Contract learning in the aftermath of exchange disruptions: An empirical study of renewing interfirm relationships

ABSTRACT

Drawing from the contract learning literature and studies on managing exchange disruptions, this study examines how contracts can be adjusted *ex post* an exchange disruption to renew interfirm relationships. A multiple-informant survey approach is adopted in this study. Two types of senior managers in 272 manufacturing firms in China (a total of 544 senior managers) are interviewed regarding the resolution process and outcome of exchange disruptions. We find that *ex ante* contract detail fosters *ex post* contract adjustments, and contract adjustment has an inverted-U-shaped relationship with relationship continuity in the aftermath of exchange disruptions. Furthermore, the findings show that the relationship between contract adjustment and relationship continuity is moderated by the interdependence structure (buyer dependence advantage and joint dependence) of an interfirm relationship.

***Keywords*:** Contract detail, Contract adjustments, Interdependence structure, Relationship continuity

Contract learning in the aftermath of exchange disruptions: An empirical study of renewing interfirm relationships

1. Introduction

With the increase in interconnectedness and uncertainties of global supply chains, buyers and suppliers are transitioning from rigidly following a standard contract to modifying agreements and rules guiding the relationship in order to adapt to changing circumstances and improve joint performance (Whipple, Lynch, & Nyaga, 2010; Fiksel, Polyviou, Croxton, & Pettit, 2015). Evidence abounds that no matter how well designed a contract is, exchange disruptions—incidents that disturb the flow of goods, materials, and services (Craighead, Blackhurst, Rungtusanatham, & Handfield, 2007)—can still occur. For example, the British Airports Authority (BAA) and its first-tier suppliers for infrastructure projects developed a detailed contract that rewarded suppliers immediately after completing a component for an infrastructure project. However, the contract did not motivate suppliers to work cooperatively across subprojects, including integration work needed in later stages that had gone unnoticed in the early stage, an inherent problem in complex projects. As a result, exchange disruptions occurred in which suppliers neglected additional work needed in later stages that was unspecified in the contract, causing exchange disruptions. In response, BAA adjusted the contract and designed an incentive scheme that compensated for loopholes in the contract (Gil, 2009). Such exchange disruptions are pervasive in global supply chains as evidenced by the classic example of Nokia and its chip supplier Philips Electronics (Fiskel et al., 2015) and by the case of Land Rover and its chassis frame supplier UPF-Thomason (Sheffi & Rice, 2005).

Firms cannot prevent all disruptions from occurring no matter how detailed of a contract they draft (Scholten & Schider, 2015; Kamalahmadi & Parast, 2016). Ex post adaptation and

adjustments to resolve disruptions thus become important, as contract termination is costly in many buyer-supplier relationships characterized by interdependence and "substantial asset-specific investments, which cannot be easily measured or reallocated to other contracts without loss" (Gil, 2009: 149). Instead of incurring substantial termination costs, exchange partners can use disruptions as a learning opportunity to improve their transactions with each other and renew their relationships (Anderson & Jap, 2005; Lohr, 2011). However, little empirical evidence exists on whether firms can capture lessons learnt from disruptions through contract adjustments and whether such adjustments help renew the interfirm relationship (Mayer & Argyres, 2004). Previous contracting research primarily focuses on the role of contracts in preventing exchange disruptions (Cao & Lumineau, 2015; Liu, Luo, & Liu, 2009) and devotes limited attention to the use of contracts at renewing interfirm relationship in the aftermath of exchange disruptions (Lumineau & Malhotra, 2011).

This study aims to make three contributions to the existing literature. First, we extend the interfirm contracting literature (e.g., Poppo & Zhou, 2014; Wuyts & Geyskens, 2005) by examining how ex ante contract detail affects ex post contract adjustment in the aftermath of exchange disruptions. Lumineau and Malhotra (2011) propose that a gap in existing contract research is the lack of understanding of whether contracts that are effective ex ante remain effective after an exchange disruption. Furthermore, controversies exist in the contracting literature regarding whether a firm using a detailed contract is more or less likely to adjust their contracts after experiencing exchange disruptions (Cohen & Levinthal, 1990; Mayer & Argyres, 2004). We aim to address the controversy by examining whether the level of detail in an original contract, the starting point of contract learning, affects subsequent contract adjustments.

Second, we contribute to the contract learning literature (e.g., Argyres et al., 2007; Lumineau, Fréchet, & Puthod, 2011; Vanneste & Puranam, 2010) by demonstrating the curvilinear relationship between contract adjustments and relationship continuity after exchange disruptions. While existing contract learning studies have shed light on the importance and process of contract learning and adjustments, little empirical evidence exists on the outcome of contract adjustments (Lumineau et al., 2011). Although contract adjustments may benefit the relationship by addressing loopholes in the original contract, some anecdotal evidence suggests that excessive adjustments may be costly, restrict flexible responses, and instill distrust (e.g., Eberl, Geiger, & Aßländer, 2015; Luo, 2002). It is thus worthwhile to systematically examine the pattern of impact that contract adjustments may have on relationship continuity after an exchange disruption – whether it is linearly effective or there is a point beyond which contract adjustments may backfire.

