0,16} = 1.70$, $p > 0.10$), we find evidence that does not support H2. This finding may be a result of managers being overconfident in their firm's ability to detect supplier malfeasance and overlooking increased transaction costs resulting from increased risks

Table 2.4 Linear Mixed Model Regression Results

Variable	Hypothesis	Model		
		Coefficient	Estimate ^a	Std. error
Intercept		γ_{00}	19.64**	5.10
Firm size ^b		$\gamma_{0,1}$	-1.39	2.80
Industry ^c				
Aerospace		$\gamma_{0,2}$	0.30	5.20
Automotive		$\gamma_{0,3}$	-0.69	4.42
Consumer Products		$\gamma_{0,4}$	8.69[†]	4.97
Hi-Tech		$\gamma_{0,5}$	-7.23	5.19
Pharmaceutical		$\gamma_{0,6}$	12.24[†]	6.72
Chemical Manufacturing		$\gamma_{0,7}$	-8.35	6.18
Services & Other		$\gamma_{0,8}$	1.57	3.82
Education ^d				
Less than a Bachelor's degree		$\gamma_{0,9}$	2.40	3.83
Bachelor's degree		$\gamma_{0,10}$	-4.92	3.03
Gender ^e		$\gamma_{0,11}$	6.08*	2.62
Impression of contract manufacturers		$\gamma_{0,12}$	1.96	1.32
Years of sourcing experience		$\gamma_{0,13}$	0.05	0.14
Supplier Cost Advantage (SCA) (Superior)	H1a	$\gamma_{0,14}$	12.79*	5.11
Supplier Quality Advantage (SQA) (Superior)	H1b	$\gamma_{0,15}$	20.09**	5.09
Ability to Monitor Supplier (AMSP) (Able)	H2	$\gamma_{0,16}$	1.70	5.13
SCA x SQA		$\gamma_{0,17}$	6.88	7.02
SCA x AMSP	H3a	$\gamma_{0,18}$	22.27**	7.20
SQA x AMSP	H3b	$\gamma_{0,19}$	2.10	3.16
SCA x SQA x AMSP		$\gamma_{0,20}$	11.83	9.72
Bandwagon Pressure (BP) (Present)	H4	$\gamma_{1,0}$	7.79**	3.49
BP x Firm size ^b		$\gamma_{1,1}$	3.58[†]	1.95
BP x Industry ^c				
BP x Aerospace		$\gamma_{1,2}$	1.79	3.65
BP x Automotive		$\gamma_{1,3}$	-0.75	3.11
BP x Consumer Products		$\gamma_{1,4}$	-11.31**	3.50
BP x Hi-Tech		$\gamma_{1,5}$	-5.08	3.64
BP x Pharmaceutical		$\gamma_{1,6}$	-9.55*	4.72
BP x Chemical Manufacturing		$\gamma_{1,7}$	0.43	4.35
BP x Services & Other		$\gamma_{1,8}$	-2.10	2.67
BP x Education ^d				
BP x Less than a Bachelor's degree		$\gamma_{1,9}$	-2.48	2.70
BP x Bachelor's degree		$\gamma_{1,10}$	0.14	2.13
BP x Gender ^e		$\gamma_{1,11}$	-1.66	1.84
BP x Impression of contract manufacturers		$\gamma_{1,12}$	0.23	0.93
BP x Years of sourcing experience		$\gamma_{1,13}$	-0.29**	0.09
BP x SCA	H5a	$\gamma_{1,14}$	4.90	3.16
BP x SQA	H5b	$\gamma_{1,15}$	2.06	3.16
BP x AMSP		$\gamma_{1,16}$	0.44	3.19
BP x SCA x SQA		$\gamma_{1,17}$	-5.21	3.58
BP x SCA x AMSP		$\gamma_{1,18}$	-0.97	3.63
BP x SQA x AMSP		$\gamma_{1,19}$	-0.23	3.61
Residual error (r_{ij})			116.19**	
Subject variance (u_{0j})			352.24**	
R_1^2			43.75 ^g	
- 2 Log Likelihood			5210.88** ^g	

* $p \leq 0.05$; ** $p \leq 0.01$; $^{\dagger}p \leq 0.10$. Bold indicates statistically significant regression coefficients

^a Unstandardized estimates

^b Firms Over 1000 employees is the omitted group.

^c General Manufacturing is the omitted group.

^d Master's degree is the omitted group.

^e Female is the omitted group.

^f The interaction of Bandwagon Pressure and Master's degree is the omitted group.

^g The null model used in calculations includes covariates. education

costs of contracting and monitoring costs associated with supplier dependence. Nonetheless, this finding suggests managerial behavior may invite the unintended consequence of an increased likelihood of undetected supplier opportunism. In short, this finding suggests managers may be complacent and suppliers may benefit by pursuing opportunistic behavior.

2.5.2.2 Are Managers Concerned with Monitoring Cost Advantage?

H3s asserts that the ability to monitor supplier performance will moderate the relationship between a supplier's cost advantage and the percentage outsourced. We find support for H3a ($\gamma_{0,18} = 22.27$, $p > 0.01$). To help explain the statistically significant interaction we examine pairwise comparisons⁷ to determine the direction and magnitude of interaction effect. The results are summarized in Table 2.5. We find that when the supplier has a cost advantage and the ability to monitor supplier performance makes a statistically significant difference ($I-J = 19.71$, $p < 0.01$) on the percentage outsourced. However, when the supplier has an inferior cost capability the ability to monitor performance does not make a statistically significant difference ($I-J = 3.91$, $p > 0.10$) on the percentage of outsourced. From Figure 2.2, managers prefer to outsource a greater percentage to a supplier with a cost advantage, but the percentage outsourced will conditionally depend on the ability to monitor that supplier's performance. Yet, when the supplier offers no cost advantage the ability to monitor performance does not affect the decision. Moreover, this finding may be rational because the governance structure may be used as a mechanism to control costs and risks. An increase in outsourcing increases the

⁷ Our pairwise comparisons are protected tests and not subject to familywise error rates (Cohen et al. 2003).

Table 2.5 Pairwise Comparisons

(A)	Supplier Cost Advantage	Ability to Monitor Supplier Performance	Estimated Mean	Mean Difference (I-J)
	Superior	Able (I)	71.95	19.71**
		Unable (J)	52.49	
	Inferior	Able (I)	38.75	3.91
		Unable (J)	34.84	
(B)	Industry	Bandwagon Pressure	Estimated Mean	Mean Difference (J-I)
	Aerospace	Absent (I)	45.56	11.85**
		Present (J)	57.42	
	Automotive	Absent (I)	44.56	9.30**
		Present (J)	53.86	
	Chemical Mfg.	Absent (I)	36.9	10.49*
		Present (J)	47.4	
	Consumer Products	Absent (I)	53.95	-1.24
		Present (J)	52.7	
	General Mfg.	Absent (I)	45.25	10.06**
		Present (J)	55.31	
	High Technology	Absent (I)	38.02	4.97
		Present (J)	43	
	Pharmaceuticals	Absent (I)	57.5	4.31
		Present (J)	58.01	
	Services & Other	Absent (I)	46.82	7.95**
		Present (J)	54.78	
(C)	Years of Sourcing Experience	Bandwagon Pressure	Mean	Mean Difference (J-I)
	5.96 yrs	Absent (I)	45.61	9.46**
	5.96 yrs	Present (J)	55.07	
	15.19 yrs	Absent (I)	46.07	6.72**
	15.19 yrs	Present (J)	52.8	
	24.32 yrs	Absent (I)	46.54	3.99**
	24.32 yrs	Present (J)	50.53	

*p ≤ 0.05; **p ≤ 0.01; †p ≤ 0.10.

exposure to opportunistic renegotiation, and hence may increase costs and risks. However, the ability to monitor supplier performance mitigates the risk and subsequently costs of opportunistic renegotiation, but monitoring is not free. Therefore we would expect less outsourcing when a firm has an inability to monitor supplier performance because developing or implementing the ability would be costly or difficult. Moreover, these findings are also consistent with agency theory (Eisenhardt 1985, Jensen and Meckling 1976) and suggest that managers do not exhibit overconfidence in their firm's ability to monitor and control a supplier's cost advantage.

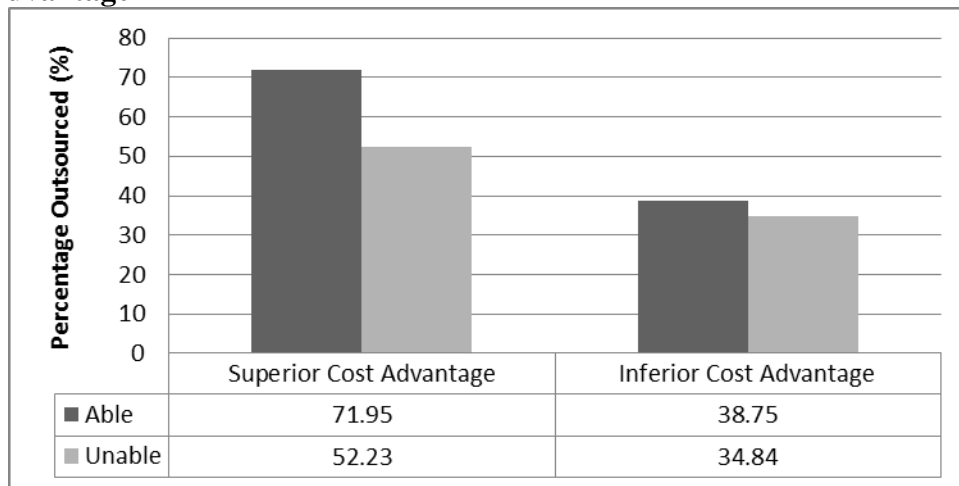
2.5.2.3 Are Managers Concerned with Monitoring Quality Advantage?

H3b states that managers will be concerned with monitoring the supplier's quality advantage for shirking behavior. We find ($\gamma_{0,19} = 2.10, p > 0.10$) therefore, we reject H3b. In other words, the relationship between the supplier's quality advantage and the percentage of outsourcing does not depend on the ability to monitor the supplier's performance. This finding may, in part, be attributed to manager's overconfidence assuming that a supplier's quality will not change when monitoring is difficult, which is consistent with Gray, et al. (2012). Managers may believe that their firm can either control or manage supplier quality (e.g., be able to detect any change in quality without effort or that the supplier won't shirk on quality). In short, if managers believe they can manage supplier quality without monitoring, they may be overestimating their firm's ability to detect changes in supplier behavior. Conceivably, managers may be overconfident because their beliefs are miscalibrated (Kahneman et al. 1999). Another possible source of managerial overconfidence is the *fallacy of initiative* (Tversky and Kahneman 1973), where managers may attribute less opportunistic behavior to contract manufacturers because they believe them to have less initiative to act opportunistically. In addition, we speculate managers may be treating quality as an order qualifier and treating cost as an order winner by overlook the monitoring of supplier quality advantage because they are placing an emphasis on the suppliers cost advantage. Yet, by failing to consider the ability to monitor the supplier's quality advantage managers may be inadvertently increasing quality risks and agency costs.

2.5.3 Do Managers Outsource More When Facing Bandwagon Pressure?

H4 asserts that managers facing bandwagon pressure will outsource more. We find a significant and positive relationship between bandwagon pressure and the percentage outsourced ($\gamma_{1,0} = 7.79$, $p \leq 0.01$) supporting H4. Our finding adds a subtle nuance to the prevailing view that supply chain decisions are influenced by the actions of the competition (Hayes et al. 2005, Porter 1980). The prevailing view suggests that managers should assess their new competitive position, prior to making a decision. Our operationalization of bandwagon pressure was simply to

Figure 2.2 Interaction of the Ability to Monitor Supplier Performance and Supplier Cost Advantage



tell the managers that competitors were outsourcing. We do not say why the competition is outsourcing, which we believe is consistent with practice⁸. Managers are left to speculate as to the rationale behind the decision as well as what the news means for their competitive position. This ambiguity may contribute to managers looking to the competition for the right course of action (Cialdini 2009). In real world outsourcing

⁸ News articles or firm financial reporting of outsourcing seldom mention anything beyond improved performance or competitive position.

situations, managers may be ignorant of what the right decision is to make and thus follow “the rest of the crowd” assuming that the competition is better informed. Ironically, ‘the rest of the crowd’ may be ignorant as well. This pluralistic ignorance can cause bandwagon behavior (Cialdini 2009). Additionally, conformity or joining the outsourcing bandwagon has several psychological benefits for managers. First, it provides social proof the right course of action and may reduce criticism if the choice turns out poorly (Cialdini 2009). Second, conformity diffuses responsibility for the decision, thus the manager may feel less culpable (Cialdini and Goldstein, 2004). Third, and finally, managers that conform may have a positive assessment of their choice and subsequently may feel better about their decision (Cialdini and Goldstein, 2004).

2.5.3.1 Does the Effect of Bandwagon Pressure Enhance the Supplier’s Cost or Quality Advantage?

H5a-b state that the relationship between supplier advantage and the percentage of outsourcing will increase when bandwagon pressure is present. In other words managers will find supplier cost or quality advantage more appealing when faced with bandwagon pressure. We do not find evidence for either H5a ($\gamma_{1,14} = 4.90, p > 0.10$) or H5b ($\gamma_{1,15} = 2.06, p > 0.10$), as the interaction between bandwagon pressure and supplier cost advantage does not explain a statistically significant amount of the variance in the percentage of outsourcing. Failure to find support for Hypothesis 5b suggests managers, on average, are not increasing their outsourcing because they are not jumping on the bandwagon to increase quality. Rejection of Hypothesis 5a and 5b, taken together, indicates that managers may not be jumping on the bandwagon because of supply market

factors and pursuit of competitive advantage, as suggested by Gray, Roth and Tomlin (2009). Also, finding neither the effect of cost nor quality are influenced by bandwagon pressure suggests institutional pressures to imitate (i.e., DiMaggio and Powell 1983) may not directly influence an individual's preference.

Rather the bandwagon has a direct effect on outsourcing. This direct relationship indicates that managers may be conforming because managers observe the actions of the competition (or speculate about competitive actions) and infer the competitors actions may be the 'right' thing to do irrespective of their firm's specific situation. Therefore, our study suggests that the bandwagon effect reflects a psychological phenomenon (e.g., social proof) (Cialdini 2009). We look for additional information about what may be driving the bandwagon behavior by examining the influence of employment and individual characteristics on bandwagon behavior. We examine these characteristics below.

2.5.3.2 The Moderating Effect of Individual Characteristics on Bandwagon Pressure

We do not find that education ($\gamma_{1,9} = -2.48, p > 0.10$; $\gamma_{1,10} = 0.14, p > 0.10$), gender ($\gamma_{1,11} = -1.66, p > 0.10$) or impression of contract manufacturers ($\gamma_{1,12} = 0.23, p > 0.10$)

moderate the relationship between bandwagon pressure and the percentage outsourced.

However, we find the interaction between the years of sourcing experience and bandwagon pressure is statistically significant ($\gamma_{1,13} = -0.29, p < 0.01$). Managers with more experience outsource due to bandwagon pressure at a smaller rate than those with less experience, see Figure 2.3. Notably, highly experienced managers or managers with 24.32 years of sourcing experience are less affected by bandwagon pressure, than less

experienced managers, who have only 5.96 years of sourcing experience. This finding suggests that experience can substantially reduce, but not eliminate the effects of bandwagon pressure. Arguably, the reduction in the effect of bandwagon pressure on the percentage of outsourced is due to differences in confidence and uncertainty about the decision. As experience increases individuals tend to become more confident in their decisions (Griffin and Tversky 1992). This increased confidence leads to a decrease in the reliance on social proof (Cialdini 2009) because the manager believes he already made the right choice. Similarly, managers with more experience may be more knowledgeable or have greater expertise. This greater level of knowledge may allow managers to be more discerning (Simon and Chase 1973); and in turn, they may determine that in this context the information provided by bandwagon pressure is not relevant to their decision.

2.5.3.3 The Moderating Effect of Employment Characteristics on Bandwagon Pressure

We find that firm size ($\gamma_{1,1} = 3.58$, $p < 0.10$) and industry ($\gamma_{1,4} = -11.31$, $p < 0.01$; $\gamma_{1,6} = -9.55$, $p < 0.05$) may significantly influence manager's bandwagon behavior. Large firms tend to jump on the outsourcing bandwagon slightly more than small firms. In addition, we find that managers from most industries (i.e., aerospace, automotive, chemical manufacturing, general manufacturing, high technology and services) tend to be influenced by bandwagon pressure more than managers from consumer products or pharmaceutical industries, see Figure 2.4. Both of these findings suggest that industry

trends or institutionalization forces influence the managers learning processes and subsequently their outsourcing decisions.

Figure 2.3 Interaction of the Years of Sourcing Experience and Bandwagon Pressure

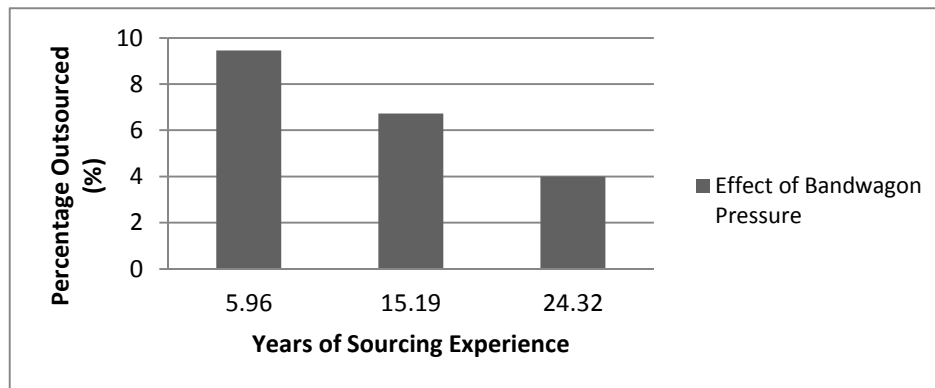
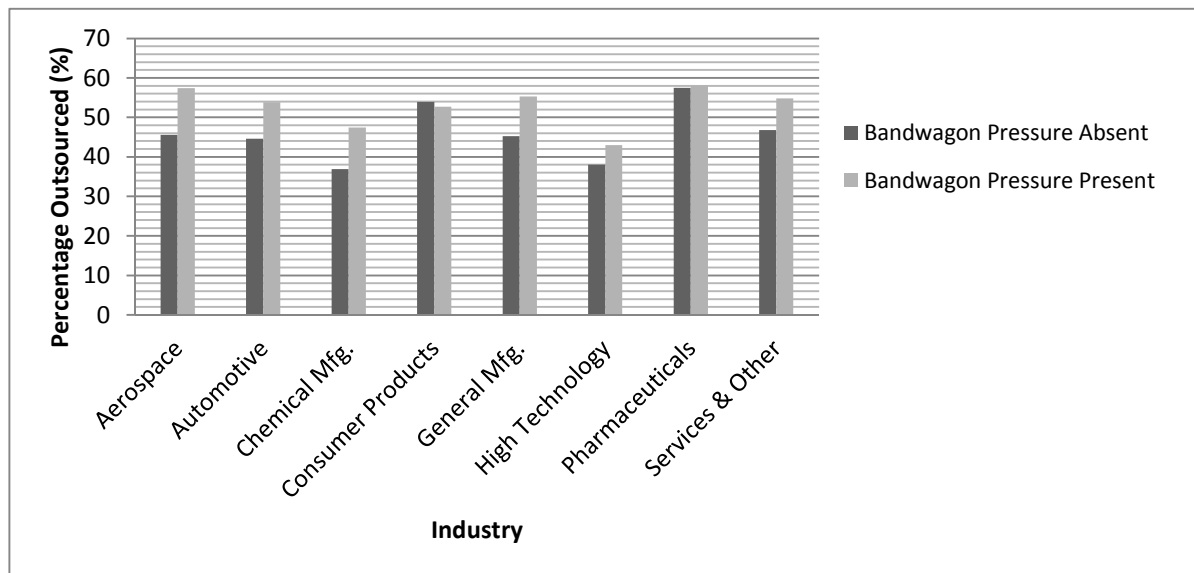


Figure 2.4 Interaction of Industry and Bandwagon Pressure



2.6. Discussion and Limitations

Our findings suggest that managers may be overconfident when about their ability to monitor a supplier's quality advantage but not a supplier's cost advantage. As a result,

excessive outsourcing may be occurring⁹. This contradictory finding suggests that managers are concerned with supplier opportunistic renegotiation but not quality shirking. Nonetheless, managers should clearly be concerned with both because they both influence cost or risk. To the extent that suppliers are inherently effort adverse (Jensen and Meckling 1976), they will shirk unless monitored. We believe there are several possible explanations that may explain this contradictory finding. First, managers may be overconfident about their ability to control supplier quality (Gray et al. 2009a), but not cost. Overconfidence may be a result of miscalibration in beliefs (Kahneman, et al. 1999). Specifically, managers may believe quality is ubiquitous or easy to control. The proliferation of quality management literature, systems and certification standards (e.g., ISO) may contribute to this misperception. However, quality varies greatly even when similar quality systems are in place (Gray et al. 2011) or the same quality standards are implemented (Sroufe and Curkovic 2008). Any of these causes individually or a combination of causes may explain why managers are overconfident in their ability to monitor or control supplier quality advantage but not cost advantage.