Third, we extend the contract learning literature by investigating the relationship conditions that make the effect of contract learning most beneficial. Contract adjustments often require re-negotiation, and power and dependence play a critical role in the renegotiation process. Existing studies find that power and dependence asymmetries inhibit cooperation (e.g., Gulati & Sytch, 2007; Shervani, Frazier, & Challagalla, 2007), while joint dependence facilitates cooperation (e.g., Casciaro & Piskorski, 2005; Hibbard et al., 2001). Few studies, however, examine in the aftermath of exchange disruptions, how interdependence structure affects the effectiveness of contract adjustments made to facilitate cooperation (Bode, Wagner, Petersen, & Ellram, 2011; Lumineau & Malhotra, 2011). To address this gap, we examine how dependence asymmetry and joint dependence influence the efficacy of contract adjustments.

This study considers the perspective of buyer firms and investigate a buyer's use of contract adjustments to cope with supplier-related exchange disruptions[1]. Although buyers and suppliers differ in their job functions, "symmetry is expected in the nature and pattern of causation of the behavioral constructs that underlie their relationship" (Jap & Anderson, 2003:1686). The remainder of the paper is structured as follows. We first discuss the theoretical background of interfirm contract governance and contract learning. This followed by the hypothesis development, method and result sections. We conclude with a discussion of the theoretical and managerial implications of the empirical findings.

2. Theory and hypotheses

Contracts have been well recognized as a tool to facilitate interfirm exchanges and mitigate exchange disruptions (Cao & Lumineau, 2015; Mooi & Gilliland, 2013). The majority of contract studies have taken the transaction cost economics (TCE) perspective to examine how existing contracts prevent exchange disruptions *ex ante* (e.g., Cao & Lumineau, 2015; Jiang, 2009; Liu et al., 2009; Lumineau & Henderson, 2012). For example, scholars have examined how detailed contracts curb local supplier opportunism (Zhou & Xu, 2012), how organizational culture affects detailed contract drafting and close partner selection (Wuyts & Geyskens, 2005), and how detailed contractual agreements serve as a key relationship connector to regulate

[1] Exchange disruptions may result from partner opportunism (Samaha et al., 2011), misunderstanding between exchange partners (Vlaar et al., 2006), or environmental factors (e.g. Tsunami in Japan) (Bode et al., 2011). Following previous literature on contracts in marketing (e.g. Antia & Frazier, 2001; Wang, Gu, & Dong., 2013), we do not differentiate causes of an exchange disruption (e.g., internal vs. external, opportunistic vs. non-opportunistic) because the attributions of exchange disruptions can be subject to biases of different parties (Wang et al., 2013; Watson, 1982). Instead, we examine exchange disruptions according to observed outcomes (i.e. damage generated for one of the exchange parties). We include damage intensity as a control variable in our empirical analysis (Antia & Frazier 2001; Wang et al., 2013).

interfirm relationships (Cannon & Perreault, 1999). In general, the TCE-influenced contracting literature views contracts "as a once-and-for-all activity rather than as an evolving process requiring significant learning" (Argyres, Bercovitz, & Mayer, 2007:4). Although the literature recognizes that exchange partners cannot foresee all possible exchange contingencies when formulating a contract (Williamson, 1985), little attention has been given to how exchange partners can learn from unexpected circumstances and adjust contracts accordingly (Lumineau et al., 2011).

In contrast, contract learning scholars propose that as firms contract over time, unexpected circumstances arise, and contracting parties need to adjust contracts to enhance their coordination and safeguarding functions (Argyres et al., 2007; Mayer & Argyres, 2004). Mayer and Argyres (2004) argue that contracts themselves may serve as knowledge repositories, with solutions to issues encountered with prior contracts incorporated into subsequent ones, thus improving the performance of subsequent collaborations. Along similar lines, Kimel (2007) discusses that exchange parties do not view contracts "as a conclusive list of fixed rights and obligations, but rather as a starting point for renegotiation and adjustment when circumstances change or difficulties arise" (Kimel, 2007: 250). Kimel (2007) further argues that exchange parties in reality often do not insist on their contractual rights or easily resort to litigation, but rather exhibit "an ongoing willingness to make the necessary adjustments in order to continue to co-operate" (Kimel, 2007: 250).

Although the contract learning literature (e.g., Mayer & Argyres, 2004) acknowledges that contracts are knowledge repositories that undergo adjustments as unforeseen circumstances arise, it primarily focuses on the process of learning to contract (Vanneste and Puranam, 2010; Lumineau et al., 2011) rather than its relationship outcomes. As a result, there is limited evidence

of whether adjustments made to existing contracts indeed promote relationship continuity after exchange disruptions (Lumineau et al., 2011).

Building on the contract learning literature, the current study aims to address these under-researched issues in interfirm contracting research. Because contracts govern buyer-supplier relationships using formal rules and principles to define roles and responsibilities and specify procedures for monitoring the exchange process (Argyres et al., 2007; Schepker, Oh, Martynov, & Poppo, 2014), we define contract adjustments as changes made to formal rules and principles to clarify roles and responsibilities and monitor transactions in the aftermath of exchange disruptions. We view contract adjustments as reflective of learning gained as exchange parties work together (Mayer & Argyres, 2004; Poppo & Zhou, 2014) and propose that they are influenced by the level of detail in the original contract. Furthermore, we propose that contract adjustments can effectively renew interfirm relationships after exchange disruptions, although this renewal effect may be curvilinear and contingent on the interdependence structure of an interfirm relationship. The proposed conceptual model is presented in Figure 1.

[Insert Figure 1 here]

2.1 Ex ante contract detail and ex post contract adjustment

We examine whether *ex ante* contract detail affects *ex post* contract adjustment after exchange disruptions. We focus on the overall level of detail in a contract, rather than specific contractual clauses because the overall level of detail in a contract reflects a firm's knowledge base with respect to buyer-supplier contracting (Li, Poppo, & Zhou, 2010; Mayer & Argyres, 2004; Zhou, Zhang, Sheng, Xie, & Bao, 2014) and serve as a starting point for subsequent contract adjustments. The level of detail in a contract can range from a simple agreement outlining only the broad expectations for exchange behaviors to detailed specifications of buyers

and suppliers' responsibilities (Cannon & Perreault, 1999; Wuyts & Geyskens, 2005). Choosing the level of detail in a contract is among the first important strategic choices buyers must make when entering into a new purchasing arrangement (Cannon & Perreault, 1999).

One may argue that detailed contracts can reduce the need for contract adjustments as a detailed contract may outline a relatively complete contingency plan for coping with unexpected circumstances (Ariño & Reuer, 2004). In other words, the more detailed the contract is, the more effective it is at coping with exchange disruptions, thus requiring little change. While having a detailed contract can prevent disruptions more effectively than a less detailed one, we argue that a detailed contract does not offset the need for contract adjustment in the aftermath of the disruption. From a contract learning perspective, the very occurrence of a disruption serves as evidence of limitations in the original contract and indicates the need for more learning and adjustment (Gil, 2009; Mayer & Argyres, 2004; Vanneste & Puranam, 2010). Given bounded rationality, it is impossible for buyers and suppliers to foresee all future relevant contingencies when drafting the initial contract (Vanneste & Puranam, 2010). As a result, no matter how detailed a contract is, it unavoidably leaves out relevant detail (Williamson, 1985) and requires adjustments and improvements as disruptions actually occur (Mayer & Argyres, 2004).

Furthermore, contract learning scholars propose that firms tend to learn in knowledge domains related to their previous knowledge and experience (Nelson & Winter, 1982). Thus, buyers who rely on detailed contracts are more likely to adjust those contracts further when an exchange disruption occurs. The codified roles, responsibilities, and exchange procedures in detailed contracts represent the shared and prior knowledge related to operating policies and technologies (Li et al., 2010). The more detailed the contract is, the higher the operational knowledge and contractual experience the buyer may have. Because prior knowledge enhances

the buyer's ability to absorb and acquire new knowledge in related domains (Cohen & Levinthal, 1990; Lane, Koka, & Pathak, 2006), buyers employing detailed contracts are more likely to adjust such contracts to codify lessons learned from a disruption. For example, Eberl et al. (2015) report that Siemens established tight rules to prevent performance failures. When violation of rules actually occurred, Siemens responded with even tighter, more precisely defined rules to prevent misunderstanding and misbehavior. This case suggests that to document new learning after disruptions, firms who previously use detailed contracts are likely to make additional adjustments to the contract. Accordingly, we advance the following hypothesis:

H_1: The level of *ex ante* contract detail positively influences the level of *ex post* contract adjustment in the aftermath of an exchange disruption.

2.2. Ex post contract adjustment and relationship continuity

We further examine the effect of *ex post* contract adjustment on relationship continuity. Relationship continuity refers to exchange partners' intention to maintain a relationship after exchange disruptions (Jap & Anderson, 2003). Relationship continuity is used as the outcome variable because exchange partners' willingness to continue the relationship is the direct outcome of relationship recovery (Jap & Anderson, 2003) and essential to preserving the value-generating potential of the relationship (Malhotra & Lumineau, 2011). Relationship continuity is considered the most important indicator of relationship renewal after exchange disruptions (Amato & DeBoer, 2001).

Contract adjustment may not only be a means to codify new learning and guard against organizational forgetting (Zollo & Winter, 2002), but also may improve control and coordination of a focal relationship and foster relationship continuity (Eberl et al., 2015). Revised contractual clauses codify the collaborative parties' solutions to previously unexpected problems (Gil, 2009; Zollo & Winter, 2002). The codification of this new knowledge, learned from resolving

problems, can improve coordination by re-establishing a common base of knowledge between the contracting parties (Camerre & Knez, 1996; Mayer & Argyres, 2004; Vanneste & Puranam, 2010). The re-established knowledge base can effectively guard against opportunistic attempts because additional codification clears ambiguity in the original contract and provides renewed guidance for appropriate behaviors under varying situations. Hence, the revised contract enables the relationship to renew and progress based on lessons learned from the disruption (Mayer & Argyres, 2004; Poppo & Zhou, 2014; Selnes & Sallis, 2003). Empirically, Poppo and Zhou (2014) found that when change forces exchange partners to adjust an initial contract, a refined contract provides effective guidance for resolving conflicts and reconciling the relationship. Similarly, in an Accenture report, it is found that companies that update their supply chain contracts more often to accommodate changing business conditions are more competitive and sustainable (Accenture, 2006).