Second, this miscalibration of cost and quality beliefs may be the result of myopic learning. The supplier actions based on cost opportunism (i.e., contract renegotiation) may provide feedback that is immediate and unambiguous outcomes (i.e., reduced profits). To the contrary, supplier actions based on quality opportunism (i.e. quality shirking) may be time lagged and have ambiguous outcomes (decreased customer satisfaction, increased warranty costs and product recalls). Levinthal and March (1993)

⁹This interpretation is supported by Camerer and Lovo (1999) who found that overconfidence may promote excess entry into competitive games or markets.

report that learning is biased towards immediate and unambiguous outcomes, whereas it is difficult to learn when the cause-effect relationship is lagged.

Third, cost opportunism may be more available in memory than quality opportunism. Thus, cost may be more memorable because of the aforementioned learning, as well as from their performance evaluations and incentive systems. Managers are evaluated and promoted in part on their job performance. It is commonly believed that managers are more likely to be evaluated on their performance in terms of short-term costs not total delivered costs may include the lagged costs of poor quality from suppliers. Moreover, incentive systems may reemphasize short-term cost performance over long-term total costs. For these reasons, supplier cost opportunism may be more memorable than supplier quality opportunism. Tversky and Kahneman (1973, pg. 232) suggest that: “Continued preoccupation with an outcome may increase its availability, and hence, it’s perceived likelihood.” In other words, because cost is more memorable, managers may believe that supplier cost opportunism is likely to occur, than supplier quality opportunism. As result, managers choose to monitor cost but not quality.

Regarding bandwagon pressure, our findings indicate that conformance is not driven by the pursuit of supplier cost or quality advantage. Instead, bandwagon pressure appears to have a systematic effect where managers imitate what the competition is doing. This suggests outsourcing bandwagon behavior may be a primarily a psychological phenomenon instead of an institutional one. Significant interaction between bandwagon pressure and sourcing experience support this interpretation. Moreover, it suggests that managers may assume the competition knows what the right

decision is, hence they conform (Cialdini 2009). Ironically, managers that conform to bandwagon pressure may evaluate their outsourcing decision performance as better when they are following the crowd (Cialdini and Goldstein 2004, Cialdini 2009); however, actual perform may be worse because they are later adopters (McNamara, et al., 2008) or efficiency is reduced (DiMaggio and Powell 1983). Moreover, managers may not be aware that they are influenced by bandwagon pressure (Cialdini and Goldstein 2004).

Thus, managers may systematically increasing risk because they are joining the bandwagon and overconfident about their ability to control quality. Our findings suggest that buyer behaviors may have unintended consequences for the buyer-supplier relationship. Specifically, the buyer by being overconfident and failing to monitor supplier quality advantage may create a perverse incentive where the supplier may benefit more from quality shirking. Additionally, managers that think they can control quality or that are joining the bandwagon may be the cause of adverse selection. This is contrary to the traditional view (Akerlof 1970) that the supplier's hidden information causes adverse selection as managers may ignore supplier information when making their choice. In contrast, the buyer may make decisions that do not have firm's best interests in mind and consequently increase costs.

Given our results, the biases introduced by bandwagon pressure, overconfidence and individual characteristics may be reduced by counterfactual thinking (Kahneman 1995). Take for example, the managerial interventions: First, by identifying instances where a higher or lower percentage of outsourcing does not make sense managers may be able to identify underlying assumptions or gain insights into their current decision.

Second, firms can require that alternative supplier assessment occur, one where the suppliers are evaluated holistically and another where attribute based evaluation strategies are implemented. Evaluating potential suppliers in these two different ways has two primary benefits. (1) Reevaluating the contract manufacturer from different frames may offer different insights and convergent validity. (2) Considering alternative-based evaluation and attribute based evaluation are complementary. Evaluating every alternative requires high cognitive attention (Hastie and Dawes 2010), so important details (i.e., quality) may be overlooked. Conversely, attribute-based evaluation defines attributes a priori (e.g., cost and quality) making sure that important details are evaluated but often results in narrower search for information (Hastie and Dawes 2010).

As with any study, ours is not without limitations. First, we examine individual manager decisions. These decisions may not be indicative of organizational behavior as organizational processes may mediate the relationship between the individual manager's decision and the organization's decision. Behavioral operations would indicate that the manager's decisions or recommendations will weigh heavy in their organization's decision-orientation. Future research is needed regarding organizational processes and decision shaping. Second, we do not explicitly link overconfidence or bandwagon pressure to organizational outcomes. While the literature is clear that overconfidence (Malmendier and Tate 2005, Malmendier and Tate 2008) and joining the bandwagon (McNamara et al. 2008, Staw and Epstein 2000) tend to lead to negative organizational outcomes, nonetheless overconfidence (Galasso and Simcoe 2011) and bandwagon behavior (DiMaggio and Powell 1983) may have positive outcomes. The extant literature

does not examine overconfidence or bandwagon behaviors within supply markets or more specifically outsourcing. Therefore, we cannot conclude that either overconfidence or bandwagon behavior result in poor supply chain performance. Third, institutional theory suggests that early adopters may be benefiting and that late adopters may be joining the bandwagon for institutional reasons. We do not distinguish between the influences of these two possibilities in our study. Fourth, our operationalization of bandwagon pressure shows bandwagon behavior but does not distinguish the possible competing causes that may drive bandwagon behavior. Additional research should examine if bandwagon outsourcing is driven by herding behavior, information cascades, social proof or some combination of these causal mechanisms. Each of these limitations is an opportunity for future research. We suggest that in the future researchers tie overconfidence and bandwagon pressure to organizational outcomes and supply chain performance.

2.7 Conclusions

In summary our study finds that both superior cost and/or quality capabilities of the contract manufacturer when compared to the buying firm's manufacturing abilities indeed act to increase outsourcing. In addition, we find that manager's outsourcing propensity is reduced, on average, when there is difficulty in monitoring supplier performance, even when the supplier has a cost advantage over the firm's internal manufacturing. In contrast, difficulty in monitoring supply performance has no moderating influence on relative supplier quality advantage. These are consistent with Gray, et al.'s (2009a, 2012) findings that difficult to measure capabilities, like quality,

have no effect on the decision to outsource. In other words, unlike costs, where the rational model prevails, reduced sourcing occurs when measurement is difficult; however, managers are not altering their decision processes accordingly when it comes to supplier quality advantage. Thus, managers may be overconfident in assuming that they can adequately manage quality (e.g., by codification and testing) and knowledge transfer issues (e.g., adding sufficient resources) or that their suppliers know more than they do regarding quality, and will provide it even without their ability to monitor adequately.

Unexpectedly, these behavioral results signal a naive understanding of quality management practices and their relationship to costs (Crosby 1979, Deming 1986, Ward and Duray 2000, Rungtusantham et al. 2001, Shah and Ward 2003) and knowledge management (Anand et al. 2010, Grant 1996, Roth et al. 1994). It is well-established in quality management that ensuing product failures, quality risks, and recalls in the field actually increase total costs. The notions of *overconfidence* (Langer 1975), *availability bias* (Tversky and Kahneman 1974), and *myopic learning* (Levinthal and March (1993)) may further explain these observations from a behavioral lens. Specifically, managers may believe they can control supplier quality thus shifting their focus to cost management. The more emphasis the firm places on costs relative to quality, the more its internal decision makers may emphasize cost over quality, regardless of tangibility and monitoring ability. Therefore, the pervasiveness of firms' emphasis on per unit "costs" determined prior to the make-buy decision, and the likelihood that the costs of poor quality outcomes are lagged, provide a plausible explanation underlying the behavioral theories.

Additionally our study finds that the bandwagon affects outsourcing directly, regardless of relative supply cost and quality advantages as posed by Gray et al. (2009). Rather managers may be jumping on the bandwagon for psychological reasons, such as following the crowd because the crowd provides proof of what should be done (Cialdini 2009). Third, we examined employment and individual characteristics sheds light on factors that may enhance or mitigate bandwagon pressure, and in turn, offers managerial guidance in such areas as leadership training and simulations. We find that managers with more sourcing experience are less affected by the bandwagon pressure, but the bandwagon behavior is not completely eliminated. Surprisingly, we find that industry norms may play a role in outsourcing, which suggests outsourcing may be in part a fad.

Our experimental results, taken together, suggest that managers increased outsourcing due to bandwagon pressure and prospective overconfidence, and consequently, may inform from a behavioral perspective what Anderson and Parker (2002) call an *outsourcing trap*. Furthermore, the deleterious effects of overconfidence and bandwagon pressure have been hypothesized to be major and irrational causes of both stock market and housing bubbles (Shiller, 2005). Using these analogies, this study provides the first empirical evidence that similar behavioral operatives may be creating an *outsourcing bubble*, with significant ramifications for supply chain structure. Many companies have moved production to suppliers they may not have the ability to monitor, yet nonetheless remain confident about their ability to know what the suppliers is doing (Harney 2008, Roth et al., 2008). Both supply chain management theory (Eisenhardt

1989, Williamson 1985) and case study observations (Harney 2008, Roth et al., 2008) suggest suppliers will shirk when the buyer is unable to monitor supplier performance.

While not specifically addressed in this paper, many of the touted benefits associated with outsourcing to suppliers in low cost countries are diminishing, as costs rise due to increased complexities of outsourcing and offshoring (Gray et al. 2011), and a myriad of operational malfeasances come to light. While low cost countries provide an attractive price tag, the cost of shirking, poaching of intellectual property and contract renegotiations may eclipse the benefits of outsourcing (Harney 2008). Nonetheless, many companies may be joining the offshoring-outsourcing bandwagon (Gray, et al. 2009a, Levine 2011); and the unintended consequences associated with outsourcing may be eroding manufacturing country and firm-level competitiveness (Handley 2012). We believe future research on offshore outsourcing is needed to study this issue. Nonetheless, joining the outsourcing bandwagon and overconfidence in the ability to control supplier quality may be increasing supply costs and risks.

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CHAPTER THREE
ESSAY 2 MAKE-BUY: THE PERCEPTION OF RISK AND BENEFIT
THROUGH ROSE COLORED GLASSES

“One of the major biases in risky decision making is optimism. Optimism is a source of high-risk thinking.”

-Daniel Kahneman

“With things of a human origin, it's harder to objectively figure out the probabilities. To the best of my knowledge, people are not doing credible analysis on the risks facing this country, and if they were, who's to know that those are static probabilities?”

-Barry Fischhoff

Abstract

This paper focuses on how managers perceive risk and benefit after deciding to govern a transaction by either making or buying. Supply chain management theory espouses managers should try to maximize benefits and minimize risks. Managers weigh the positives (benefits) versus the negatives (risks), and then choose a course of action. To be completely rational a manager must explicitly know the probability and magnitudes of all possible outcomes. Yet, in most supply chain situations the information needed to employ actuarial science is unavailable. This lack of information may be due to deliberate information asymmetries or ignorance. Nonetheless, the result for managers is the same: They must assess risk and benefit based on limited information. As the assessment of risk and benefit is often made based on perception, it may be subject to biases and heuristics. One such heuristic, the affect heuristic, suggests managers may perceive benefit and as a result feel good about transaction attributes such as low cost,

high quality, and ability to monitor that align with their decision to make or buy. Subsequently, this good feeling about alignment will affect how managers perceive risk such that managers may be viewing risk through rose-colored glasses. We design an experiment to examine this phenomenon. Our results indicate that managers choose to make or buy based primarily on acquiring low cost, thus they perceive acquisition of low cost capability to be beneficial. Concomitantly, they perceive acquisition of low cost to be less risky, thus resulting in a negative correlation between perceived risk and benefit. We explore the implications of this finding for supply chain management.

Keywords: Supply Chain Risk Management, Perception of Risk

3.1 Introduction

This study aims to explore how risk and benefit are perceived after managers make a decision to insource (make) or outsource (buy) the manufacturing of a product. After the make-buy decision is made the manager's perception of supply risk and benefit influence how the supply chain is managed. Recent empirical evidence suggests that the buyer may be unaware of the risks presented by supplier opportunism (Handley, 2012), selective in the type of risks that influence their decisions or ignore difficult to determine risks altogether (Hall, Roth, & Rungtusanatham, 2012). This evidence is particularly troublesome in light of the fact that supply chains are becoming more global, complex and increasingly risky (Choi & Krause, 2006). At the same time, supply chains face an increasing diversity of environmental factors (e.g., political, social, macroeconomics) which may increase risk (Rao & Goldsby, 2009). Identification and assessment of supply

chain risks rely heavily on manager perceptions (Analytics, 2012; Ellis, Henry, & Shockley, 2010) and guide managerial risk management strategies (Kleindorfer & Saad, 2005; Tomlin, 2006). Yet, we do not know how sourcing choices influence managers' perceptions of risks and benefits. Our research addresses this by examining the following question: How do managers perceive risks and benefits?

This is an important question to answer as the value of appropriately applied risk management strategies is undeniable and substantial (Kleindorfer & Saad, 2005; Tomlin, 2006). Ironically, the focus of identification and these studies is how risk perception leads to some risk mitigating to contingency strategy. Yet, these studies fail to address how managers use of intuition may result in the misperception of risk and mismanagement of supply chain risks. Most risk identification and assessment by managers is based on experience and intuition (Analytics, 2012; March & Shapira, 1987; Shapira, 1995). Given that supply chain managers often have to identify and assess risks when the nature and extent of risks is not well known, this reliance of intuition is not surprising. Moreover under the right conditions managers (e.g., a stable cause-effect relationship, a broad and unbiased exposure to relevant situations) may learn expert intuition (Klein, 1997b; Simon, 1987).

While the reliance on intuition is certainly expedient and efficient, reliance on intuition often leads to biases in large part because learning is imperfect (Levinthal & March, 1993) and other cognitive processes are fallible (Tversky & Kahneman, 1974) often because of incomplete information (Klein, 1997a). In supply chain management, managers may be biased as a result of unobservable information and outcomes. For

example, suppliers keep information private, thus creating information asymmetry resulting in a bias in what a manager (buyer) knows. This asymmetry may result in a learning bias that prevents development of expertise (Levinthal & March, 1993) or the availability of information retrieval from memory (Tversky & Kahneman, 1973). At the same time this information asymmetry results in an information gap, a gap that affect or feelings fill (Zajonc, 1980; Zajonc & Markus, 1982). Affective information aids judgment but also may unconsciously influence decisions and risk-related behaviors (Loewenstein, Weber, Hsee, & Welch, 2001; Finucane et al, 2000). What we already know about risk identification and assessment suggests that managers may misperceive supply chain risk because of information asymmetries and their reliance on affective assessment to judge risk.

The dominant paradigm suggests that risk and benefit are positively correlated (i.e., the higher the risk the higher the benefit) in the market (Fama, 1970; Fama & French, 1993). Thus, managers should before, during and after their make-buy decision perceive risk and benefit to be positively related. Also, managers, in general, are risk averse (Jensen & Meckling, 1976; March & Shapira, 1987) as a result managers should err on the side of caution. However, managers may be risk averse, yet behave risky because they are overly optimistic in their predictions about risk (Kahneman & Lovallo, 1993). Evidence from psychology suggests that managers may be optimistic about their predictions of risk when they perceive benefit is high (Finucane, Alhakami, Slovic, & Johnson, 2000; Loewenstein et al., 2001). Managers should feel the make-buy decision is most beneficial when there is alignment of the beneficial transactional attributes (e.g.,

low cost, high quality and ability to monitor) with their choice to make or buy. As a result of feeling good about the beneficial alignment, managers may underestimate the risks associated with their choice suggesting a negative relationship between the perception of risk and benefit. If managers act on this perception they may be unknowingly increasing risks. Thus there is a dilemma in our understanding of how managers perceive risk and benefit in the supply chain. We empirically investigate this dilemma.

Our research contributes to the understanding of the perception of risk and benefit surrounding the make-buy decision in several important ways. First, buying (outsourcing) is inherently more risky than making because a firm (the principal) relinquishes the direct control and management of the production process and at the same time exposes itself to supplier (agent) opportunism. However, upon deliberate and quantitative analysis the manager may feel that the benefits of outsourcing (e.g., lower costs, improved quality) may outweigh the risks. Yet, our findings suggest that managers focus on benefits and put on rose-colored glasses when examining the risks. Surprisingly, we do not find that the alignment of the make-buy decision with high quality or ability to monitor plays a role in managers' perception of risk or benefit. Taken together these findings suggest cost is king, but ironically may also be the cause of mismanagement that results in increased supply chain risks.

The rest of the paper proceeds as follows. First, we review the psychology, risk and supply chain management literatures to develop our hypotheses and model. Next, we discuss our empirical approach that we use to examine our hypotheses. Third, we discuss

our findings. Lastly, we conclude with the implications of our study for supply chain managers and researchers.

3.2 Related Literature

The dominant view in operations and supply chain management strategy is that the make-buy decision is driven by capability and risk considerations (Hayes, Pisano, Upton, & Wheelwright, 2005). Essentially, managers are differentiating between make and buy to choose the governance form that will yield the greatest expected net benefit (Williamson, 2005). In general, making is considered the choice of last resort because of lock-in costs (Hayes et al., 2005; Williamson, 2005). Yet, buying presents its own set of risks and benefits. Buying is inherently beneficial because it prevents lock-in and leverages the supply market. Buying is risky with a long list of transactional costs: Incomplete contracting, hold-up costs, switching costs, costs of creating credible commitments, monitoring and enforcement costs (Williamson, 1985). Hence the loss of control associated with buying is accompanied by an increase in risk and hence management and agency costs will increase.

While risk and benefit are distinct concepts they are inexorably linked together ex ante, it is not clear to how managers assess risk or benefit (ex post) after making their decision. Classical economic theory suggests, in general¹⁰, risk and benefit are naturally and positively related (Knight, 1921). Thus a rational manager should either perceive both benefit and risk to be low or high. Yet, managers may be boundedly rational and

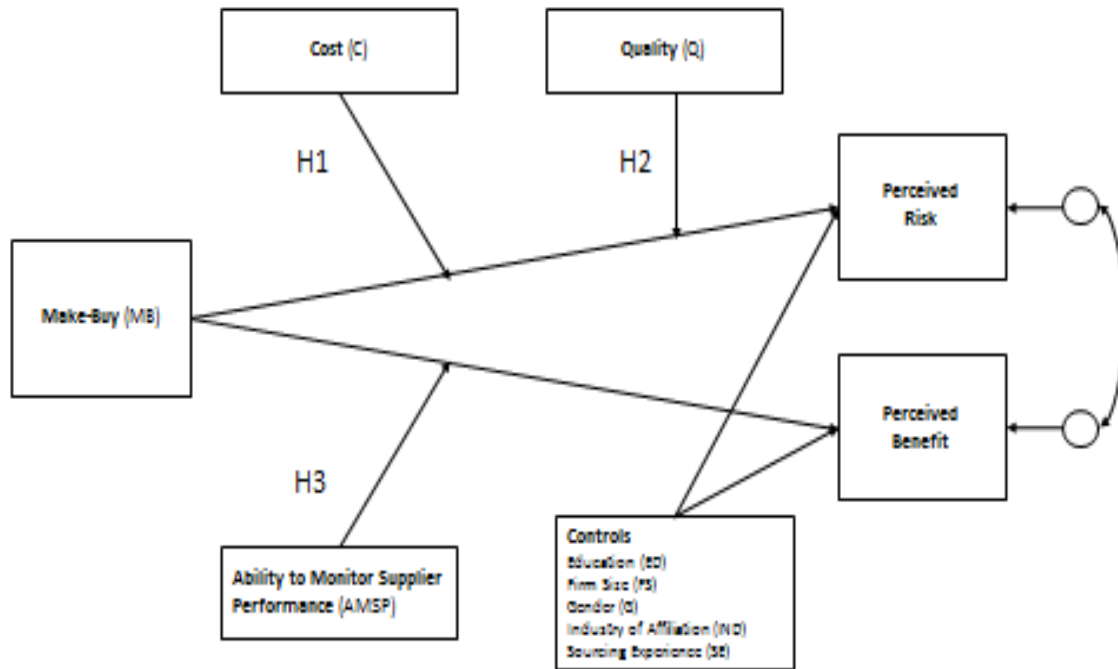
¹⁰ It is possible with the right diversification of a portfolio to simultaneously decrease risk and increase return, see for example: Markowitz, H. 1952. Portfolio selection. *The Journal of Finance*, 7(1): 77-91..In supply chain management we believe such an opportunity would be uncommon.

rely on heuristics to make decisions (March & Simon, 1958; Simon, 1957). Managers may use an affective heuristic that relies on the manager's affective state for information and thus may influence both the perception of risk and benefit (Finucane et al., 2000). It is this perception that drives managerial intentions and subsequently behavior (Ajzen, 1991). However, affect and feelings are by their very nature content and context specific (Finucane et al., 2000; Loewenstein et al., 2001). As such, we believe managers will select the make-buy choice based on the attributes of the transaction and therefore their perceptions will be based on the attributes that align with their choice. Thus, neither making nor buying should be inherently perceived as good or bad, beneficial or ineffectual, risky or riskless. In other words the affective feelings of make or buy depend conditionally on the attributes that align with the choice. We propose a conceptual model in Figure 3.1, which examines how the alignment of transactional attributes with the make-buy decision may influence perceptions of risk and benefit.

3.2.1 Identification and Assessment of Risks in Supply Chain Management

Our study defines risk as the subjective assessment or judgment of the perceived hazards associated with their make-buy decision. We define risk as such for clarity as there are a wide range of definitions for what risk in supply chain management means (Sodhi, Son and Tang 2012). This is not surprising as risk has different definitions and connotations, see Table 1, in two of supply chain management's reference disciplines: economics and psychology.

Figure 3.1 Essay 2 Hypothesized Model



In economics, risk is the probability of an outcome occurring. This includes both positive outcomes (gains) and negative outcomes (loss). There are two logical ways to assess risks: a priori and statistically (Knight, 1921). However, there are two critical assumptions made in order to use an a priori distribution: 1) the a priori distribution accounts for all possible outcomes and 2) the a priori distribution is static. The second way, statistical probability assessment, is determined empirically from historical data as such it is predicated on the assumption that the causal mechanism that caused the past distribution remains the same (Knight 1921). In psychology risk is a subjective assessment of a loss outcome occurring (Loewenstein et al., 2001; Yates & Stone, 1992).

Table 3.1 Definitions of Risk

Author	Discipline	Definition
Knight (1921)	Economics	Risk is the probability occurrence of an event predicted either a priori or statistically.
Fama and French (1993)	Economics	Risk is variance in the probability distribution of observable outcomes.
Loewenstein et al. (2001)	Psychology	Risk is feeling that provides information which aids the assessment of difficult to control or observe hazards.
Finucane et al. (2000)	Psychology	Risk is a judgment of a perceived hazard which is influence by our affective interpretation of information.
Yates and Stone (1992)	Psychology	Risk is a subjectively determined perception of the magnitude and uncertainty of loss.

Both the objective (Kleindorfer & Saad, 2005; Tang & Tomlin, 2008; Tomlin, 2006) and subjective (Ellis et al., 2010; Zsidisin, 2003a; Zsidisin, 2003b) paradigms of risk are used in supply chain management research. In supply chain management, we clearly have both objectively and subjectively assessable risks (Rao and Goldsby 2009), yet our study focuses on subjective assessment of risk for several reasons. First, we believe subjective assessment of risk is the dominant risk assessment method that occurs in industry. Recent evidence (e.g., AON Analytics 2012) suggests that managers often make a judgment of risk rather than a formal actuarial assessment of risk. Second, we believe that the subjective judgment occurs often because managers tend to deal with unobservable constructs (Godfrey & Hill, 1995). Specifically, we believe supply chain managers tend to encounter broad unobservable risks (e.g., supplier opportunism) vs. specific observable risks (e.g., probability of an earth quake in Japan shutting down supplier operations). Lastly, while the objective and subjective paradigms appear incommensurate, the line between subjective and objective risks is not clear (Fischhoff, Watson, & Hope, 1984). Many seemingly expert and objective assessments (i.e., a priori

distributions and actuarial tables) of risks require judgment and interpretation of facts to draw conclusions, thus often even among experts there is often disagreement about what the objective risks are (Fischhoff et al., 1984). Barry Fischhoff noted: “With things of a human origin, it's harder to objectively figure out the probabilities.”

Supply chain management subjective risk assessment relies on estimations of risk made by experts (Ellis et al., 2010; Zsidisin, 2003b). Estimations based on judgments or intuitions are fallible (Knight, 1921; Simon, 1987) and often biased in predictable ways (Tversky & Kahneman, 1974). In general, actuarial or statistical outperform expert judgments (Dawes, Faust, & Meehl, 2002; Meehl, 1954). In short if there is an objective assessment of risk managers should use it. Again, we believe in supply chain management often there is not a way to objectively assess risks, what do managers do? How do they subjectively assess risks? The extant literature says they rely on intuition or emotion (March and Shapira 1987, Simon 1987). Moreover, managers focus on the risk of losses instead of both gains and losses (March and Shapira 1987; Zsidisin 2003a). Our study focuses on how managers perceive benefit and risk together as assessment of one may affect the other (Finucane et al., 2000; Loewenstein et al., 2001), while most supply chain studies the focus on identifying (Zdisisin 2003a,b), assessing (Ellis et al. 2009) or managing risks (Hult, Craighead, & Ketchen, 2010; Tomlin, 2006).(Finucane et al., 2000)

3.2.2 Identification and Assessment of Benefits in Supply Chain Management

We define benefit as the subjective assessment or judgment of the perceived financial or operational gains with their make-buy decision. In economics, benefit is synonymous with profit (Knight, 1921). Benefit or the pursuit of profit generating

activities is a pervasive goal for most firms (Cyert & March, 1992; Williamson, 1985). In supply chain management benefit is often expressed as profit or operational outcomes that lead to profit such as on-time delivery, high quality, low production costs and volume flexibility (Roth, 1996). However, managers' assessment of benefit or "perception" is subjective and managers must use judgment in their forecasted prediction of profit or performance improvements. Numerous studies adopt this perspective and link perception of operational outcomes with self-reported "perceived" performance (Flynn, Huo, & Zhao, 2010; Handley, 2012; Rosenzweig & Roth, 2004; Schroeder, Shah, & Xiaosong Peng, 2011). Moreover, there is some evidence that self-reported perceptions of performance (benefit) may be reasonably accurate (Ketokivi & Schroeder, 2004). Nonetheless, this literature does not link the perception of benefit with the perception of risk.

3.2.3 Make-Buy, Risk and Benefit in Strategic Management

The decision to determine whether a firm makes or buys is fundamental to operations and supply chain management. The make-buy decision simultaneously determines the resources a firm have access to (Barney, 1999) and the transaction costs the firm experiences (Williamson, 2008), and ultimately how the firm performs (Hayes et al., 2005; Porter, 1980). Essentially, managers face a cost-benefit analysis where they determine the net benefit of making vs. buying and go with the highest net benefit option (Hayes et al., 2005; Porter, 1980). In our study net benefit has the standard meaning where net benefit is t benefits minus costs. However, often costs are the result of risks (Hayes et al., 2005; Williamson, 2008), therefore we use the terms interchangeably.

The resource based view and transaction cost economics differ in how they emphasize the tension between risk and benefit when considering whether to make or buy. The resource-based perspective emphasizes about how to acquire, select or develop resources to generate value (Barney, 1991). Essentially, managers facing the make-buy decision should be concerned with benefits (effectiveness). The presumption is that acquisition of a valuable resource (benefit) will outpace the costs of accepting or managing risks (e.g., agency, coordination and opportunism) (Barney, 1999). Transaction cost economics (TCE) emphasizes efficiency or management of costs (risks) (Williamson, 1999). TCE assumes that cost minimization is profit maximizing. Thus the benefit (value) associated with any given transaction is fixed¹¹, so in the make-buy decision managers should pursue the lowest cost option. “Making” tends to have high opportunity costs, yet nonetheless should be used when buying has high risks (i.e., opportunism costs, potential for hold up, high enforcement costs, high switching costs). Both of these theories have different underlying assumptions about risk and benefit but suggest that risk and benefit are positively correlated.

With that said these perspectives are complementary (Williamson, 1999) and often integrated in supply chain management to inform or predict the make-buy decision (see for example Gray, Roth, & Tomlin, 2009; Leiblein & Miller, 2003; Poppo & Zenger, 1998). So while RBV and TCE emphasize that risk-benefit analysis is drives the managers make-buy decision, they are silent about how managers will perceive risk and

¹¹ Albeit Williamson (2008) is clear that making is the option of last resort.

benefit after their decision. Presumably, a manager would want to correctly perceive risk and benefit in order to effectively manage the supply chain.

3.2.4 Competitive Capabilities

Competitive capabilities are the set of heterogeneous abilities of the firm to perform against its competitors in target markets (Roth & Jackson, 1995). The capabilities and the make-buy choice that determine the attributes of a transaction are selected simultaneously by managers (Riordan & Williamson, 1985). While RBV tells us that manager's make-buy decision will be influenced by the desire to obtain valuable competitive capabilities (Leiblein, 2003), it does not tell us what capabilities are relevant (valuable) to the decision. We look to the SC&OM literature to tell us what capabilities are relevant to the make-buy decision. SC&OM literature typically examines cost, delivery, flexibility and quality capability (Rosenzweig & Easton, 2010; White, 1996). Our study limits the focus to only cost and quality because they are competitive priorities that every firm encounters (Boyer & Lewis, 2002) and often are triggers of the make-buy evaluation process (Moschuris, 2007). Competitive priorities are the intended attributes that an organization wants to improve or maintain in order to compete in the market (Boyer & Lewis, 2002; Skinner, 1969). Competitive priorities are goals that guide managers actions to acquire capabilities (Skinner, 1969).

Cost capability is defined as “the current ability of the manufacturing function to support competing on price (Gray, et al., 2009 pg. 31).” Quality capability refers to the ability to compete based on conformance quality. Conformance quality is “the degree to which a product's design and operating characteristics meet established standards

(Garvin, 1987 pg. 105).” We build on these definitions for cost and quality to define relative cost and quality capabilities from the firm’s perspective relative to some reference a contract manufacturer, which is consistent with McIvor (2009). Superior (inferior) relative cost capability is the ability of the firm to produce at lower (higher) costs when compared to a contract manufacturer. Similarly, superior (inferior) relative quality capability is the ability of the firm to produce higher (lower) conformance quality compared to a contract manufacturer.

Cost and quality capabilities create competitive advantage through arrangement (Helfat & Peteraf, 2003) or their complementary nature (Wernerfelt, 1984). Thus a manager’s role is to identify, acquire, create and arrange cost and quality capabilities to enable operational performance. Managers add value in the production sourcing decision from acquiring cost or quality capability. Hence, managers prefer to source from the firm with better relative capabilities (Barney, 1999, McIvor, 2009). There is some empirical evidence that supports the notion that managers make production sourcing decisions based on relative cost and quality capabilities. A firms production costs compared to a potential supplier have been shown to have a significant impact on the make-buy choice (Argyres, 1996; Hall et al., 2012; Walker & Weber, 1984). Similarly, among suppliers, high supplier quality relative to other suppliers favors selection (Kannan & Tan, 2002; Wilson, 1994).

3.2.5 Behavioral Uncertainty

Consistent with essay 1, behavioral uncertainty is with regards to the manager’s belief in the ability to monitor the cost and quality capability of the contract

manufacturer. A widely accepted definition for behavioral uncertainty developed by John and Weitz (1988) suggests behavioral uncertainty “refers to the difficulty of ascertaining the actual performance or adherence to contractual agreement (John and Weitz, 1988 pg. 342).” We adapt this definition to include the notion that managerial preference is influenced by their *belief* in the difficulty of determining performance or detecting and enforcing contract violations. This is an important distinction as actual is different from belief. It is the manager’s belief that will drive their preference.

Behavioral uncertainty increases transaction costs due to increased contract terms, ex post monitoring and enforcement of the exchange (Jensen and Meckling, 1976, Williamson, 1985). Contractual terms can act to eliminate the influence of the hostage (Williamson, 1985) by incorporating intensives, penalties, and sanctions to facilitate contractor behavior. However, these contractual guarantees are not enforceable or credible threats if the opportunistic behavior or outcomes of the behavior (e.g. reduced conformance quality) cannot be observed (Kaya & Ozer, 2009). Additionally, due to goal conflict between the firm (principal) and the contract manufacturer (agent)(Eisenhardt, 1989; Jensen & Meckling, 1976), it is plausible for a contractor to exaggerate cost and quality capability to win the contract, and then shirk their responsibilities (Gray, Roth, & Tomlin, 2012; Kaya & Ozer, 2009). Therefore both cost and quality capabilities necessitate monitoring. As the ability of the firm to evaluate performance decreases information asymmetries will increase resulting in either increased policing and enforcement costs or higher costs due to opportunistic behavior. These arguments from agency theory and TCE suggest managers prefer to produce in-house as behavioral

uncertainty increases in order to avoid opportunistic behavior. Similarly, the empirical evidence supports these arguments by demonstrating that as behavioral uncertainty increases, in-house production is preferred (Hall et al., 2012; John & Weitz, 1988; Sutcliffe & Zaheer, 1998).

3.2.6 Alignment

Our study defines alignment as the match between the make-buy decision and advantageous characteristics such as low cost, high quality and the ability to monitor. For example, a manager decides to buy and the supplier has the ability to provide low cost products then alignment occurs. Hence misalignment occurs when the make-buy decision fails to acquire an advantageous characteristic. For example, a manager decides to make but their firm's quality is inferior compared to the other potential supplier. While there are many views of alignment, our definition is consistent with operations strategy, contingency theory and transaction cost economics. In operations strategy, strategic alignment occurs when the operational strategy links with the priorities of the organization (Hayes et al., 2005; Skinner, 1969). In the make-buy context, the manager aligns strategy with priorities when they select a governance form that provides them with the requisite competitive capabilities. Contingency theory espouses that effective organizations and subsystems should be designed to fit the environment and subsystems (Lawrence & Lorsch, 1967; Thompson, 2003). The contingency theory perspective logic underlies logic of strategic alignment (Hayes et al., 2005), but also suggests environmental factors that may influence effective strategy such as behavioral uncertainty should be considered. Lastly, alignment is a key assumption of TCE. TCE assumes that:

“economic organization resides in the hypothesis that transactions, which differ in their attributes are aligned with governance structures, which differ in their costs and competencies, so as to effect a (mainly) transaction cost economizing result” (Williamson 2005 pg. 6). Within the context of make-buy all of these perspectives offer valuable insights as the strategic alignment, environmental alignment and transactional alignment are simultaneously determined by the make-buy decision.

The strategic alignment perspective suggests that make-buy decisions are not made within a vacuum and operational choices will have an impact on firm performance. Therefore the best choice is the one that aligns make-buy with the priorities of the organization. While contingency theory suggests that the best make-buy choice is the one that aligns the subsystem (operations) to the organizational environment. TCE suggests that the make-buy choice will determine the costs; hence the most economizing and aligned choice is the best. There is evidence that each of these perspectives may be relevant to the make-buy choice as: 1) the alignment of competitive priorities with the decision to make-buy increases performance (Kroes & Ghosh, 2010); 2) The performance of operational practices often depends on the alignment with the operational environment (Sousa & Voss, 2008) and 3) alignment of the make-buy decision and transactional attributes may lead to increased manufacturing ((Macher, 2006) and technological performance (Leiblein, Reuer, & Dalsace, 2002). Given that each of these perspectives may influence performance an effective make-buy decision is a choice that aligns the acquisition of competitive capabilities and management of behavioral uncertainty with the priorities of the firm and long term costs (risks) of the transaction.