Meanwhile, a few recent studies also found a dark side to *ex post* contract adjustment, whereby excessive adjustment to contracts can become costly (Eberl et al., 2015; Luo, 2002), instill distrust in a buyer-supplier relationship (Puranam & Vanneste, 2009; Roehrich & Lewis, 2014), result in rigidity (Cannon & Perreault, 1999; Eberl et al., 2015), and ultimately destroy the relationship (Luo, 2002). In particular, excessively adjusting contracts and tightening rules provides a strong signal of distrust to the other party (Eberl et al., 2015; Jap & Ganesan, 2000). This distrust can backfire on the focal relationship by encouraging more opportunism from the other party in areas that are left unspecified within contracts (Ghoshal & Moran, 1996). Furthermore, overly strict contracts and rules can be rigid and dysfunctional as they prevent exchange partners from adapting to specific environmental changes and impede strategic flexibility in response to dynamic environments (Cannon & Perreault, 1999). Both distrust and

rigidity can negatively affect an exchange partner's confidence in the relationship and thus intention to stay committed to a relationship (Luo, 2002; Morgan & Hunt, 1994).

We thus propose an inverted-U-shaped relationship between contract adjustments and relationship continuity. The focal exchange relationship is renewed as firms codify new learning that specifies common understanding between the partners and reset expectations. Too many adjustments result in rigidity and distrust, which diminishes gains from a moderate level of contract adjustments. Too few adjustments, on the other hand, prevent the effective documentation of new learning required for refining guidelines for proper behaviors and responses to contingencies. In sum, a moderate level of contract adjustments is likely to lead to optimal level of relationship continuity. Accordingly, we hypothesize:

H_2: *Ex post* contract adjustment has an inverted-U-shaped relationship with relationship continuity, such that it has **(a)** a positive linear effect and **(b)** a negative quadratic effect on relationship continuity.

2.3. The moderating role of the interdependence structure

We further examine the relationship conditions that foster or constrain the relationship between contract adjustment and relationship continuity. Several studies on managing exchange disruptions have suggested that relative power and interdependence structure of a buyer-supplier relationship influences contract negotiation (Bode et al., 2011; Gaski, 1984; Lumineau & Malhotra, 2011). In the current study, interdependence structure is captured by both joint dependence and dependence asymmetry (Emerson, 1962; Gulati & Sytch, 2007). Emerson (1962) distinguishes between joint dependence in a dyad (the sum of exchange partners' total dependence on each other), and dependence asymmetry (the difference in exchange partners' dependence on each other). In his conceptualization, joint dependence and dependence asymmetry capture the cohesion and power advantage of a buyer-supplier relationship,

respectively (Emerson, 1962). Both aspects should be included to capture the interdependence structure in an interfirm relationship (Gulati & Sytch, 2007).

As the current study takes the perspective of the buyer who initiates contract adjustments as a response to supplier-related disruptions, we focus on buyer dependence advantage to capture the dependence asymmetry in the focal relationship. Buyers with a great power and dependence advantage determine the rules of collaboration (Schepker et al., 2014). Schepker et al. (2014) argue that with increased dependence advantage, the party with power is given broader decision making rights. Under this condition, contract adjustments by a powerful buyer are likely to motivate compliance from a dependent supplier (Mooi & Gilliland, 2013). Similarly, Bode et al. (2011) propose that a relatively dependent supplier is likely to comply with new requirements of buyers to restore relationship stability after exchange disruptions. Furthermore, the higher level of dependence also constrains a supplier's switching options (Heide & John, 1988). A buyer's contract adjustment is thus more likely to be accepted by the supplier as they are interested in resolving conflicts (Gulati & Sytch, 2007) and willing to fix problems revealed by exchange disruptions (Bode et al., 2011; Mooi & Gilliland, 2013). Increased supplier cooperation increases a buyer's confidence that short-term inequities will be corrected over time to yield a long-term benefit (Anderson & Weitz, 1989). Although there is risk associated with collaborating with a supplier who has created exchange disruptions, buyers with power advantage are likely to believe that supplier cooperation will last over time and thus regain commitment and confidence in the relationship. Therefore, we consider that the bright side of *ex post* contract adjustment in terms of improved control and coordination of the focal relationship is strengthened when a buyer has a dependence advantage over a supplier.

However, high buyer dependence advantage also can cause problems (Gu & Wang, 2011). When the buyer has a relative power advantage, though its ability to control and coordinate the exchange relationship is enhanced, conflict between partners is likely to grow. In an asymmetric relationship, firms tend to look out more for their individual gains than for joint gains (Jap, 2001). The more dependent supplier will perceive the buyer's excessive contract adjustments after a disruption as an attempt secure the buyer's interests at the expense of the supplier's. Because of the perceived distrust, the supplier may reciprocate with noncompliance such as selectively disclosing information (Gilliland, Bello, & Gundlach, 2010) even after contract adjustments are made. Therefore, the dark side of contract adjustments as reflected in its negative quadratic effect on relationship continuity, will be aggravated when the relationship is imbalanced and favors the powerful buyer. In sum, we propose:

H_3: Buyer dependence advantage moderates the effects of *ex post* contract adjustment on relationship continuity such that it **(a)** strengthens the positive linear effect and **(b)** aggravates the negative quadratic effect of *ex post* contract adjustment.