Again, the extant literature suggests managers often do choose a strategy that acquires competitive capabilities (Argyres, 1996; Leiblein, 2003) and align priorities (Boyer & Lewis, 2002; Gray et al., 2009; Krause, Pagell, & Curkovic, 2001). However, contrary to the assumption that managers have foresight (Williamson 1985) managers may be myopic identifying and assessing the long term transaction costs (risks) (Hall et al., 2012; Handley, 2012; Handley & Benton, 2012; Levinthal & March, 1993). Therefore we investigate the role that alignment plays in the perception of risks and benefits as misperception may be influencing risk identification, assessment and subsequently supply chain risk management.

3.3. Hypotheses

3.3.1 The Effect of Capability and Make-Buy Alignment on Perceived Risk and Benefit

Low cost and higher quality are in general in demand from customers and may be a source of competitive advantage (Barney, 2002). Therefore managers will pursue a make-buy decision that can reduce costs or increase quality and will undoubtedly consider their choice to be a beneficial. Not surprisingly evidence of sustained competitive advantage from capabilities is scant (Winter, 2003). This may be due to management of resources in dynamic environments (Sirmon, Hitt, & Ireland, 2007; Teece, Pisano, & Shuen, 1997). For cost and quality capabilities to continue to provide competitive advantage a.k.a. benefit, they must be maintained and enhanced (Teece et al., 1997), otherwise manager's risk losing the benefit received from their choice.

There are several reasons why the benefit associated with low cost and high quality capabilities is high risk. First, organizations may lose inertia such that cost or quality capabilities are not given the resources to maintain high performance. For example, when organizations replace top management (e.g., chief executive officer), the new management often have different priorities and reallocate resources as a result organization often unlearn (Nystrom & Starbuck, 1984). Second, maintaining a capability may be viewed as a cost center instead of a source of future cost savings (Crosby, 1979; Deming, 1986). This view may be exacerbated by the inability of the supplier to not receive benefit from their investment in capability development, but they still have the cost of maintaining their capability but see little to no returns. Given this situation the supplier has every incentive to shirk or opportunistically renegotiate. Third, high performing suppliers may offer their product to the firm's direct competitors in an attempt to get a return on their investment in development of superior capability (Rust, Moorman, & Dickson, 2002). If successful, their attempt at revenue expansion results in a loss of advantage (benefit) for the firm. Fourth, regression to the mean suggests that high performing suppliers may naturally regress towards mean performance. For these reasons superior cost or quality capabilities will also be high risk.

At the same time, there are several reasons why the risk associated with poor performing cost and quality capabilities is low. First, the firm or supplier with a poor performing capability may have less of an ability to deviate from expected performance as the variance is conditional on the mean. For example, if the mean non-conformance

rate¹² μ is 0.5 then at most the a poor performing supplier may shirk 50% whereas if μ is 0.01 then the high performing supplier may shirk at most 99%. The exact same logic can be applied to cost capability. Secondly, the low performing supplier has less of an incentive to shirk. Third, in fact a low performing supplier has market based profit incentives (Rust et al., 2002) as well as improved operational performance (Rosenzweig & Roth, 2004) to invest and develop capabilities. Forth, the regression to the mean effect suggests a poor performing supplier may improve.

Thus the extant economics, operations and strategy literature suggests that the benefit associated with cost and quality capabilities is positively related to risk. The question becomes do managers misperceive these risks because they have positive affect because of obtaining beneficial capabilities? Psychology literature (i.e., Finucane et al. 2000, Loewenstein et al. 2001) suggests the answer to this question is yes. This is because managers may focus on the positive affect or feelings they have about acquiring beneficial and this positive affect then influences their perception of risk. At the same time, managers when faced with a low benefit experience negative affect being unsatisfied thus judge the situation as high risk. Therefore we hypothesize:

Hypothesis 1a: The alignment of low cost capability and a manager's make-buy choice has a positive impact on their perception of benefits.

Hypothesis 1b: The alignment of low cost capability and a manager's make-buy choice has a negative impact on their perception of risks.

¹² Conformance is considered to be a zero or one trait where either the part conforms or it does not (Crosby 1979).

Hypothesis 2a: The alignment of high quality capability and a manager's make-buy choice has a positive impact on their perception of benefits.

Hypothesis 2b: The alignment of high quality capability and a manager's make-buy choice has a negative impact on their perception of risks.

Judgments of risk and benefit may be made at the same time resulting in a net difference in perceived risk and benefit (Alhakami & Slovic, 1994). As such the perceptions are not independent and the difference of the two may be reflective of net benefit or net riskiness (Alhakami & Slovic, 1994). Therefore, we hypothesize that:

Hypothesis 1c: The alignment of cost capability and a manager's make-buy choice has a positive impact on the difference between perceived benefits and perceived risks.

Hypothesis 2c: The alignment of quality capability and a manager's make-buy choice has a positive impact on the difference between perceived benefits and perceived risks.

3.3.2 The Effect of the Ability to Monitor Supplier Performance and Make-Buy Alignment on Perceived Risk and Benefit

One of the fundamental problems of the that managers face when confronted with the make-buy decision is information asymmetry between what the manager knows about what the supplier is capable or actually of doing. In effect when information asymmetries exist the firm is exposed to adverse selection and morale hazard (e.g., supplier shirking, opportunistic renegotiation, capability fade). The two classical

methods of handling of dealing with information asymmetries are signaling (Spence, 2002) and screening (Stiglitz, 1975).

In supply chain management supplier certification is in effect signaling (Hwang, Radhakrishnan, & Su, 2006) . But common certifications may not actually be credibly signaling the cost or quality. For example, ISO 9000 may not actually signal quality capability, but instead it signals that quality management systems are in place (Sroufe & Curkovic, 2008). As ISO does not directly signal quality capability both high capable and low quality capable firms may be certified (Sroufe & Curkovic, 2008). Other forms of signaling exist such as information sharing but once again, these signals must be credible and there is ample literature that suggests suppliers will distort information to their benefit (see for example Croson & Donohue, 2006; Gao, Gopal, & Agarwal, 2010; Hwang et al., 2006; Kaya & Ozer, 2009). If a firm is able to monitor supplier performance, outcomes (e.g., cost and quality) to behaviors that lead to outcomes can be measured as a credible signal of performance (Eisenhardt, 1985). If unable to monitor performance, signals of performance are not verifiable and hence not credible.

At the same time, managers may use screening to get suppliers to reveal information. Screening in the supply chain context is in effect supplier evaluation and is often accompanied by supplier development. While there are different forms of supplier evaluation (e.g., indirect vs. direct evaluation), typically direct evaluation the more credible form of evaluation is expensive (Purdy & Safayeni, 2000). Direct supplier evaluation involves direct examination of both product and processes. At the same time a firm will usually supplement direct evaluation with indirect information (i.e., information

about processes and products provided by the supplier) (Purdy & Safayeni, 2000).

Supplier development is a form of screening whereby the firm induces a supplier to reveal private information at the same time the firm invests in making the supplier better (Krause, 1997). Neither supplier evaluation nor supplier development is inexpensive. Therefore when the ability to determine supplier performance is reduced the costs of incentives, policing and enforcement will increase. Often these costs are substantial so a manager is faced with the choice to either make and not have the problem of managing supplier information asymmetries or accept the information asymmetry as part of the transaction.

The result of the latter or the inability of a manager to resolve the information asymmetry that exists should be an increase in perceived risk. Managers may tend to perceive and have more negative affective reactions to uncontrollable or unobservable risks compared to controllable and observable risks (Slovic, 1987). As a result of contemplating the hazard that information asymmetries represent managers may also view a risky situation as less beneficial (Finucane et al., 2000). On the other hand if managers choose to make, they likely feel that control and avoiding morale hazards is beneficial and hence perceive making as low risk. For these reasons, the ability or inability to monitor supplier performance will impact both the perceptions of risk and benefit.

Hypothesis 3a: The alignment of the ability (inability) to monitor supplier performance and a manager's buy (make) choice has a negative impact on their perception of risks.

Hypothesis 3b: The alignment of the ability (inability) to monitor supplier performance and a manager's buy (make) choice has a positive impact on their perception of benefits.

Again, as the perception of benefit and risk may be linked we hypothesize that:

Hypothesis 3c: The alignment of the ability (inability) to monitor supplier performance capability and a manager's make-buy choice has a positive impact on the difference between perceived benefits and perceived risks.

3.4. Research Methods

Our research questions regarding the affective drivers of managers' perception of benefit and risk require a high level of control in order to make causal inference. We need a high level of control because the examination of manager's perception of benefit and risk may be influenced by the decision-making context (Loewenstein et al., 2001) or specific hazards present in the environment (Finucane et al., 2000). In order to reduce the chance of spurious influences on these perceptions, we decided to use a scenario-based role-playing experiment (Rungtusanatham, Wallin, & Eckerd, 2011). A scenario based role-playing experiment allows us to use the experienced managers to make decisions in a hypothetical make-buy situation in order to reduce the causes while both controlling for differences in individual managers experiences and

Our study is the first supply chain management study to use an experiment to examine managers' perceptions of benefits and risks. Most existing research on the topic tends to use either case-based (see for example Zsidisin, 2003a; Zsidisin, 2003b; Zsidisin, Ellram, Carter, & Cavinato, 2004) or survey methods (see for example Ellis et al., 2010;

Sodhi, Son, & Tang, 2012). We complement these existing methods by examining factors that influence these perceptions in isolation and our experimental method may help triangulate the extant supply chain risk findings.

3.4.1 Subjects

Our target sample frame is supply chain management professionals with relevant experience making sourcing decisions. As such, we recruited 383 volunteers from 18 different Institute of Supply Management (ISM) chapters. ISM is a premiere profession organization for supply chain professionals. Of these volunteers, we excluded some subjects based on several criteria. First, we excluded subjects who self-reported that they had no relevant experience making sourcing decisions as we believe they may not be representative of our target population. Second, we excluded subjects that had excessive missing data and those who had missing data on the make-buy decision. Third, we excluded seven subjects who had their doctorate from the analysis as they were too underrepresented to make a valid statistical inference. We excluded 82 subjects based on these three criteria leaving 301 subject responses for our analysis.

Table 3.2 provides a demographic description of our subjects. Our sample is predominantly middle age with about 70% being between the ages of 41 and 60. The sample is approximately 40% female and 60% male. The subjects tend to be well educated with over 75% having a college or advanced degree. Additionally, the subjects tend to be highly experienced with about 75% having 9 or more years of relevant sourcing experience. In terms of employment background the majority of our subjects work for large firms in manufacturing related industries.

3.4.2 Experimental Procedure and Scenario Design

We used an existing scenario-based role-playing experiment developed by Hall, Roth and Rungtusanatham (2012). See Appendix B for examples of the scenarios implemented. Accordingly, we implemented these scenarios using a rigorous experimental procedure see Essay 1 for details.

3.4.3 Control Variables

We control for employment (Leiblein et al., 2002) and individual characteristics (Mantel, Tatikonda, & Liao, 2006) as both may influence their make-buy decision. Specifically, we control for the firm size and industry in which the manager is employed (employment characteristics) as well as the manager's level of education, gender and years of sourcing experience (individual characteristics). In addition, employment characteristics may be influence managers perception of risk and benefit as industries face different challenges and risks (Rao and Goldsby 2009) and may differ in what is considered beneficial (Barney, 2002). Similarly, individual characteristics may influence risk perceptions (Gustafson, 1998) or perceived benefit (Atkinson, 1957).

3.4.4 Analytical Method

We use two stage least squares (2SLS) to conduct our empirical analysis. We use 2SLS because we recognize that our experiment may have a selection problem resulting from imperfect compliance. We believe some of our subjects may have chosen to make or buy based on some variable that we did not observe because some of our subjects received a treatment where every factor favored either make (buy) yet nonetheless they choose to buy (make). These unobservable causes could lead to biased estimates of the

effect of the make-buy choice on perceived benefit or risk. Specifically, imperfect compliance results in under estimation of coefficients as non-compilers do not receive the intended treatment (Angrist, Imbens, & Rubin, 1996). The use of instrumental variables can be used to correct for imperfect compliance (Angrist et al., 1996).

Table 3.2 Sample Characteristics

	n	%
Age		
Under 30	20	6.6
31-40	34	12.2
41-50	77	32.6
51-60	94	35.9
61 or better	31	12.2
No response	2	0.7
Total	301	100.0
Gender		
Female	127	41.8
Male	177	58.2
Total	301	100.0
Education		
Less than Bachelor's degree	64	21.1
Bachelor's degree	145	47.7
Master's degree	95	31.3
Total	301	100.0
Number of employees (firm size)		
Under 1000	133	43.8
Over 1000	171	56.3
Total	301	100.0
Industry		
Manufacturing	221	72.3
Aerospace	25	8.2
Automotive	42	13.8
Chemical Mfg.	16	5.3
Consumer Products	29	9.5
Hi-Tech	26	8.6
General Mfg.	70	23.0
Pharmaceutical	13	4.3
Services & Other	83	27.3
Total	301	100.0
Years of sourcing experience		
Less than 3 years	16	5.3
3-8 years	60	19.7
9-15 years	102	33.6
16-24 years	66	21.7
25 or more years	60	19.7
Total	301	100

3.4.4.1 Instrumental Variables

We collected information from two variables that may be theoretically linked to the make-buy choice but not related to perceptions of risk or benefit: the manager's impression of contract manufacturers (IMPCM) and the profit (P) level of the business unit where managers currently work. Both of these instrumental variables are related to manager's personal experience and learning as a result they may influence their make-buy preference. Hence we believe they could be related to imperfect compliance as they influence the make-buy decision other than our manipulated treatments. However, we do not believe that either of these would be related to a manager's post hoc perceived risk or benefit. We test the instruments for relevance and find that profit is negatively correlated with the make buy decision ($-0.17p < 0.01$) and impression of contract manufacturers is positively correlated with make-buy decision ($0.12 p < 0.05$). We test the assumption that the instruments are exogenous or not correlated with the error using the Hansen J test (Hansen, 1982) and find evidence supporting that they are exogenous.

3.4.4.2 Model Specification and the Analytical Model

Our model specification includes the three experimental factors (i.e., cost capability, quality capability and ability to monitor supplier performance), our control variables (I.e., education, gender, sourcing experience, firm size and industry), the endogenous variables (i.e., Make-Buy), interactions between the endogenous variable and the experimental factors (i.e., γ_1 Make-Buy * Cost Capability + γ_2 Make-Buy * Cost Capability + γ_3 Make-Buy * Cost Capability) and the instruments (i.e., impression of contract manufacturers and profit). Using standard notation from Cameron and Trivedi

(2005) we specify the predictors as X , the Endogenous variables as Z and the instrumental variables as I . Our basic model is:

$$y = \alpha X + \beta Z + \gamma XZ + \varepsilon$$

We assume Z is correlated with ε but we have an instrumental variable I

Reduced form is:

$$Z = \pi_1 X + \pi_2 I + V_1$$

Therefore the model implied XZ is:

$$XZ = \pi_3 X \cdot X + \pi_4 I \cdot X + V_2$$

The expanded form for our second stage model is:

$$\begin{aligned} y = & \alpha_0 + \alpha_1 X_{ED} + \alpha_2 X_G + \alpha_3 X_{SE} + \alpha_4 X_{FS} + \alpha_5 X_{IND} + \alpha_6 X_C + \alpha_7 X_Q + \alpha_8 X_{AMSP} + \alpha_9 X_{ED*C} \\ & + \alpha_{10} X_{ED*Q} + \alpha_{11} X_{ED*AMSP} + \alpha_{12} X_{G*C} + \alpha_{13} X_{G*Q} + \alpha_{14} X_{G*AMSP} + \alpha_{15} X_{SE*C} + \alpha_{16} X_{SE*Q} \\ & + \alpha_{17} X_{SE*AMSP} + \alpha_{18} X_{FS*C} + \alpha_{19} X_{FS*Q} + \alpha_{20} X_{FS*AMSP} + \alpha_{21} X_{IND*C} + \alpha_{22} X_{IND*Q} + \alpha_{23} \\ & X_{IND*AMSP} + \alpha_{24} X_{Q*C} + \alpha_{25} X_{AMSP*C} + \alpha_{26} X_{AMSP*Q} + \beta_1 Z_{MB} + \gamma_1 Z_{MB}*X_C + \gamma_2 Z_{MB}*X_Q + \gamma_3 \\ & Z_{MB}*X_{AMSP} + \varepsilon^{13} \end{aligned}$$

The expanded forms for our four first stage models are:

$$(1) MB(Z) = \pi_{11} X_{ED} + \pi_{12} X_G + \pi_{13} X_{SE} + \pi_{14} X_{FS} + \pi_{15} X_{IND} + \pi_{16} X_C + \pi_{17} X_Q + \pi_{18} X_{AMSP} + \pi_{21} I_P + \pi_{22} I_{IMPCM} + V_1$$

$$(2) MB*C(X_C Z) = \pi_{31} X_{ED*C} + \pi_{32} X_{G*C} + \pi_{33} X_{SE*C} + \pi_{34} X_{FS*C} + \pi_{35} X_{IND*C} + \pi_{36} X_{C*C} + \pi_{37} X_{Q*C} + \pi_{38} X_{AMSP*C} + \pi_{41} X_{P*C} + \pi_{42} X_{IMPCM*C} + V_2$$

$$(3) MB*Q(X_Q Z) = \pi_{31} X_{ED*Q} + \pi_{32} X_{G*Q} + \pi_{33} X_{SE*Q} + \pi_{34} X_{FS*Q} + \pi_{35} X_{IND*Q} + \pi_{36} X_{C*Q} + \pi_{37} X_{Q*Q} + \pi_{38} X_{AMSP*Q} + \pi_{41} X_{P*Q} + \pi_{42} X_{IMPCM*Q} + V_3$$

$$(4) MB*AMSP(X_{AMSP} Z_3) = \pi_{31} X_{ED*AMSP} + \pi_{32} X_{G*AMSP} + \pi_{33} X_{SE*AMSP} + \pi_{34} X_{FS*AMSP} + \pi_{35} X_{IND*AMSP} + \pi_{36} X_{C*AMSP} + \pi_{37} X_{Q*AMSP} + \pi_{38} X_{AMSP*AMSP} + \pi_{41} X_{P*AMSP} + \pi_{42} X_{IMPCM*AMSP} + V_4$$

¹³ We exclude Cost Capability * Cost Capability, Quality Capability * Quality Capability and Ability to Monitor Supplier Performance * Ability to Monitor Supplier Performance terms as they are collinear with Cost Capability, Quality Capability and Ability to Monitor Supplier Performance respectively.

3.4.5 Experimental Checks

We conduct several experimental checks to assess our manipulations, the potential for confounds, existence of demand characteristics. We did not find any evidence of validity issues. However, that does not preclude the possibility. For more details see Essay1.

3.5. Results

We estimate our two stage least squares models using Stata 11 and the `ivreg2` command. We summarize our hypothesized results in Table 3.3. We summarize our statistical model the conditional¹⁴ make-buy models in Table 3.4. The coefficients presented in Table 3.4 represent local average treatment effects (LATE) (Angrist et al., 1996). Our interpretation of the LATE coefficients is the average effect of the treatments for compliers as we instrument for non-compliance (Angrist et al., 1996). Additionally, our variables are coded in standard zero or one format for ease of interpretation. The make-buy decision is coded such that make is 0 and buy is 1. Similarly, cost capability is coded such that the firm has a superior cost capability relative to the supplier is 0 and when the supplier has a relative superior cost capability is 1. Quality follows this same convention where when the firm has relative superior quality capability the code is 0 and when the supplier has relative superior capability the code is 1. The ability to monitor

¹⁴ We tested an unconditional model where the make-buy decision was the only endogenous variable used to predict risk and benefit. This test was performed a priori in order to establish that no existing bias towards make or buy existed. We did not find any significant differences. The full results can be found in Appendix E

supplier performance is coded such that 0 is when the firm is unable to monitor performance and 1 is when they are able.

Table 3.3 Summary of Hypothesized Results

Hypothesis	Result
H1a: The alignment of cost capability and managers make-buy choice has a positive impact on the perception of benefit.	Supported
H1b: The alignment of cost capability and managers make-buy choice has a negative impact on the perception of risk.	Not supported
H1c: The alignment of cost capability and managers make-buy choice has a positive impact on the difference between perceived benefit and perceived risk.	Supported
H2a: The alignment of quality capability and managers make-buy choice has a positive impact on the perception of benefit.	Not supported
H2b: The alignment of quality capability and managers make-buy choice has a negative impact on the perception of risk.	Not supported
H2c: The alignment of quality capability and managers make-buy choice has a positive impact on the difference between perceived benefit and perceived risk.	Not supported
H3a: The alignment of the ability (inability) to monitor supplier performance and the manager's buy (make) choice has a negative impact on the perception of risk.	Not supported
H3b: The alignment of the ability (inability) to monitor supplier performance and the manager's buy (make) choice has a positive impact on the perception of benefit.	Not supported
H3c: The alignment of the ability (inability) to monitor supplier performance capability and the manager's make-buy choice has a positive impact on the difference between perceived benefit and perceived risk.	Not supported

Lastly, while there are alternative ways to represent alignment(Venkatraman, 1989), alignment as moderation tends to be a common conceptualization in strategy (Boyd, Haynes, Hitt, Bergh, & Ketchen Jr, 2012) and operations research (Sousa & Voss, 2008). Our coefficients are conditional because we include interaction terms to represent alignment. Hence, the coefficient for make-buy shows the perceived difference in y (where y is perceived risk, benefit or the difference between perceived benefit and risk) between making (coded as 1) and buying (coded as 0) when the firm has the superior low cost capability, the superior quality capability and the firm is unable to monitor supplier performance. The coefficient for cost capability shows the difference in perceived benefit between when the supplier has the superior cost capability and when the firm has the superior cost capability given that a manager decide to make. The same is true for

Table 3.4 Results

Variable	Coefficient	Model 1: Perceived benefit ^a	Model 2: Perceived risk ^a	Model3: The difference ^a
Intercept	α_{00}	5.39**	2.58**	2.80**
Education (ED)	α_{01}	0.01	-0.10	0.10
Gender ^b (G)	α_{02}	0.06	0.10	-0.05
Sourcing experience (SE)	α_{03}	0.00	0.00	-0.00
Firm size ^c (FS)	α_{04}	-0.15	0.32	-0.35
Industry ^d (IND)	α_{05}	-0.32	-0.00	-0.42
Cost capability (C)	α_{06}	-1.55**	1.03	-2.78**
Quality capability (Q)	α_{07}	-0.50	1.04	-1.44
Ability to monitor supplier performance (AMSP)	α_{08}	0.07	-0.15	0.26
ED*C	α_{09}	0.05	0.10	0.03
ED*Q	α_{10}	0.12	-0.27	0.37
ED*AMSP	α_{11}	-0.00	0.31	-0.32
G*C	α_{12}	0.56	-0.08	0.62
G*Q	α_{13}	0.07	-0.00	0.19
G*A	α_{14}	-0.21	-0.33	0.05
SE*C	α_{15}	-0.01	-0.00	-0.01
SE*Q	α_{16}	0.00	-0.02†	0.03
SE*AMSP	α_{17}	0.02	0.01	0.00
FS*C	α_{18}	-0.33	0.00	-0.39
FS*Q	α_{19}	0.31	-0.20	0.51
FS*AMSP	α_{20}	-0.00	-0.13	0.04
IND*C	α_{21}	0.19	-0.33	0.60
IND*Q	α_{22}	0.22	0.19	0.05
IND*AMSP	α_{23}	0.37	-0.00	0.42
Q*C	α_{24}	-0.14	-0.85	0.99
AMSP*C	α_{25}	-0.37	0.40	-0.95
AMSP*Q	α_{26}	-0.19	-0.34	0.08
Make-buy (MB)	β_{01}	-2.11	1.66	-3.66
MB*C	γ_{01}	2.86*	-1.41	4.14†
MB*Q	γ_{02}	0.32	0.18	-0.29
MB*AMSP	γ_{03}	1.13	-1.07	2.61
R ²		0.43**	0.21**	0.36**

*p ≤ 0.05; **p ≤ 0.01; †p ≤ 0.10. Bold indicates statistical significance

^a Unstandardized estimates

^b Females are the omitted group.

^c Firms Under 1000 employees are the omitted group.

^d Manufacturing firms are the omitted group.

interpreting quality capability and the ability to monitor supplier performance. Each of the subsequent subsections discusses the statistical results for each hypothesis.

3.5.1 The Alignment of Cost Capability and the Make-Buy Decision

Not surprisingly, the make-buy decision, in the first stage, is driven by cost capability ($p < 0.05$) see Appendix G. H1a predicts that managers will perceive the make-buy decision more beneficial when they procure low cost capability than when they do not. As a result of operationalizing the alignment of cost capability and make-buy decision as moderation we must examine the main effect of cost capability, the make-buy decision and the interaction between the make-buy decision and cost capability in order to test the hypothesis. In other words, a manager perceives the situation where he chooses to buy (make) and the supplier (firm) has low costs as beneficial. We test the cost alignment hypothesis for both of these situations in Model 1, see Table 3.4. The alignment between the firm's low cost capability and the decision to make is directly test by the cost capability coefficient ($\alpha_{06} = -1.55$, $p < 0.01$) because of our effects coding scheme. The interpretation of this coefficient is when the cost capability is aligned with the make decision, benefit is perceived to be more beneficial than when misaligned. The interaction term presents the change in the perceived benefit of low cost capability due to a change in the make-buy Decision. This means when the manager decides to make he finds that the alignment with a suppliers low cost capability is beneficial ($\gamma_{01} = 2.86$, $p < 0.05$). These two findings taken together give support for H1a and are summarized in Figure 2.3.

H1b predicts that managers will perceive the procurement of low cost capability as lower risk than not. We test H1b by examining the cost capability ($\alpha_{06} = 1.03$, $p > 0.10$)

and the cost capability make-buy decision interaction coefficients ($\gamma_{01} = -1.41$, $p > 0.10$) in Model 2. We failed to find support that alignment plays a role in the perception of risk. This lack of support for H1b but support for h1a might indicate that managers may be assessing net benefit or net risk as suggested by Alhakami and Slovic (1994). We interpret this finding as managers are focused on the benefit and thus overlook the risk; H1c if significant would support this interpretation.

H1c predicts that the difference in managers' perception of benefit with risk will be larger when cost capability is in alignment with the make-buy decision than when it is not. We test H1b by examining the cost capability ($\alpha_{06} = 2.78$, $p < 0.01$) and the cost capability with make-buy decision interaction coefficients ($\gamma_{01} = 4.14$, $p < 0.10$) in Model 3. We find support that the difference in perceived benefit and risk increases, which may be a rough proxy for expected net benefit, when cost capability is aligned with the make-buy decision. This finding adds support for the notion that managers perceive higher benefit (e.g., a supplier with lower cost) situations as concomitantly being lower risk. Conversely, managers perceive misaligned situations as higher risk and lower benefit, see Figure 2.3. This difference in perception may lead to mismanagement of the supply chain. Specifically, it suggests that managers may not put in appropriate post hoc mechanisms to manage the supply chain risks because they do not recognize the exposure to the aforementioned hazards related to the low cost benefit. At the same time, it suggests that in situations where there is no low cost benefit managers perceive high risk and thus may over manage or develop these suppliers. In short, this misperception may

lead to misallocation of risk management, supplier evaluation and development resources.

3.5.2 The Alignment of Quality Capability and the Make-Buy Decision

H2a asserts that managers will perceive the benefit associated with the make-buy decision to be greater when their choice has a high quality capability than when their choice has lower quality. This means managers will perceive higher benefit if they chose to make if the firm's internal quality capability is superior to the alternative supplier. Similarly, the managers will perceive higher benefit when they choose to buy and the supplier has a superior relative quality capability. We test H2a in a similar manner that we examined H3a-c. We examine the main effect of quality capability ($\alpha_{07} = 0.32, p > 0.10$) and the quality capability with the make- buy decision interaction coefficients ($\gamma_{02} = -0.50, p > 0.10$) in Model 1. We failed to find support for ($p > 0.10$) alignment playing a role in the perception of benefit from increased quality. H2b states that managers will perceive the procurement of high quality capability as lower risk than not. We test H2b by examining the quality capability ($\alpha_{07} = 0.18, p > 0.10$) and the quality capability make-buy decision interaction coefficients ($\gamma_{02} = 1.04, p > 0.10$) in Model 2. We failed to reject ($p > 0.10$) that alignment plays no role in the perception of quality risk. H2c predicts that the difference in managers' perception of the benefit from quality and the risk from quality will be greater when quality capability is aligned than when it is misaligned. We do not find support for H2c as neither quality capability ($\alpha_{07} = -1.44, p > 0.10$) nor the interaction ($\gamma_{02} = -0.29, p > 0.10$) in Model 3 are statistically significant.

Figure 3.2 The Effect of Cost Alignment on Perceived Benefit

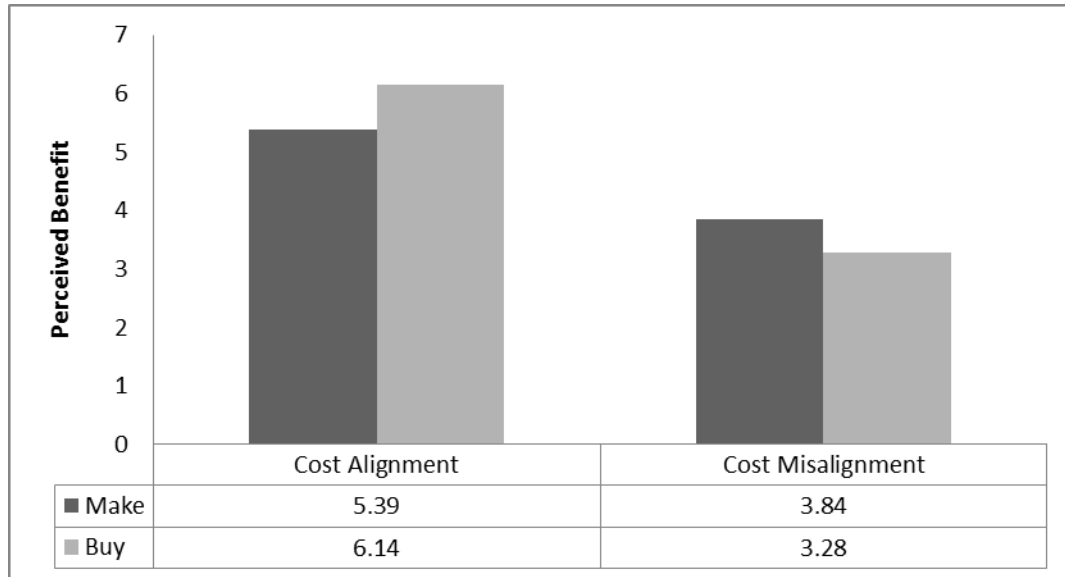
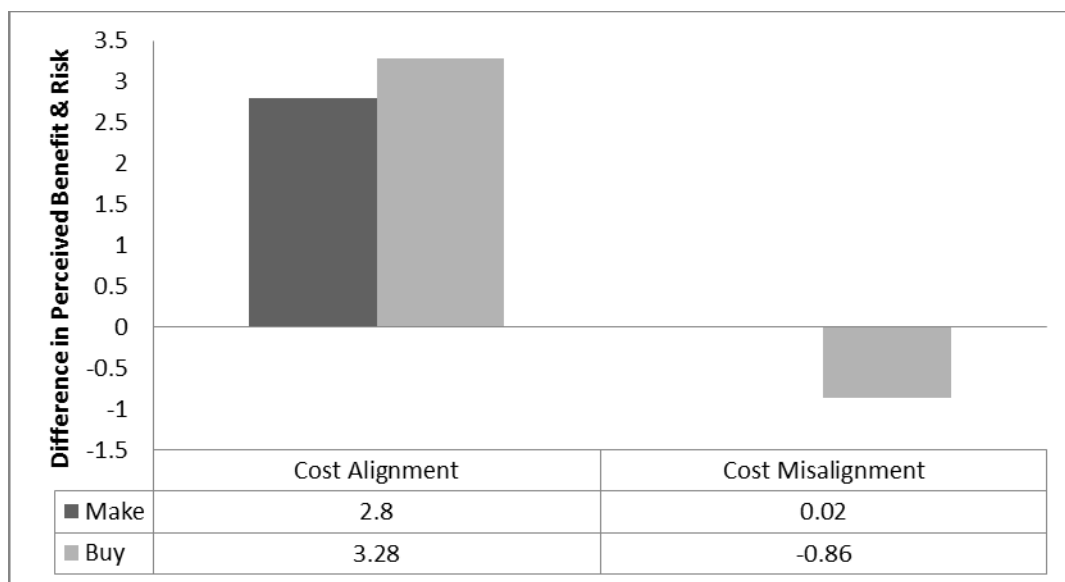


Figure 3.3 The Effect of Cost Alignment on the Difference in Perceived Benefit and Risk



The failure to find support for hypotheses for H2a-c may be troublesome as quality capability significantly ($p < 0.05$) predicts the make-buy choice, see Appendix G. The failure to find support may reflect that managers may not perceive quality as beneficial or may not be aware of quality risks such as quality fade. These findings suggest a lack of general understanding of quality management in the supply chain (Foster, 2008). This may not be surprising as managers may misperceive relationships in complex systems (Stermann, 1989) or quality systems may have an inherent trade-off where in the short run the pursuit of quality may have negative consequences before improving performance in the long run (Stermann, Repenning, & Kofman, 1997). Additionally, these results may indicate that managers view quality as a cost center (Crosby, 1979), are myopic about quality costs (Deming, 1986; Hall et al., 2012; Juran, 1986), or may be unaware of the advantages offered by planning for superior quality (Juran, 1992).

3.5.3 The Alignment of the Ability to Monitor Supplier Performance and the Make-Buy Decision

H3a states that managers will perceive the risk from the ability (inability) to monitor the supplier's performance to be lower when they chose to buy (make). H3b asserts that managers should find the alignment of the ability to monitor supplier performance and their make-buy decision to be beneficial. H3c predicts an increase in the difference between perceived benefit and risk associated with the alignment of the ability to monitor supplier. The statistical results from Model 1, 2 and 3 in Table 3.4 suggests there is no support for H3a ($\alpha_{08} = 1.13, p > 0.10, \gamma_{03} = 0.07, p > 0.10$), H3b ($\alpha_{08} = -1.07, p > 0.10, \gamma_{03} = -0.15, p > 0.10$) or H3c ($\alpha_{08} = 2.61, p > 0.10; \gamma_{03} = 0.26, p > 0.10$).

The failure to find support for H6a-c after confirming that the ability to monitor supplier performance does influence the make-buy choice ($p < 0.10$, see Appendix G) is

surprising. It suggests that managers do not perceive benefits or risks with being able to determine supplier performance or maintain control over the transaction. It also supports the notion that managers do not fully understand the complexities associated being able to monitor supplier performance for contractual hazards (Handley, 2012). Additionally, it may reflect the desire to gain capabilities regardless of supplier opportunism or that the acquisition of the capability is worth the risk (Barney, 1999). Yet, it may reflect the inability of managers to foresee moral hazard, thus enabling supplier opportunism (Hall et al., 2012). Nonetheless, all of these rationales support the overlook of being able to evaluate performance may lead to what at best amounts to calculated gambling or at worst poor decision-making.

3.6. Discussion and Limitations

3.6.1 Discussion

Our findings suggest that managers may misperceive supply chain risks, especially when pursuing low cost. Specifically, we find that managers perceive risk and benefit to be negatively correlated. If managers perceive a supplier to provide an above average benefit, they also perceive the supplier to be below average risk. Conversely, if managers perceive a supplier to provide a below average benefit, they also perceive the supplier to be above average risk. This simple finding implies that managers may be over managing the risks from poor performing suppliers and under managing the risks from high performing suppliers. Ultimately, this finding suggests that supply chain disruptions or glitches may be the result of mismanagement that is driven by misperception of risks. Moreover, these disruptions or glitches have long term consequences for the firm's

access to financial resources (Hendricks and Singhal 2005a) and operational performance (Hendricks and Singhal 2005b).

Surprisingly, our lack of findings about the alignment of quality capability or the ability to monitor supplier performance may have interesting implications. First, the lack of findings about quality alignment is surprising because quality capabilities and management enhances firm performance (Naor, Goldstein, Linderman, & Schroeder, 2008; Rungtusanatham, 2001), supply chain performance (Kaijie, Zhang, & Fugee, 2007; Kaya & Ozer, 2009; Yeung, 2008) and customer satisfaction (Deming, 1986; Juran, 1986). This study finds quality does influence the make-buy choice, but does not seem to effect managers' perceptions about quality alignment being either beneficial or risky. This finding may suggest quality is an order qualifier (Hill, 1993) or benefits from quality are difficult to observe directly and are time lagged (Deming, 1986; Sterman et al., 1997). Nonetheless, the result is the same quality appears to not matter neither as a benefit to be developed and maintained nor a risk to be monitored and controlled. Similarly, we find the ability to monitor supplier performance does influence the choice but not the perceptions of risk or benefit. This is surprising because dominant supply chain theories such as agency theory and TCE suggest that it is beneficial to be able to evaluate performance and that the inability to monitor leads to increased opportunism and risks (Jensen & Meckling, 1976; Williamson, 1985). We believe this finding may be occurring as a result of optimism or overconfidence (Hall et al., 2012; Kahneman & Lovallo, 1993).

Existing research suggests that managers may overweight the benefits associated with their make-buy decision and overlook many of the risks associated with their

decision (Gray et al. 2009, Hall et al. 2012, Handley 2012). Our study provides a mechanism to explain these findings: benefit and risk are both evaluated using the managers' affective assessment. Therefore, if managers emphasize obtaining low cost benefits, one unintended result is that they may feel positive about obtaining the benefits, thus reduce their perception of risk. As a result of lowered perceived risks managers do not reflect on the plausible and foreseeable risks because they incorrectly believe them to be acceptable, inconsequential or small. Yet, this perception is which is a behavioral bias that likely leads to adverse selection. Moreover, if a supplier is selected this bias is likely to increase ex ante and ex post moral hazard because the manager perceiving low risks will not put into place appropriate and costly mechanisms to verify supplier actions or detect hidden actions.