On the other hand, joint dependence indicates cohesion (Emerson, 1962) and a strong relational orientation in a buyer-supplier relationship (Zaheer & Venkatraman, 1995). Maintaining the relationship after exchange disruptions is a high priority in mutually dependent relationships (Scholten and Schilder, 2015). Accordingly, exchange partners are strongly motivated to learn from exchange disruptions and cooperate with each other to re-establish the normal function of the relationship (Hibbard et al., 2001; Lumineau and Henderson, 2012). Such cooperative motivation complements the use of contract adjustments to document new learning from exchange disruptions (Rindfleisch and Moorman, 2003). Furthermore, collaborative communication and information sharing process established in a highly interdependent relationship can enhance the coordination and control function of contractual governance

(Lumineau and Henderson, 2012), which further strengthens the benefits accruing from contract adjustment.

Although overly adjusting an existing contract can signal distrust and result in rigidity that decrease returns to contract adjustments, such a negative quadratic effect is alleviated when the buyer and supplier are highly dependent on each other for the following reasons. First, high interdependence fosters incentive alignment and cooperative orientation between exchange partners (Wieland and Walenburg, 2013). Exchange partners with a high level of joint dependence tend to adopt a positive interpretation of each other's intentions (Gu and Wang, 2011). Suppliers in highly interdependent relationships are likely to view even a high level of buyer contract adjustments as means to document new learning from disruptions rather than a signal of distrust. Thus, they are more motivated to collaborate with buyers on revised terms to prevent future occurrences of such incidents (Mayer and Argyres, 2004).

Second, highly interdependent relationships are typically characterized by dedicated relationship-specific investments and collaborative communication (Scholten and Schilder, 2015). Such collaborative processes are essential for increasing flexibility of supply chains in response to disruptions (Sheffi and Rice, 2005), and subsequently reduces the rigidity that may be brought to the relationship by extensive contract adjustments (Scholten and Schilder, 2015). Using 16 in-depth case interviews, Scholten and Schilder (2015) find that mutual dependence between buyers and suppliers in food processing industries increases their willingness to share information, learning and dedicated investment, which increase supply chain flexibility and resilience to disruptions. As such, the cooperative motivation and process embedded in a highly interdependent relationship can mitigate the distrust and rigidity introduced by extensive contract adjustments and alleviates the dark side of contract adjustments. We thus propose:

H_4: Joint dependence advantage moderates the effects of *ex post* contract adjustment on relationship continuity such that it **(a)** strengthens the positive linear effect and **(b)** alleviates the negative quadratic effect of *ex post* contract adjustment.

3. Methods

Testing the conceptual model requires asking key informants to identify an exchange disruption and question them about the resolution process of managing the exchange disruption and about relationship outcomes after the resolution. We follow previous studies on managing exchange disruptions (Bode et al., 2011; Hibbard et al., 2001; Wang et al., 2014) in adopting a key informant approach. In particular, we interview two key informants from each buying firm (a senior purchasing manager and a senior manager). The use of two informants allows us to reduce potential common method bias and collect data from the informants who are most knowledgeable about managing exchange disruptions (i.e. the senior purchasing manager) and relationship outcomes after the resolution (i.e. the senior manager).

3.1. Sample and data collection

We examined buyer-supplier relationships by collecting data from manufacturing firms in China. China is a world manufacturing power, but there are concerns regarding delivery delays, misunderstandings of obligations, and other kinds of exchange disruptions (Fredendall, Letmathe, & Uebe-Emden, 2016). Thus, it provides an ideal setting for our study of exchange disruptions. We selected a random sample of 1000 buyer firms from the China Statistics Bureau with four-digit Chinese Industrial Classification (CIC) codes 1311–4290. A wide range of industries were represented in the sample, such as machinery, equipment, electronic components, chemicals, metal manufacturing, food, and plastics.

Data were collected through face-to-face interviews. Ten interviewers received ten or more hours of training to ensure the consistency of the interview protocol. To encourage participation, interviewees were advised of the academic nature of the study and the confidentiality of

responses. They were offered a summary report as an incentive. Each of the 1000 firms in our sample was first contacted by telephone to solicit cooperation, confirm their location, and identify key informants. Through these initial telephone contacts, we received agreements from 476 firms to participate. Of the 476 qualified firms, we successfully interviewed 308 firms, with the remainder either rejecting our invitations or on business trips when the actual interview took place. We discarded thirty-six responses where the respondents had either limited knowledge about exchange disruptions or were unable to answer key interview questions. This resulted in an effective response rate of 27.2% (272/1000). Consistent with the samples used in previous studies on managing exchange disruptions (e.g., Bode & Wagner, 2015; Wang et al., 2014), each case in our sample concerned a specific exchange disruption in a buyer-supplier relationship where the relationship outcome post-resolution were known.

All interviewers were required to collect business cards from the respondents when they conducted the field work. We randomly called 20% of the interview respondents from each interviewer to ensure the interviewer followed the interview procedure and verified that the informant's demographic data were consistent with the data reported in the questionnaires.

Based on our review of studies on managing exchange disruptions (e.g., Bode et al., 2011; Hibbard et al., 2001; Wang et al., 2014) and field interviews, we generated a list of potential supplier-related disruptions such as quality, product specifications, delivery, quantity, price, technical support, after-sales service, intellectual property rights, and technology sharing. Respondents were also given the option of describing any exchange disruptions that was not in the list. Two key informants were interviewed from each buyer firm, a senior purchasing manager and a senior manager (e.g., President, Vice President, General Manger, Chief Operating Officer, etc.). We choose senior purchasing managers because they are knowledgeable about the

process of resolving exchange disruptions (Wang et al., 2014) and are familiar with their firms' practices of managing buyer-supplier relationships in general (Bode et al., 2011). The senior purchasing managers were asked to identify incidents from the list of exchange disruptions that occurred in a focal buyer-supplier relationship. When multiple incidents were identified, we asked the informant to answer questions regarding the most recent incident. The senior purchasing manager then answered questions regarding contract details in the buyer-supplier relationship and contract adjustments made after the exchange disruption.

After data were collected from the senior purchasing manager, the second informant (senior manager in buyer firm) was presented with the name of the supplier and exchange disruptions identified by the senior purchasing manager and independently evaluated the relationship outcome after the resolution of the incident. We confirmed with each senior manager that he or she was knowledgeable about the exchange disruption identified by the senior purchasing manager and the subsequent relationship outcome after the resolution.

The data represented a heterogeneous sample including a wide range of firm sizes and industries and showed no evidence of systematic bias. The responding firms' size in terms of number of employees varied from less than 40 to over 12,000 and in annual sales from US$192,400 to US$67.7 million. The largest industry segment was the high-tech industry (24.4%), with other industries including apparel, furniture, food, and so on. On average, the respondents were 38.8 years old and had been working with their companies for 6.2 years. We checked for the possibility of non-response bias by comparing key firm characteristics such as the number of employees, firm ownership, and the industry of responding and non-responding firms. The MANOVA results indicated no statistically significant differences between respondents and non-respondents on any of the firm characteristics compared.

3.2. Measures

We first developed an initial pool of survey questions on the basis of a literature review and interviews with senior managers in manufacturing firms. The questionnaire was developed in English, translated into Chinese, and then back-translated into English independently by two bilingual translators to ensure conceptual equivalence. We conducted in-depth interviews with ten senior purchasing managers to evaluate face validity and then conducted a pilot study with twenty-five buyer firms to refine the wording of survey items. The items used in the study are measured with 7-point Likert scales (1 = strongly disagree, 7 = strongly agree), unless specified otherwise. We operationalized all the latent constructs using reflective measures because these latent constructs exist independent of the observed indicators (Coltman et al., 2008; Jarvis et al., 2003). The appendix presents measurement items, their factor loadings, reliability, and validity assessments.

Contract. We asked the respondents to report the level of contract details before a supplier-related disruption and the level of contract adjustment after the disruption. The measure of *ex ante* contract detail was adopted from Zhou and Xu (2012). The three items measure the extent to which detailed contractual agreements are used in a buyer-supplier relationship before the disruption. The measures of *ex post* contract adjustment were developed based on ideas presented in Vlaar et al. (2007). The four items capture the extent to which a buyer refines procedures, further develops formal principles, and clarifies roles and responsibilities specified in a contract after the disruption.

Dependence. The measurements of buyer and supplier dependence were adapted from Jap and Ganesan (2000); both contain three items. Following Gulati and Sytch (2007), we constructed the joint dependence variable by adding the scores of the buyer's and supplier's

dependence. Also consistent with Gulati and Sytch (2007), we measured buyer dependence advantage by calculating the difference between the supplier's and the buyer's dependence (D_S-D_B). Buyer dependence advantage equals to the difference D_S-D_B when $D_S \geq D_B$ (a supplier is more dependent on a buyer), indicating a buyer's degree of dependence advantage. When $D_S < D_B$ (a buyer is more dependent on a supplier), the buyer dependent advantage variable is set to be zero, indicating the situation of supplier dependence advantage.

Relationship continuity. For the outcome measure relationship continuity, we developed the measures based on ideas presented in Geyskens et al. (1996) and Kumar et al. (1995). The three items capture exchange partners' intention to continue the exchange relationship after exchange disruptions (Cronbach's $\alpha = .926$).

Control variables. We included a set of six control variables that are commonly used to control for their influence on buyer-supplier relationships: (1) the degree of damage created by the disruption, as intensity of damage can influence inter-firm relationships (Hibbard et al., 2001); (2) transaction frequency, measured by how often the buyer purchases from the supplier; (3) supplier product importance, measured by a three-item scale adopted from Cannon and Perreault (1999); (4) buyer firm size, included in the study as the logarithm of the number of buyer firm's employees to measure buyer firm size to counter skewness; (5) relationship length, measured by the number of years a supplier has been working with a buyer, and (6) industry type, coded as a dummy variable (0 for high-tech industry (e.g., computer, electronics) and 1 for all other industries).

3.3. Common method bias

Following previous study (Poppo & Zhou, 2014), we adopted a multiple informant approach to mitigate potential common method bias CMB (Podsakoff, MacKenzie, Jeong-Yeon,

& Podsakoff, 2003). Specifically, two informants from each responding firm in our sample are interviewed regarding the predictor and criterion variables. The first informant (senior purchasing manager) identifies an incident of exchange disruption and answers questions regarding contract detail and contract adjustments. The second informant (senior manager) evaluates relationship continuity after contract adjustments for the buyer-supplier relationship identified by the first informant. Using two different informants to answer questions regarding predictor and criterion variables reduces the chance that the mindset of the source will bias the observed relationship between predictor and criterion variables (Podsakoff et al., 2003) and thus mitigates the concern of common method bias. Moreover, as a number of our research hypotheses focus on non-linear and moderated relationships, common method bias is less of a concern. This is because it is implausible that respondents would consciously theorize the complicated relationships as proposed in our model (Aiken & West, 1991; Kotabe, Martin, & Domoto, 2003).