3.6.2 Limitations

As with any study ours is not without limits. The greatest limitation of our study is that we cannot say whether or not managers consider benefits first then through an affective mechanism then based on their affect infer risk or if managers consider risk then infer benefits. Both possibilities are plausible (Finucane et al. 2000). Does one of these possibilities occur more than the other? It would be useful to know if there is a dominant framing of the problem as reversing the frame may counteract the bias (Tversky and Kahneman 1981). While there is some evidence (i.e., Gray et al. 2009; Hall et al. 2012) that managers may be evaluating benefits first and hence often ending up with a situation where they under estimate risk, we cannot say what the precise inference mechanism is that is driving the negative correlation. Also, we cannot preclude the possibility that our

findings are reflective of perceived net benefit or perceived net riskiness (Alhakami & Slovic, 1994). Therefore, we suggest that future research examines if a dominant or plurality of mechanisms exist.

Our study focuses on the drivers of the perceptions of risk and benefit. We do not tie these perceptions with actual make-buy decision performance. The literature on risk-taking and performance is mixed. Executives that are risk-takers often obtain higher levels of personal achievement (income, status, and wealth) than those who are risk averse (MacCrimmon and Wehrung 1990). Risk takers are more successful in the pursuit of innovation (Galasso and Simcoe 2011), but tend to make poor acquisition (Malmendier and Tate 2008) and investment decisions (Malmendier and Tate 2005). In short risk taking is clearly good for executives but not necessarily good for firm performance. With that said there is clearly a need to tie our findings with firm performance, thus we suggest future research examine this tie.

Our study's findings are limited by the fact that we have weak instruments. While our experimental method uses random assignment to spread out omitted variables and measurement error (Shadish, Cook, & Campbell, 2001), we cannot preclude the possibility of imperfect compliance. Imperfect compliance occurs, which is a selection problem, when the managers select make or buy based on some unobservable characteristic. Often imperfect compliance leads to under estimation of the treatment effects (Angrist et al., 1996). As such we can address the problem using either regression discontinuity methods (Shadish et al., 2001) or instrumental variables (Cameron & Trivedi, 2005), but we limit our focus to instrumental variable methods. With weak

instruments our findings are biased towards standard OLS estimates and our standard errors are incorrect, yet weak instruments do not display these characteristics when the sample is asymptotically large (Staiger & Stock, 1994). The first plausible remedy is to increase our sample size. Alternatively, we can increase the number of instruments because as the number of weak instruments increases the bias is reduced (Murray, 2006). Yet, another plausible alternative is the use of a new instrumental variable created from a control group that would be a strong instrument for imperfect compliance (Angrist et al., 1996). In our study this would require additional data collection where managers are not allowed to make or buy instead they are forced to make, and then we measure their perception of risk and benefit. This method would also have the added benefit of being uncorrelated with the error (i.e., instrument exogeneity), which is something that we cannot normally guarantee to be true nor directly test. Lastly, we could address this issue by using tests and confidence sets that are robust to the presence of weak instruments. While there are two methods that are gaining popularity Anderson-Rubin (AR) confidence sets (Murray, 2006) and Conditional Likelihood Ratio (CLR) test (Moreira, 2003), right now the CLR test only applies to a single endogenous variable. Since we have more than one endogenous variable future examination is limited to the AR confidence regions, which may be unbounded and unconnected (Anderson & Rubin, 1949). We recommend future research use both the control group instrumental variable approach proposed by Angrist et al. (1996) and AR confidence sets suggested by Murray (2006).

3.7 Conclusions

As companies continually consider the make-buy decision in pursuit of competitive advantage (benefit) companies are often surprised by the risks introduced by their choice. The good news for companies is that managers after the make-buy decision has been made may be managing extreme risks such as supply chain disruptions when managing risks (Ellis et al., 2010; Zsidisin, 2003b). Moreover, these expert managers may be proficient at identifying many of the keep drivers of risk (Dawes et al., 2002; Dawes, 1979). The is that these same managers may be overlooking difficult to obverse risks (Hall et al., 2012) and often simple decision support tools will outperform the managers judgment or perception of risk (Dawes et al., 2002; Dawes, 1979). Even worse news is that as managers become more time compressed the negative correlation between perceived benefit and risk may become larger (Finucane et al. 2000). And the worst news is suggested by prospect theory (Kahneman & Tversky, 1979) that managers may be risk seeking when they perceive small losses but risk averse when losses are perceived to be catastrophic. The extant emphasis on managing supply chain disruptions and our work shows that this may very well be the case. The implication of this being true is simple managers may over manage low probability high magnitude risks and under manage high probability low magnitude risks. We suggest that future research should explore this possibility as clearly managers' perceptions and behavioral preferences may drive their supply chain management choices.

Our study contributes to the existing supply chain management literature by examining the drivers of managers' perception or misperception of risk and benefit. Our

empirical evidence supports the risk as feeling literature (Finucane et al., 2000; Loewenstein et al., 2001) suggesting that managers may be linking their assessment of benefit and risk through their feelings. This is an important area for supply chain management explore because often hard data on the risks or benefits of a decision is scant, thus managers must rely on their intuition. We show that managers intuition is often biased to believe high (low) benefit supply chain choices are concomitantly low (high) risk. Clearly, supply chain risk management can benefit from further exploration of managers' intuitions, but also our findings suggest interventions for organizations that future research may explore. A better understanding of how risk is perception is biased and how to counteract the bias can help develop better practices and ultimately reduce costs of supply chain risks.

3.8 References

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CHAPTER FOUR

CONCLUSIONS

“Businesses are not investing in trying to figure out what they’ve done wrong.

That’s not an accident. They don’t want to know.’”

-Daniel Kahneman

4.1 Study Implications and Contributions

Taken together, our essays argue that managers systematically deviate from our normative supply chain management theories (i.e. agency theory, resource-based view, and transaction cost economics) in systematic and predictable ways. We asked three questions that are relevant to supply chain management: 1) Do managers account for supplier opportunism when making their governance decision? 2) Does social pressure encourage managers to join the outsourcing bandwagon? and 3) Do managers, contrary to standard economic theory, perceive risk and benefit to be negatively related?

These questions were each investigated using a randomized scenario-based role playing experiment. Our investigation and findings from this experiment suggest several key insights. First, we investigated if managers do account for supplier opportunism in their decision. In Essay 1, we found that managers consider cost-based opportunism but not quality-based opportunism when making their decision. This finding suggests that managers may be evaluating supplier opportunism based on their personal experience, intuition or sourcing factors that are most salient (i.e., cost). Clearly, this is a bias that may have deleterious consequences (e.g., consumer safety, increased total cost of ownership, product recalls, etc.). Nonetheless, the prevalence of this bias is troublesome.

We believe that this bias exists in part due to a bias how supply chain managers learn and subsequently availability in memory. Supply chain managers have several sources of biased learning. The first source of biased learning is incentive systems that reward cost variance but do not necessarily take total cost into account. The second source of biased learning is the ambiguity associated with what quality means. As there are many different definitions of quality (see for example Garvin, 1987), it is easy to see how managers may get confused about what 'quality' their organization wants to acquire or manage. The third and final source is the time lag between when a decision is made and poor quality outcomes is most likely large, while cost outcomes are usually felt sooner. Thus managers may have a difficult time attributing poor quality outcomes with their choice of supplier where as poor cost outcomes may be more easily associated with their decision. Therefore for implications for managers based on this bias are relatively simple: 1) Change incentive systems to reward total cost of ownership or improve the accuracy of the determination total cost of ownership, 2) clarify what quality means and emphasis its relation to both cost as well as the mission of the organization and 3) improve feedback and control systems to include timely and relevant information for supply chain managers.

Second, also in Essay 1, we examine if managers jump on the outsourcing bandwagon and what enhances or mitigates this behavior. Our findings suggest several key insights. Our main finding is that counter to institutional theory bandwagon behavior does not seem to be due to coercion (i.e., pursuing more outsourcing to gain a quality advantage because the consumer or some regulatory body expects it) or adherence to

norms (i.e., pursuing more outsourcing to gain a cost advantage or match a competitors cost advantage). However, we do find support that managers are joining the outsourcing bandwagon to imitate the competition, diffuse the responsibility of their decision or have “social proof” what the right decision is to make. Interestingly, we did find that a manager’s sourcing experience may be related to the degree that they jump on the outsourcing bandwagon. Managers with substantial sourcing experience, in general, jump on the bandwagon less often than managers with little sourcing experience. This finding suggests that the phenomena may be psychological because experience is related to confidence, and confidence in turn influences the degree to which you look for social proof. At the same time, the managerial implication of this finding is that organizations should assign highly experienced managers to sourcing decisions that may experience bandwagon pressure.

Lastly, our findings in Essay 2 suggest that managers may be misperceiving supply chain risks in pursuit of supply chain benefits. This finding is counter to the basic logic that managers are deliberate taking on risk to acquire benefit. Our study shows three important results: 1) managers perceive superior supplier attributes to be less risky than inferior supplier attributes, 2) buying is systematically seen as more beneficial but not more risky than making and 3) risk and benefit are perceived to be negatively correlated. This suggests that managers may not be appropriately managing supply chain risks as they perceive low risk to exist in a situation where the supplier offers a high benefit. Yet, economic theory suggests that when a supplier offers high benefit then there is a substantial risk that the promised benefit may fail to materialize or diminish

overtime. The implication of this misperception is that managers may be over managing the risks of suppliers with inferior capabilities but under managing supplier with superior capabilities.

Collectively, these findings argue for organizations to start examining low and high performing sourcing decisions, supply chain risk management practices- particularly those that identify or assess risks and the characteristics of who is making the decision. Identifying these biases are important because as Mantel et al. (2006, p. 822) noted: “management can ensure a more rational make-buy decision if they understand the biases that influence the decision and point these biases out to the decision maker.” In other words, by identifying biases we can begin to work on interventions that make the process more rational. At the same time, these two essays suggest there may be path dependence in the development of supply chain risks. Specifically, the bias in the governance choice suggests managers may enable quality shirking (Essay 1) and managers after the choice is made managers are not concerned with managing risks caused by information asymmetries (Essay 2). These two behaviors compound the risk of supplier opportunism and may explain why manufacturers are experiencing so many quality related supply chain performance problems and disruptions. While managers are concerned with ex ante cost capability monitoring (Essay 1), this concern does not appear post hoc (Essay 2) suggesting managers may be indeed overconfident. As a result of this overconfidence managers not only misperceive risks but they subsequently mismanage them resulting in ironically increased costs.

4.2 Future Research

The increased reliance on outsourcing for goods and services may pose a threat or lead to reduced performance if managers are biased. As such one potential threat to supply chain risk management occurs if managers perceive an increased benefit to outsourcing and concomitantly do not perceive an increase in risk. At its very core purchasing and subsequently supply chain risk management are predicated on the notion that externalizing (outsourcing) the production of a good or service is inherently more risky than making, but may be more beneficial. Therefore the misperception by managers about the true supply chain risks may indeed reduce supply chain performance. With that said our research on the misperception of risk and benefit is the first step in improving supply chain risk management. There are many possible avenues to explore, but we suggest that future research examines: under what conditions do managers more accurately perceive risk and benefit? We suspect that managers are more accurate or better calibrated in when information is easily accessible, translatable and verifiable. Moreover, the ability of both the manager and the organization to translate this information into knowledge or their absorptive capacity may enhance their assessment (Cohen & Levinthal, 1990).

While we find evidence that suggests that managers are concerned with cost based opportunism (e.g., opportunistic renegotiation) but not quality based opportunism (quality shirking), we merely speculate as to the potential explanations behind the phenomena. These speculations need to be examined. Is it incentives that play a role in memory creation, those in turn bias managers to focus on cost opportunism? Is it ambiguity

around what quality is? Do managers believe they can control supplier quality? Do managers believe suppliers lack the initiative to shirk on quality? All of these are questions that future research should answer. The very foundation of agency theory and transaction cost economics suggests managers should be accounting for all forms of opportunism, but clearly managers, mere humans, are fallible. It is the functional form and nature of this fallibility that we need to examine in order to improve decisions and supply chain performance.

We provide evidence that managers may be joining an outsourcing bandwagon. However, we do not know if joining the bandwagon has positive or negative performance implications. Previous research is mixed as to whether or not joining the bandwagon is beneficial or harmful. The majority opinion suggests that joining the bandwagon may not be beneficial because the first mover (leader) or early movers tends to benefit the most, while late movers may not benefit at all (McNamara et al., 2008). However, a compelling counter argument is that following the bandwagon may be seen by resource providers (e.g., bankers, venture capitalists, board of directors) as rational and appropriate given the context (Baum & Oliver, 1991). Therefore managers who follow the bandwagon may have greater access to resources (Baum & Oliver, 1991), which in turn the increased access to resources may enable increased performance (Barney 1991). Hence, we suggest that future research examine the relationship between bandwagon outsourcing and financial as well as operational performance.

Our collective findings suggest that there may be a need to examine the decision-making process as well as characteristics of the decision maker in order to improve

supply chain performance. At the time of this dissertation, the world is experiencing dynamic world trade that is leading to increased profits, but also increased supply chain frailty. The real question is how do we improve supply chain management in a world that is complex and dynamic? These characteristics tend to be indicative of poor decision-making environments (Levinthal & March 1993; March 1994), yet nonetheless decisions must be made. Given that firm prosperity and survival now ever increasingly depends on supply chain performance we must address this question.

4.3 References

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APPENDICES

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	Augusta	Baltimore	Buffalo	Chicago	Dallas	Grand Rapids	Indianapolis	Kansas City	Kernersville	Madison	Philadelphia	Reading	San Antonio	Springfield	St. Louis	Tenneva	West Georgia	Wichita
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	4	2	2	0	1	0	4	0	0	0	1	0	2	0	1	1	1	1
	5	1	3	0	3	2	2	0	2	1	2	1	2	0	0	1	3	9
	7	7	7	3	2	9	6	11	4	8	5	1	6	4	2	1	7	9
	14	4	18	1	4	8	6	6	8	3	4	6	6	6	3	4	0	8
	2	5	2	0	2	3	0	2	6	2	2	1	1	2	1	2	1	3
	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
	32	19	32	4	12	23	18	19	20	14	14	9	18	12	7	9	12	30
	17	10	15	2	7	9	8	7	7	5	6	2	6	2	3	5	6	10
	15	9	17	2	5	14	10	12	13	9	8	7	12	10	4	4	6	20
	32	19	32	4	12	23	18	19	20	14	14	9	18	12	7	9	12	30
	2	4	12	2	1	8	3	3	4	3	5	3	4	2	1	0	0	4
	12	9	13	1	4	9	9	13	10	7	5	3	9	7	4	7	7	16
	18	6	7	1	7	6	6	3	6	4	4	3	5	3	2	2	5	10
	32	19	32	4	12	23	18	19	20	14	14	9	18	12	7	9	12	30
	12	1	20	3	6	13	7	9	9	10	8	6	7	6	2	2	4	8
	20	18	12	1	6	10	11	10	11	4	6	3	11	6	5	7	8	22
	32	19	32	4	12	23	18	19	20	14	14	9	18	12	7	9	12	30
	15	3	22	4	7	22	12	18	14	10	11	7	12	11	7	9	10	27
	3	0	1	1	1	4	2	2	2	0	1	0	1	2	0	1	3	1
	1	0	5	1	0	3	1	2	5	0	0	0	4	0	3	0	0	17
	3	0	1	0	0	0	0	1	1	0	3	0	0	1	1	4	0	1
	2	2	2	0	1	1	4	3	2	4	0	2	1	1	0	0	1	3
	1	1	4	0	3	0	2	4	2	1	1	0	3	1	1	0	0	2
	5	0	7	2	1	14	2	5	2	4	4	5	3	5	1	1	6	3
	0	0	2	0	1	0	1	1	0	1	2	0	0	1	1	3	0	0
	17	16	10	0	5	1	6	1	6	4	3	2	6	1	0	0	2	3
	32	19	32	4	12	23	18	19	20	14	14	9	18	12	7	9	12	30
	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$	$\bar{x}(s)$
	12.5	21.7	16.0	14.7	17.5	14.8	11.7	16.8	17.3	14.2	15.8	10.0	16.5	15.2	13.7	14.1	12.5	14.5

Appendix B

Baseline Information

In designing our eight scenarios (Table 1), several aspects of our decision-making scenarios are held constant. This constant baseline of information provides subjects with the context necessary to make the decision task realistic and still allow for a reasonable sample size. To guide our choice of baseline information, we examined literature and included factors that have well-established influences on outsourcing. We found that cost and quality priorities, type of manufacturing (i.e. component vs. contract), asset specificity, technological uncertainty, capacity constraints and economies of scale all should influence outsourcing decision-making. In addition, we provide managers with a specific industrial and product context. Specifically, we tell managers that they are to make sourcing decisions for a new, on-patent drug in the pharmaceutical industry. We limit our outsourcing decision to this context for several reasons. First, most managers know what a drug is and how important it may be for the end customer. Second, cost and quality are realistic priorities in this context. Third, supplier poaching of intellectual property is less of a concern because the drug is on-patent.

We include competitive priorities as baseline information to ensure the manager's sourcing decision is aligned with business strategy because business strategy (Kroes and Ghosh 2010) and competitive priorities guide managerial decisions (Boyer and Lewis 2002). Specifically, we tell managers that both cost and quality are competitive priorities since we are interested in examining a tension between acquiring cost and quality capabilities as suggested by Gray et al. (2009a). The cost and quality priority information included in the scenarios was based on the facets discussed by Boyer and Lewis (2002).

We limit the context of our scenarios to contract manufacturing, where contract manufacturing refers to a situation where a supplier is responsible for the entire end product instead of supplying only a single component part. Moreover, contract manufacturers have a greater responsibility over end product quality and often greater incentives to shirk (Gray et al. 2012). An additional benefit of limiting our scenarios to contract manufacturing is that it is easier for the manager to understand that the supplier has complete responsibility of production for the product versus the manager having to

determine the importance of the component being sourced. Contract manufacturing differs from component manufacturing in that contract manufacturers often have a higher level of specific assets because contract manufacturing involves a greater number of production tasks. As such, we include high asset specificity as baseline information. As suggested by Mayer and Salomon (2006), this has the added benefit of controlling for the effect of asset specificity on outsourcing to help to isolate the effect of variables that do not have as well-established influences including: supplier cost and quality advantage, overconfidence and bandwagon pressure. The asset specificity information we provide is based on prior literature that identifies specific assets as difficult or costly to redeploy (Heide and John 1990, Stump 1995).

In addition, we include high technological uncertainty in our baseline scenario. We do so for two reasons. First, anticipation of technological shifts often favors the use of suppliers (Afuah 2001, Sutcliffe and Zaheer 1998). Second, in today's ever-changing world companies should anticipate that technology will change and design their supply chains accordingly (Fine 2000). Our technological uncertainty baseline information is based on Sutcliffe and Zaheer (1998) and Walker and Weber (1984). Lastly, we eliminate capacity and economies of scale differences between the firm and supplier because economies of scale and adequate capacity may influence outsourcing (Hayes et al. 2005, Porter 1980).