Statistically, we used two approaches to examine the influence of potential common method bias. First, we used Harmon's one factor test on all items. Five distinct factors were extracted accounting for 82.3 percent of the total variance, with the first factor explaining 23.3 percent, failing to identify a substantial amount of common method variance (Podsakoff & Organ, 1986). Second, we applied Lindell and Whitney's (2001) method variance (MV) marker approach. We identified a variable that is unrelated to at least one key construct to use as a proxy for common method variance (Lindell & Whitney, 2001) and adjusted the construct correlations and statistical significance by the lowest positive correlation (r = .017) between the MV marker and other variables. All significant correlations remained significant after the partial correlation

adjustment (See Table 1), suggesting that common method bias was not a serious concern (Lindell & Whitney, 2001).

[Insert Table 1 Here]

4. Analysis and results

4.1. Measurement model

To test our hypothesis, we first used confirmatory factor analysis to establish the validity of the latent constructs. We then assessed the structural model. The measurement model fits the data satisfactorily ($\xi^2_{(135)}$ =284.115, p < .001; GFI =0.904; NFI =0.946; CFI =0.970; IFI =0.971; RMSEA = 0.064). All factor loadings are highly significant ($p < .001$), and the composite reliability of all constructs are greater than the 0.7 cutoff. Average variances extracted (AVE) are greater than 0.5, demonstrating convergent validity and reliability (Fornell & Larcker, 1981). To examine discriminant validity, we calculated the shared variance between each pair of constructs to determine if they are smaller than the AVE for the individual constructs. The results show that the AVE for each construct is higher than its highest shared variance with the other constructs, providing evidence for discriminant validity (See Table 2) (Fornell & Larcker, 1981).

4.2. Structural model

We use hierarchical moderated regression analyses to test our hypotheses because our structural model contains interaction terms and curvilinear effects (Jaccard et al., 1990; Bello et al., 2010). For each latent construct, we create a composite score with unit weighting (Bobko et al. 2007; Henseler 2012) by calculating the average of measurement items. Unit weights are commonly adopted in empirical B2B studies (e.g., Heide et al. 2007; Jap and Ganesan 2000; Sheng et al. 2011; Poppo et al. 2016) because it has substantial predictive validity when

compared with weights from a factor analysis, particularly in instances where a theoretical rationale for choosing a weight for each measurement item is lacking (Bobko et al. 2007).

Main effects. H_1 posits that *ex ante* contract detail will positively lead to *ex post* contract adjustment. We found that there is a positive relationship between contract detail and contract adjustment (γ = .535, p < .01), providing support for H_1. As Table 2 shows, Model 1 where we only include control variables explains 22.3% of variance in contract adjustment. Adding the variable contract detail in Model 2 increases R-square values by 0.232 (p <.01) to 45.5%, suggesting the strong explanatory power of our model.

[Insert Table 2 Here]

H_{2a} and H_{2b} posit an inverted-U-shaped relationship between contract adjustment and relationship continuity, and H_3 and H_4 propose that this relationship is moderated by the interdependence structure of a buyer-supplier relationship. Because interdependence structure may influence contract adjustment, contract adjustment is endogenous and the coefficients of interaction terms between interdependence structure and contract adjustments using OLS would be inflated. To correct for the endogeneity we used two-stage least square regressions (2SLS) following the recommendation of Hamilton and Nickerson (2003).

In stage one, we regressed contract adjustment on buyer dependence advantage and joint dependence to obtain residuals free of the influence of the moderators. The results of the stage-one estimate show that contract adjustment is positively related to joint dependence (γ = .410, p<0.01) but not to buyer dependence advantage (γ = -.088, n.s.). These results confirm the impacts of interfirm interdependence structure on contract adjustment and indicate that it is suitable to use the two-stage model to correct for potential endogeneity among the predictors.

In stage two, we used the residual as an indicator of contract adjustment, which represents the portion of contract adjustment that was not accounted for by the interdependence structures. We then added interaction terms between the residual of contract adjustment and interdependence structure and tested the contingency effects. To interpret the results, we mean-centered each moderating variable (Aiken & West, 1991). Across all models, the highest variance inflation factor was 2.77, substantially less than the cut-off point of 10 (Neter, Wasserman, & Kutner, 1990), suggesting that multi-collinearity is not a serious concern. In Table 3, we report the results of the second-stage models.

[Insert Table 3 Here]

The full model as shown in Model 3 of Table 3 accounts for 53.2% of the variance in relationship continuity, again suggesting the explanatory power of the model. We found that contract adjustment has a significant and positive effect on the buyer-supplier relationship continuity after the exchange disruption ($\Omega = .220$, $p < .01$). Moreover, the coefficient for the square term of contract adjustment is negative and significant ($\Omega = -.138$, $p < .05$). Therefore, both H_{2a} and H_{2b} are supported. To help interpret this curvilinear relationship, we use the unstandardized parameter estimates to depict the effects in Figure 2. The figure shows that contract adjustment indeed helps improve relationship continuity after a disruption occurs; however, this benefit comes at a decreasing rate when there is too much adjustment.