The Sourcing Decision Exercise

YOUR ROLE: *You are a sourcing manager at Alpha Pharmaceuticals. Alpha Pharma has just successfully completed clinical trials on a new proprietary drug, Livero. Livero has been approved by the Food & Drug Administration (FDA). However, Alpha Pharma has not done full scale manufacturing of Livero.*

Your task as the sourcing manager will be to make the Livero sourcing decision for Alpha Pharma. It is up to you to decide whether to manufacture Livero internally, outsource to XYZ Co or choose a mixture of in-house and contract production. Furthermore, you have been given full authority to make this choice. There are no 'correct' answers, so please respond based upon what you believe to be the best option.

Please read the following scenario and answer the subsequent questions based upon your understanding of what you just read. Again, there are no 'wrong' answers. Additional space is provided for your questions and comments. Your participation is voluntary and strictly confidential. After completion please return this document to the presenter.

Background information on the pharmaceutical industry

The pharmaceutical industry currently faces the following challenges:

- Increasing demand for pharmaceuticals.
- Intellectual property rights allow innovative drugs (patented) to be licensed or produced exclusively.
- New process technology and product offerings are common.
- Competitive pressure to provide high return on assets, equity and revenues.
- Low switching costs and multiple drugs within a category allow for customer substitution.
- Brand image, company reputation and consumer trust are critical to achieving and maintaining market share.
- The pharmaceutical industry is highly regulated.
- Companies are required to track conformance quality as well as undergo production site inspections.
- The industry is facing greater price controls and negotiated drug prices.

Alpha Pharma

Alpha Pharma is a pharmaceutical company that innovates and brings drugs to market.

- To compete, Alpha Pharma has to be able to commercially produce high quality drugs at low cost.
- Cost is a competitive priority because drugs are selected based on cost and patient benefit.
- Quality is a competitive priority because switching costs are low, brand image is a driver of sales, and the cost of a drug recall is high.
- Any sourcing decision at Alpha Pharma must consider cost and quality priorities.

Livero

- Livero requires a production system tailored to meet unique operational requirements.

- Implementation of the unique production system will require significant time and resources to train and develop personnel.
- Livero's production technology is uncertain and may change over time.
- Future improvements in technology will likely render current technology obsolete.
- Both Alpha Pharma & XYZ Co have the capacity to produce Livero.
- Alpha Pharma and XYZ Co have similar economies of scale.

XYZ Co

Alpha Pharma has examined a number of potential contract manufacturing organizations. Currently, they are evaluating a particular contract manufacturer: *XYZ Co*.

- XYZ Co has capabilities similar to Alpha Pharma's competitors.
- Alpha Pharma has requested and received quality and cost reports from XYZ Co.
- Alpha Pharma has obtained publically available inspection records of XYZ Co from the FDA.

As sourcing manager, you have just received the following information:

XYZ Co's capabilities compared to Alpha Pharma

<<Insert supplier cost and quality advantage cues here >>

Information about the ability to monitor XYZ Co

<<Insert ability to monitor supplier performance cues here>>

Vignette Treatment Information

Supplier Cost Disadvantage

- XYZ Co's manufacturing costs are higher than Alpha Pharma.
- XYZ Co purchases materials at higher costs than Alpha Pharma
- XYZ Co is not skilled at reducing costs once production has started; Alpha Pharma is adept at reducing costs.

Supplier Quality Disadvantage

- XYZ Co's manufacturing function provides inconsistent quality, while Alpha Pharma does not.
- XYZ Co. produces a higher number of defective units of drugs similar to Livero than Alpha Pharma.

Unable to Monitor Supplier Performance

- Evaluating XYZ Co's performance will be primarily a subjective process.
- Alpha Pharma is unable to determine the production cost of XYZ Co.
- Alpha Pharma is unable to determine whether agreed upon quality standards and specifications are adhered to by XYZ Co.

Supplier Cost Disadvantage

- XYZ Co's manufacturing costs are lower than Alpha Pharma.
- XYZ Co purchases materials at lower costs than Alpha Pharma
- XYZ Co is skilled at reducing costs once production has started; Alpha Pharma is not adept at reducing costs.

Supplier Quality Disadvantage

- XYZ Co's manufacturing function provides consistent quality, while Alpha Pharma does not.
- XYZ Co. produces a lower number of defective units of drugs similar to Livero than Alpha Pharma.

Able to Monitor Supplier Performance

- Evaluating XYZ Co's performance will be primarily an objective process.
- Alpha Pharma is able to accurately estimate the production cost of XYZ Co.
- Alpha Pharma is able to accurately determine whether agreed upon quality standards and specifications are adhered to by XYZ Co.

Bandwagon Absent

As the sourcing manager, if you can allocate production of Livero between Alpha Pharma and XYZ Co, how should production be allocated between Alpha Pharma & XYZ Co?

Bandwagon Present

As the sourcing manager, you find out that Alpha Pharma's competitors are outsourcing similar production to contract manufacturers. How should production be allocated between Alpha Pharma & XYZ Co?

Post Vignette Questionnaire

Questions about your understanding of the scenario. Please refer back to the scenario if you need to.

1. To what degree is Alpha Pharma able to determine the production costs of XYZ Co?

☐ Unable ☐ Somewhat Unable ☐ Neither ☐ Somewhat Able ☐ Able ☐ Don't Know

2. To what degree is Alpha Pharma able to determine quality standards and specifications are adhered to by XYZ Co?

☐ Unable ☐ Somewhat Unable ☐ Neither ☐ Somewhat Able ☐ Able ☐ Don't Know

3. How would you rate cost as a priority for Alpha Pharma?

☐ Low ☐ Somewhat Low ☐ Neither ☐ Somewhat High ☐ High ☐ Don't Know

4. How would you rate quality as a priority for Alpha Pharma?

☐ Low ☐ Somewhat Low ☐ Neither ☐ Somewhat High ☐ High ☐ Don't Know

5. Livero requires investment in a unique production system and specific assets.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disagree	Somewhat Disagree	Neither	Somewhat Agree	Agree	Don't Know

6. Livero's production technology may change over time.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disagree	Somewhat Disagree	Neither	Somewhat Agree	Agree	Don't Know

7. How difficult would it be for Alpha Pharma to determine the production costs of XYZ Co?

☐ Difficult ☐ Somewhat Difficult ☐ Neither ☐ Somewhat Easy ☐ Easy ☐ Don't Know

8. How difficult would it be for Alpha Pharma to determine quality standards and specifications are adhered to by XYZ Co?

☐ Difficult ☐ Somewhat Difficult ☐ Neither ☐ Somewhat Easy ☐ Easy ☐ Don't Know

9. XYZ Co has lower costs than Alpha Pharma.

☐ Disagree ☐ Somewhat Disagree ☐ Neither ☐ Somewhat Agree ☐ Agree ☐ Don't Know

10. XYZ Co has lower quality than Alpha Pharma.

☐ Disagree ☐ Somewhat Disagree ☐ Neither ☐ Somewhat Agree ☐ Agree ☐ Don't Know

11. How subjective is the process that Alpha Pharma uses to evaluate the performance of XYZ Co?

☐ Subjective ☐ Somewhat Subjective ☐ Neither ☐ Somewhat Objective ☐ Objective ☐ Don't Know

12. Alpha Pharma is able to determine the production costs of XYZ Co.

☐ Disagree ☐ Somewhat Disagree ☐ Neither ☐ Somewhat Agree ☐ Agree ☐ Don't Know

13. Alpha Pharma is able to determine that quality standards and specifications are adhered to by XYZ Co.

☐ Disagree ☐ Somewhat Disagree ☐ Neither ☐ Somewhat Agree ☐ Agree ☐ Don't Know

As the sourcing manager, it is your responsibility to choose where Livero is produced.

Scenario 1: As the sourcing manager, where would you choose to have Livero produced?

☐ Alpha Pharma ☐ XYZ Co

14a. Given your choice, as sourcing manager, what is your perception of Livero's supply risk?

☐ Very Low ☐ Low ☐ Somewhat Low ☐ Moderate ☐ Somewhat High ☐ High ☐ Very High

14b. Given your choice, as sourcing manager, what is your perception of Alpha Pharma's financial and operational benefit?

☐ Very Low
 ☐ Low
 ☐ Somewhat Low
 ☐ Moderate
 ☐ Somewhat High
 ☐ High
 ☐ Very High

Scenario 2: As the sourcing manager, if you can allocate production of Livero between Alpha Pharma and XYZ Co, how should production be allocated between Alpha Pharma & XYZ Co?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%
XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ
Co	Co	Co	Co	Co	Co	Co	Co	Co	Co	Co
0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Alpha	Alpha	Alpha	Alpha	Alpha	Alpha	Alpha	Alpha	Alpha	Alpha	Alpha
Phar	Phar	Phar	Phar	Phar	Phar	Phar	Phar	Phar	Phar	Phar
ma	ma	ma	ma	ma	ma	ma	ma	ma	ma	ma

15a. Given your choice, as sourcing manager, what is your perception of Livero's supply risk?

☐ Very Low
 ☐ Low
 ☐ Somewhat Low
 ☐ Moderate
 ☐ Somewhat High
 ☐ High
 ☐ Very High

15b. Given your choice, as sourcing manager, what is your perception of Alpha Pharma's financial and operational benefit?

☐ Very Low
 ☐ Low
 ☐ Somewhat Low
 ☐ Moderate
 ☐ Somewhat High
 ☐ High
 ☐ Very High

Scenario 3: As the sourcing manager, you find out that Alpha Pharma's competitors are outsourcing similar production to contract manufacturers. How should production be allocated between Alpha Pharma & XYZ Co?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%
XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ
Co	Co	Co	Co	Co	Co	Co	Co	Co	Co	Co
0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Alpha	Alpha	Alpha	Alpha	Alpha	Alpha	Alpha	Alpha	Alpha	Alpha	Alpha
Phar	Phar	Phar	Phar	Phar	Phar	Phar	Phar	Phar	Phar	Phar
ma	ma	ma	ma	ma	ma	ma	ma	ma	ma	ma

16a. Given your choice, as sourcing manager, what is your perception of Livero's supply risk?

☐ Very Low
 ☐ Low
 ☐ Somewhat Low
 ☐ Moderate
 ☐ Somewhat High
 ☐ High
 ☐ Very High

16b. Given your choice, as sourcing manager, what is your perception of Alpha Pharma's financial and operational benefit?

- ☐ Very Low ☐ Low ☐ Somewhat Low ☐ Moderate ☐ Somewhat High ☐ High ☐ Very High

Please tell us a little bit about yourself and your current employer. Your feedback, answers, and identity will be anonymous and kept confidential. Thank you for your participation.

17. What is your current or most recent job title? _____

18. How many years of experience have you had in a sourcing related role? _____

19. How many total years of work experience do you have? _____

20. What is your highest level of education? Please circle the most appropriate choice.

- ☐ High School ☐ Associate's Degree ☐ Bachelor's Degree ☐ Master's Degree ☐ Doctorate

21. What is your age? ☐ 20 & under ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ 61-70 ☐ 71+

22. What is your gender? ☐ Female ☐ Male

23. Which category below best describes the industry where you currently work or most recently have worked? Please circle only one.

- a) Aerospace
- b) Automotive
- c) Consumer Products
- d) High-Tech
- e) General Manufacturing
- f) Pharmaceutical
- g) Other, please specify _____

24. What is your current employment status (Please mark all that apply.)?

- ☐ Employed ☐ Unemployed ☐ Retired ☐ Student

Please answer the following six questions based on how accurately the statement describes you personally.

25. I will tolerate increased supply chain risks in order to reduce supply chain costs.

- ☐ Very Inaccurate ☐ Moderately Inaccurate ☐ Neither ☐ Moderately Accurate ☐ Very Accurate

26. I will tolerate increased supply chain risks in order to increase supply chain quality.

- | | | | | |
|---------------------------------------|---|-------------------------------|---|-------------------------------------|
| <input type="radio"/> Very Inaccurate | <input type="radio"/> Moderately Inaccurate | <input type="radio"/> Neither | <input type="radio"/> Moderately Accurate | <input type="radio"/> Very Accurate |
|---------------------------------------|---|-------------------------------|---|-------------------------------------|

27. I will tolerate increased supply chain risks in order to increase supply chain on-time delivery.

- | | | | | |
|---------------------------------------|---|-------------------------------|---|-------------------------------------|
| <input type="radio"/> Very Inaccurate | <input type="radio"/> Moderately Inaccurate | <input type="radio"/> Neither | <input type="radio"/> Moderately Accurate | <input type="radio"/> Very Accurate |
|---------------------------------------|---|-------------------------------|---|-------------------------------------|

28. I am confident that I could deal efficiently with unexpected supply chain events.

- | | | | | |
|---------------------------------------|---|-------------------------------|---|-------------------------------------|
| <input type="radio"/> Very Inaccurate | <input type="radio"/> Moderately Inaccurate | <input type="radio"/> Neither | <input type="radio"/> Moderately Accurate | <input type="radio"/> Very Accurate |
|---------------------------------------|---|-------------------------------|---|-------------------------------------|

29. I can solve most supply chain problems if I invest the necessary effort.

- | | | | | |
|---------------------------------------|---|-------------------------------|---|-------------------------------------|
| <input type="radio"/> Very Inaccurate | <input type="radio"/> Moderately Inaccurate | <input type="radio"/> Neither | <input type="radio"/> Moderately Accurate | <input type="radio"/> Very Accurate |
|---------------------------------------|---|-------------------------------|---|-------------------------------------|

30. When I am confronted with a supply chain problem, I can usually find several solutions.

- | | | | | |
|---------------------------------------|---|-------------------------------|---|-------------------------------------|
| <input type="radio"/> Very Inaccurate | <input type="radio"/> Moderately Inaccurate | <input type="radio"/> Neither | <input type="radio"/> Moderately Accurate | <input type="radio"/> Very Accurate |
|---------------------------------------|---|-------------------------------|---|-------------------------------------|

31. From your experience, how much control do you think you have over the process to identify potential suppliers?

- | | | | | |
|---|---|-------------------------------|---|--|
| <input type="radio"/> Absolutely No Control | <input type="radio"/> Almost No Control | <input type="radio"/> Neither | <input type="radio"/> Almost Complete Control | <input type="radio"/> Complete Control |
|---|---|-------------------------------|---|--|

32. From your experience, how much control do you think you have over the supplier evaluation process?

- | | | | | |
|---|---|-------------------------------|---|--|
| <input type="radio"/> Absolutely No Control | <input type="radio"/> Almost No Control | <input type="radio"/> Neither | <input type="radio"/> Almost Complete Control | <input type="radio"/> Complete Control |
|---|---|-------------------------------|---|--|

33. From your experience, how much control do you think you have over the supplier selection process?

- | | | | | |
|---|---|-------------------------------|---|--|
| <input type="radio"/> Absolutely No Control | <input type="radio"/> Almost No Control | <input type="radio"/> Neither | <input type="radio"/> Almost Complete Control | <input type="radio"/> Complete Control |
|---|---|-------------------------------|---|--|

34. From your experience, how often is supplier information discovered after supplier selection has occurred that might have changed your supplier selection?

- | | | | | |
|---------------------------------------|---|-------------------------------|---|---|
| <input type="radio"/> Very Frequently | <input type="radio"/> Somewhat Frequently | <input type="radio"/> Neither | <input type="radio"/> Somewhat Infrequently | <input type="radio"/> Very Infrequently |
|---------------------------------------|---|-------------------------------|---|---|

35. From your experience, how frequently does a typical supplier change their supply chain management practices in response to changes in your own company's practices?

- ☐ Very Frequently ☐ Somewhat Frequently ☐ Neither ☐ Somewhat Infrequently ☐ Very Infrequently

36. From your experience, how frequently does a typical supplier change their behavior based on your own company's supply chain management practices?

- ☐ Very Frequently ☐ Somewhat Frequently ☐ Neither ☐ Somewhat Infrequently ☐ Very Infrequently

37. Given the opportunity, a typical supplier will attempt to pass additional costs on to your company to increase their profits.

- ☐ Strongly Disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree ☐ Don't Know

38. Given the opportunity, a typical supplier will attempt to reduce quality to increase their profits.

- ☐ Strongly Disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree ☐ Don't Know

39. A typical supplier will do things that may be detrimental to your firm's supply chain performance without informing you.

- ☐ Strongly Disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree ☐ Don't Know

40. Given your experience what is your impression of contract manufacturers?

- ☐ Very Poor ☐ Poor ☐ Somewhat Poor ☐ Neutral ☐ Somewhat Good ☐ Good ☐ Very Good

41. How much experience does your current or most recent employer have with contract manufacturers?

- ☐ None ☐ Little ☐ Some ☐ Substantial ☐ Extensive

42. About what percentage of sales revenues from the business unit that you work in can currently be attributed to products made by contract manufacturers?

43. To what extent does the quality of your current contract manufacturers meet your business unit's expectations?

- ☐ Substantially Below Expectations
 ☐ Below Expectations
 ☐ Meets Expectations
 ☐ Above Expectations
 ☐ Substantially Above Expectations

44. To what extent does the cost of your current contract manufacturers meet your business unit's expectations?

- ☐ Substantially Below Expectations
 ☐ Below Expectations
 ☐ Meets Expectations
 ☐ Above Expectations
 ☐ Substantially Above Expectations

45. What was your business unit's profit level before taxes for the most recent fiscal year?

- ☐ Negative (net loss)
 ☐ Break even (no profit/loss)
 ☐ Up to 5% profit
 ☐ Over 5% to 10% profit
 ☐ Over 10% to 15% profit
 ☐ Over 15% to 25% profit
 ☐ Over 25% profit

46. Which one of the following descriptions is most typical of your business unit's products?

- ☐ Standard product with no options
☐ Standard product with standard options
☐ Standard product modified to customer specification
☐ Standard product with options modified to customer specification
☐ Customized product manufactured to customer specification

47. Please indicate the core competencies of your business unit. Mark all that apply*.

- ☐ R&D
 ☐ Purchasing/ Sourcing
 ☐ Marketing
 ☐ Project Management
 ☐ Contract Management
 ☐ Manufacturing

48. What is the approximate number of employees employed by your business unit?

- ☐ 0-250
 ☐ 251- 500
 ☐ 501-750
 ☐ 751-1000
 ☐ 1001+

49. The unemployment rate at the end of 2012 will be smaller than it is today.

- ☐ Strongly Disagree
 ☐ Disagree
 ☐ Neutral
 ☐ Agree
 ☐ Strongly Agree

50. When you must choose between the two, you dress for fashion, not for comfort.

- ☐ Strongly Disagree
 ☐ Disagree
 ☐ Neutral
 ☐ Agree
 ☐ Strongly Agree

51. The sourcing situation described in this exercise was realistic.

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

52. I took my role in this exercise seriously.

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

53. In my current or most recent work, I encounter the issues discussed in this exercise.

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

54. Please indicate the extent to which you are knowledgeable about the issues raised in this study.

☐ No Knowledge ☐ Little Knowledge ☐ Some Knowledge ☐ Substantial Knowledge ☐ Extensive Knowledge

55. Please list any areas in which our exercise could be improved or share any additional comments. (Please use the back of page if you run out of room)

Thank you for taking the time to participate in our exercise and to fill out our survey. Your time and input are greatly appreciated.

Appendix C

Sensitivity Analysis of Our Results

Sample Sensitivity

We are interested to see if our results are sensitive to potential location or selection bias. To test our theory and its sensitivity to our location, we ran our analyses on the first seven locations of our sample (i.e., Buffalo, Wichita, Reading, Springfield, Teneva, San Antonio, and Grand Rapids). Then we compared these results to the results from the next 8 locations (Madison, West Georgia, Indianapolis, Augusta, Kernersville, Dallas, Philadelphia and Baltimore). We did not find substantive difference in our results. Thus we have some evidence that our results may not depend on the location.

To examine selection bias we compared the demographics from the “Results of the 2009 ISM Membership Needs Survey,” (<http://www.ism.ws/files/membership/memneedssurvey2009.pdf>) to our sample demographics. ISM conducts this survey every three years so 2009 represents the most up-to-date and most relevant comparison for our study. We find that our sample is consistent with ISM’s sample of its own population in several key ways. Specifically, we find that our study’s demographics are the same on age, education and gender. Moreover, our sample does not differ from ISM’s in the amount of sourcing experience or firm size. However, we do find that our sample does deviate from ISM’s demographics in one key way; our sample is over representative of manufacturing and under representative of service organizations.

Analytical Method Check

We tried three different analytic specifications. First we tried the simplest analytic method which is to use a general linear model (GLM) repeated measures analysis. In this analysis we did violate the homogeneity of variance assumption, but were well within the accepted skewness and kurtosis limits (Cohen et al. 2003) suggesting that the F-test s for statistical significant may be only mildly liberal. However, because we had heterogeneous variance we decided to use a linear mixed model (LMM) analysis. In addition an LMM analysis allowed us to examine random

effects such as randomness introduced by the subject or by the subject's response to bandwagon pressure. Finally we used a generalized estimating equations (GEE) analysis in case we made specification error in the random effects. Across these three analytic methods we find consistency in the results. We believe this consistency exists because our heterogeneity of variance is not caused by underlying distributional issues and that our random effects are relatively simple because we only have one within subjects factor that is repeated only on period.

Software Check

We wanted to make sure that our empirical results were robust to any differences in estimation techniques used by the software we used. In order to do so we evaluated three different softwares (SAS SPSS and Stata) and four different software procedures (SAS: proc mixed, SAS: proc glimmix, SPSS:mixed and Stata: xtmixed).

All of the softwares had both maximum likelihood (ML) and restricted maximum likelihood estimations (REML) available with the default being REML. Next, we compared computational algorithms available in the three softwares: 1) SAS uses the Newton-Raphson and Fisher scoring algorithms, 2) SPSS uses the Newton-Raphson and Fisher scoring algorithms, 3) Stata uses the Newton-Raphson and Expectation-Maximization algorithms. As we are primarily interested in the observed matrix we compared the Newton-Raphson method across all three softwares but did look for any differences between SAS and SPSS using the Fisher scoring algorithm.

We then compared SAS proc mixed and SAS proc glimmix and found identical results. However, we decided to use proc glimmix as the post hoc estimation commands are more useful. Specifically, the post hoc comparison of means command LSMESTIMATE, which is found in glimmix, defines the linear contrasts based on the least squares means instead of the model effects like the ESTMATE command does in proc mixed. For our model where we are testing three-way interactions it is superior because we can only focus on the differences due to the interaction terms not including the main effects. With the ESTIMATE command you are required to include the main effects. The significance of this is simply that comparisons are more parsimonious and

less vulnerable to typographical errors. The last important difference is that you can easily make multiple comparisons and adjust for multiplicity (i.e., Bonferonni adjustment).

After comparing procedures within SAS, we compared procedures across softwares. Estimates for the fixed effect parameters were identical as was the calculation of the log-likelihood for both ML and REML. Surprisingly, we found few differences between SAS proc glimmix, SPSS mixed and Stata xtmixed. SAS differed from both SPSS and Stata in the calculations for the random effects and residual variance, but the difference was very minor representing less than 0.0001 difference. Another difference is that SAS and SPSS only include model fixed and random parameters in the calculation of the AIC or BIC, while Stata includes covariates. Lastly, in the tests for fixed effects SAS and SPSS used t-tests involving degrees of freedom, while Stata uses z-tests independent of the number of degrees of freedom. Even with these minor differences across softwares, we found consistent results.

Manipulation Checks

We look at different specifications for our manipulation checks. The simplest model is simply to fit the complete full factorial treatment model to the specific binary manipulation. However, due to few observations of failed manipulation checks 19 participants failed ability to monitor supplier performance manipulation, 15 participants failed the cost manipulation check and 17 participants failed the quality manipulation check. Hence the complete model does not converge based on restrictive and standard fit criteria. Instead we decide to focus on techniques that will provide accurate estimates of our manipulation checks. Specifically, we examine three selection methods that determine how effects from the complete full factorial model move in and out of the model: backward elimination, forward selection and stepwise selection. Regardless of these selection methods the results remain the same, where the reported perception of the manipulated variable (i.e., ability to monitor, cost and quality) is only statistically significantly related to the corresponding treatment (i.e., ability to monitor, cost and quality).

The second sensitivity analysis that we perform for manipulation checks is to examine different effect parameterizations. Specifically, we check the parameter estimates for when the GLM procedure, which is less-than full rank on the reference coding, is used versus when the categories are forced to be estimated as orthogonal, which is a full rank parameterization. Since our experimental design is based on orthogonal categorical variables, the estimation of orthogonal effects makes the most theoretical sense. However, we examine the sensitivity of our manipulation checks to alternative parameterizations. Since we have only two levels for the main effects these estimates should be about the same unless higher order effects are significant. We find that the manipulation checks for cost, quality and the ability to monitor yield the same results regardless of these different effect parameterizations.

Lastly, sensitivity analysis of algorithms is unnecessary as the Newton-Raphson (observed information matrix) vs. Fisher-Scoring (expected information matrix) algorithm are equivalent when the link function is the logit and response variable is binary, hence the conclusions will be the same regardless of algorithm.

Common Methods Variance

We implement two methods suggested by Podsakoff et al. (2003) for controlling for method biases: 1) Partialing out affectivity and 2) Partialing out a marker variable. In the full sample, we partial out the variance from a manager's affective disposition towards contract manufacturers. After controlling for manager's impression about contract manufacturers we found that our substantive results do not change. In our last three data collections, we collected data that included two marker variables that are theoretically unrelated to our study (Lindell and Whitney 2001). Specifically, we ask if managers dress for fashion or comfort (Malhotra et al. 2006) and whether or not managers believe the unemployment rate will be better or worse at the end of this year. In our humble opinion, neither of these variables should be related to outsourcing. We then partial out the effect of these marker variables and found that our results do not change. While these two methods essentially treat these measures of common method variance as covariates and control for variability due to method, we may not completely

eliminate the possibility of method variance still playing a significant role in our results (Lindell and Whitney 2001, Podsakoff et al. 2003).

Degrees of Freedom Adjustments

There are three competing methods to calculate the degrees of freedom used to estimate effects: Standard use of Type III sum of squares, a Satterwaite adjustment for the degrees of freedom or a Kenward-Roger adjustment for degrees of freedom. Since our design is unbalanced we should take that fact into account when making our statistical inferences about the model. Type III does adjust for unbalanced designs but assumes underlying population variances are equal, if our design was balanced this would not be a critical assumption (Cohen et al. 2003). In our sample, we have evidence of heterogeneity and thus used LMM to model a potential source of heterogeneity, the manager. However, we cannot preclude the possibility that other sources of population heterogeneity may still exist. A Satterwaite adjustment does not assume that underlying population variances are equal but does assume sample variances may be independent (Satterthwaite 1946). The assumption former is desirable but the latter may be problematic given that we have repeated measures in our analysis. Unbalanced data that is not independent results in inflated Type I error rates (Kackar and Harville 1984). The final method the Kenward-Roger (KR) approach does not assume population variances are equal nor does it assume independence in variance (Kenward and Rogers 1997). We use the KR approach as it is the most conservative adjustment technique. However, our results do not substantively change across the three methods. We believe we find similar results despite the degrees of freedom method because our covariance structure is relatively simple and our design is relatively balanced.

Response Bias Check

As a response bias check, we compared the profile of our 304 subjects to the 79 invitees who failed to complete the experiment, or did not provide useable responses in terms of individual characteristics (i.e. gender, education and years of sourcing experience) and employment characteristics (i.e. industry and firm size) of the decision-makers that were included versus those who were excluded. No statistically significant

differences were detected for age ($\chi^2=1.8$, $df=7$, $p= 0.96$), education ($\chi^2=4.9$, $df=3$, $p= 0.17$), firm size ($\chi^2=9.48$, $df=4$, $p=0.15$), gender ($\chi^2=0.01$, $df=1$, $p= 0.90$) and industry ($\chi^2=7.16$, $df=6$, $p = 0.30$) by means of a contingency table analysis. For total work experience and years of sourcing experience, we conducted a difference-of-means test assuming unequal variances across independent samples. No significant differences were detected for total work experience ($t= -0.32$, $df=43$, $p= 0.90$) and years of sourcing experience ($t= -0.12$, $df=40$, $p = 0.74$).

Appendix D

Extended Discussion about Covariates

Individual Characteristics

Individual characteristics may influence decision-making. Specifically, March (1994, p.58) states that individual characteristics may shape decisions because “Social systems socialize and educate individuals into rules associated with age, gender, social positions and identities.” As such, we examine the role of managers’ individual characteristics on their partial outsourcing decision. Specifically, we examine the gender, education and sourcing experience as we believe that these characteristics may be related to confidence, expertise, risk-taking and conformance to bandwagon pressure, which may influence managers’ preferences.

Gender

Gender between men and women differences may reflect socialization (March 1994) or physiological differences (Atkinson 1957) that may influence decision-making. Specifically, men may prefer a higher percentage of outsourcing than women because men tend to be more aggressive (Eagly and Steffen 1986), confident about their decisions (Feingold 1994) and take more risks than women (Byrnes et al. 1999, Eckel et al. 2008). Moreover, these gender differences persist across age groups, nationalities and time (Byrnes et al. 1999, Eagly and Steffen 1986, Feingold 1994). Within the outsourcing context, a higher percentage of outsourcing is considered to be inherently riskier as it represents a larger loss of control over production. Hence, as the percentage of outsourcing increases so do risks associated with supplier opportunistic behavior. Therefore, male managers may prefer a higher percentage of outsourcing than their female counterparts, *ceteris paribus*.

Education

Education is inversely related to risk aversion (Shaw 1996). This inverse relationship is well established in the extant literature (Shaw 1996). Education may influence managers to be more confident, and hence, less risk averse. Therefore, managers with higher levels of education will prefer a higher percentage of outsourcing.

Thus more educated managers may prefer a higher percentage of outsourcing than less educated managers, *ceteris paribus*.

Sourcing Experience

Experience in a domain contributes to the development of expert decision-making skills (Klein 1997, Simon and Chase 1973). Expert decision-makers differ from novices in how they recognize situations, generate alternatives, choose problem solving strategies and in the accuracy of their choice (Chi 2006). Experts recognize a situation faster than novices (Klein 1997, Simon and Chase 1973), and search for and use fewer information cues when making a decision (Camerer and Johnson 1991, Simon and Chase 1973). In addition, experts reconfigure cues in different temporal or causal sequences obtaining differing conclusions, while novices do not reconfigure (Camerer and Johnson 1991). At the same time, experts recognize subtle features of a problem, which novices frequently miss (Chi 2006). Moreover, experts are accurate at detecting errors or the likelihood of an outcome (Chi 2006). These differences between novices and experts may explain why experts can select more effective problem solving strategies that generate near optimum solutions quickly (Chi 2006, Simon and Chase 1973). Therefore, we believe managers with substantial sourcing experience (or “experts”) will have experienced more losses or pitfalls associated with supplier opportunism, as result they will be more cautious and prefer less outsourcing. Therefore more sourcing experience may have a direct negative influence on percentage of outsourcing, *ceteris paribus*.

Moderating Effect of Individual Characteristics on Bandwagon Pressure

Moderating Effect of Gender on Bandwagon Pressure

Bandwagon pressure is posited to be an influential force that encourages the manager to conform to the perceived industry’s outsourcing choice. As such, managerial characteristics that are correlated with greater or lower levels conformance are of interest. Gender is related to two factors that affect conformance: confidence and group orientation. Specifically, greater levels of confidence lead to less reliance on social proof and a lower group orientation implies that manager decisions will be made independent of group influences (Cialdini and Goldstein 2004). Men, on average, may be influenced

less by bandwagon pressure as they are more confident and less group oriented than women (Eagly 1978). Therefore, the positive relationship between bandwagon pressure and the percentage of outsourcing may be relatively less for male managers and higher for their female counterparts.

Moderating Effect of Education on Bandwagon Pressure

Education increases decision-maker confidence (Puri and Robinson 2007). This confidence may lead to optimism about managerial choice (Puri and Robinson 2007) or resistance to conforming as the manager believes the right choice has already been made (Cialdini and Goldstein 2004). Both of these plausible explanations suggest that more educated managers will rely less on bandwagon pressure to determine the ‘correct’ partial outsourcing choice, than less educated managers. Thus, the positive relationship between bandwagon pressure and the percentage of outsourcing may be reduced as managerial education increases.

Moderating Effect of Sourcing Experience on Bandwagon Pressure

As experience increases managers tend to become more confident in their competence (Griffin and Tversky 1992, Heath and Tversky 1991), and subsequently, overconfident in judgments of their performance (West and Stanovich 1997). Also, managers with expertise tend to be more discerning and know what is relevant to a decision versus what is not (Camerer and Johnson 1991, Klein 1997). Thus, the positive relationship between bandwagon pressure and the percentage of outsourcing may be reduced as the years of sourcing experience increases.

Appendix E

Tests of Fixed Effects

Variable	LMM
Intercept	F(1,304)= 1073.89**
<i>Employment Characteristics (Between Subjects)</i>	
Firm size	F(1,304)= 0.02
Industry	F(7,304)= 1.47
<i>Individual Characteristics (Between Subjects)</i>	
Gender	F(1,304)= 4.57*
Education	F(2,304)= 2.38†
Impression of contract manufacturers	F(1,304)= 0.56
Years of sourcing experience	F(1,304)= 2.83†
<i>Between-subjects Effects</i>	
Supplier Cost Advantage (SCA)	F(1,304)= 110.72**
Supplier Quality Advantage (SQA)	F(1,304)= 83.16**
Ability to Monitor Supplier Performance (AMSP)	F(1,304)= 24.29**
SCA x SQA	F(1,304)= 0.13
SCA x AMSP	F(1,304)= 10.71**
SQA x AMSP	F(1,304)= 0.18
SCA x SQA x AMSP	F(1,304)= 1.53
<i>Within-subjects Effects</i>	
Bandwagon Pressure (BP)	F(1,304)= 9.04**
<i>Within-subjects and Employment Characteristic Interactions</i>	
BP x Firm size	F(1,304)= 3.35†
BP x Industry	F(7,304)= 2.48*
<i>Within-subjects and Individual Characteristic Interactions</i>	
BP x Gender	F(1,304)= 0.81
BP x Education	F(2,304)= 0.61
BP x Impression of contract manufacturers	F(1,304)= 0.06
BP x Years of sourcing experience	F(1,304)= 8.98**
<i>Within-subjects Interactions</i>	
BP x SCA	F(1,304)= 1.00
BP x SQA	F(1,304)= 0.12
BP x AMSP	F(1,304)= 0.01
BP x SCA x SQA	F(1,304)= 2.12
BP x SCA x AMSP	F(1,304)= 0.07
BP x SQA x AMSP	F(1,304)= 0.00
N ₁ = 304 N ₂ = 2	
Design effect= 1.81	Effective sample size = 335.33

*p ≤ 0.05; **p ≤ 0.01; †p ≤ 0.10.

Appendix F
2SLS Assumption and Robustness Tests
Results of the Unconditional Make-Buy Models

Variable	Coefficient	Model 1: Perceived benefit	Model 2: Perceived risk	Model 3: The difference
		Estimate ^a	Estimate ^a	Estimate ^a
Intercept	α_{00}	4.34**	3.22**	1.13*
Education	α_{01}	0.08	0.03	0.04
Gender ^b	α_{02}	0.30†	-0.05	0.36
Years of sourcing experience	α_{03}	0.01†	-0.00	0.01
Firm size ^c	α_{04}	-0.13	0.03	-0.17
Industry ^d	α_{05}	0.60	0.00	0.04
Cost capability (Superior supplier cost capability)	α_{06}	-0.15	0.32	-0.49
Quality capability (Superior supplier quality capability)	α_{07}	-0.12	0.06	-0.19
Ability to monitor supplier performance (Able)	α_{08}	0.56**	-0.32†	0.89**
Make-Buy	β_{01}	0.26	0.02	0.26
R ²		0.11**	0.04†	0.09**

* $p \leq 0.05$; ** $p \leq 0.01$; † $p \leq 0.10$.

Bold indicates statistical significance

^a Unstandardized estimates

^b Females are the omitted group.

^c Firms Under 1000 employees are the omitted group.

^d Manufacturing firms are the omitted group.

Identification Tests for the Unconditional Make-Buy Models

Statistical test	Perceived benefit	Perceived risk	Difference
Underidentification test			
Kleibergen-Paap rk LM statistic ^a	14.33**	14.33**	14.33**
Weak identification test			
Cragg-Donald Wald F statistic ^b	7.07 ^c	7.07 ^c	7.07 ^c
Kleibergen-Paap rk Wald F statistic ^b	8.55 ^c	8.55 ^c	8.55 ^c
Overidentification test of all instruments			
Hansen J statistic ^d	0.45	0.30	0.50

*p ≤ 0.05; **p ≤ 0.01; †p ≤ 0.10.

Bold indicates statistically significant regression coefficients

^a Significance provides evidence that the model is identified

^b Critical values are compared against Stock-Yogo weak id critical values

^c Critical value indicates weak identification

^d Significance provides evidence that model is not overidentified

Identification Tests for the Conditional Make-Buy Models

Statistical test	Perceived benefit	Perceived risk	Difference
Underidentification test			
Kleibergen-Paap rk LM statistic ^a	11.16*	11.16*	11.16*
Weak identification test			
Cragg-Donald Wald F statistic ^b	0.67 ^c	0.67 ^c	0.67 ^c
Kleibergen-Paap rk Wald F statistic ^b	1.34 ^c	1.34 ^c	1.34 ^c
Overidentification test of all instruments			
Hansen J statistic ^d	2.63	4.31	2.99

*p ≤ 0.05; **p ≤ 0.01; †p ≤ 0.10.

Bold indicates statistically significant regression coefficients

^a Significance provides evidence that the model is identified

^b Critical values are compared against Stock-Yogo weak id critical values

^c Critical value indicates weak identification

^d Significance provides evidence that model is not overidentified