[Insert Figure 2 Here]

Moderating effect of interdependence structure. We expect that buyer dependence advantage will enhance the positive effect of contract adjustment (first-order interaction) and aggravate its negative effect after an optimal point (second-order interaction) on relationship continuity (H_3). Consistently, Model 3 in Table 3 shows that the interaction between contract

adjustment and buyer dependence advantage is positive and significant (γ = .132, p < .01). Indeed, when the buyer has a strong dependence advantage against the supplier, contract adjustment has a greater effect (γ = .407, p < .01) on relationship continuity as compared to when the buyer only has a weak dependence advantage (γ = .157, p > .05). H_{3a} is thus supported. Moreover, in line with H_{3b}, the second-order interaction between the square term of contract adjustment and buyer dependence advantage is negative and significant (γ = -.148, p < .05), suggesting that overly adjusting a contract after an exchange disruption can backfire more when the buyer has a strong advantage against the supplier. We depict the effect in Figure 3. Altogether, our results demonstrate that buyer dependence advantage both strengthens the positive effect of adjusting contracts on relationship continuity and aggravates the dark side of overly high levels of contract adjustment when restoring the relationship after a disruption.

[Insert Figure 3 Here]

In H_4, we assess the moderating role of joint dependence. We expect that joint dependence will enhance the positive effect of contract adjustment (first-order interaction) and also alleviate its negative effect after an optimal point (second-order interaction) on relationship continuity. As Model 3 in Table 3 shows, the first-order interaction between contract adjustment and joint dependence positively (γ = .227, p < .01) affects relationship continuity. A slope analysis shows that when joint dependence is high, contract adjustment has a stronger positive effect on relationship continuity (γ =.510, p < .01), than when joint dependence is low (γ = .054, p > .05), in support of H_{4a}. Moreover, the interaction between the square term of contract adjustment and joint dependence is also positive (γ = .351, p < .01), indicating that when both the buyer and supplier are strongly dependent on the relationship, the harm of overly adjusting contracts after a disruption is alleviated, in support of H_{4b}. We depict the effect in Figure 4. Under the condition

of high joint dependence, the shape of the effect of contract adjustment becomes J-shaped, suggesting that its overall effect on relationship continuity is positive. Yet, under the condition of low joint dependence, the optimal level of contract adjustment is only moderate. In all, the beneficial role of joint dependence as posited in H_4 is supported.

[Insert Figure 4 Here]

Control variables. Among the control variables, we found that product importance positively influences contract adjustment (β=.365, p <.01), and relationship length positively influences relationship continuity (β=.182, p <.01), consistent with the findings of Poppo et al. (2008). We also find that damage intensity negatively influences relationship continuity (β =-.242, p <.01). As expected, the more severe the damage, the harder it is to renew the exchange relationship.

5. Discussion

The role of contracts in mitigating exchange disruptions has been widely studied. However, the majority of previous studies on contracts have focused on how contracts can prevent exchange disruptions *ex ante* rather than how they can cope with exchange disruptions *ex post* (Cannon & Perreault, 1999; Cao & Lumineau, 2015; Cavusgil, Deligonul, & Chun, 2004). It remains unclear how contracts, a mechanism that sets the fundamental rules and expectations for collaborations, can be adjusted to renew interfirm relationships after exchange disruptions. The current study extends the extant literature on mitigating the dark side of interfirm relationships by offering a detailed analysis of the function of contracts after exchange disruptions.

5.1. Theoretical implications

TCE-influenced interfirm contracting research views contracts as a static mechanism constrained by bounded rationality of exchange partners (e.g., Lumineau & Henderson, 2012).

Our findings extend this stream of research by showing that contracts undergo adjustments and evolve as unexpected circumstances surface. Specifically, buyers that have invested in drafting a detailed contract are more likely to modify such contracts to codify learning after exchange disruptions. The result provides empirical evidence for the contract learning literature (Cohen & Levinthal, 1990; Lane et al., 2006; Mayer & Argyres, 2004) that exchange partners tend to acquire new knowledge in domains related to their previous expertise. More importantly, this finding extends previous studies on mitigating exchange disruptions (e.g., Hendricks & Singhal, 2005) by showing that *ex ante* contract detail and *ex post* contract adjustments are interrelated strategies for coping with exchange disruptions and should not be treated separately.

Furthermore, our study extends the contract learning literature by showing that contract adjustment has an inverted-U-shaped relationship with relationship continuity rather than a linear positive or negative relationship (Eberl et al., 2015; Luo, 2002; Poppo & Zhou, 2014). The findings extend the contract learning literature that are primarily theoretical (Argyres et al., 2007; Mayer & Argyres, 2004; Vanneste & Puranam, 2010) by empirically testing the outcome of contract adjustments after exchange disruptions. Our findings not only support the benefits of learning to contract, but also demonstrate the danger of over-learning using contracts. If exchange partners overly codify lessons learned from exchange disruptions in contracts, they can signal distrust and introduce rigidity, which can hurt a partnership's cooperative atmosphere and reduce the likelihood of continuing the relationship after an exchange disruption.

Moreover, we advance studies that examine the role of interdependence structure at managing interfirm relationships after an exchange disruption. In particular, we propose and provide empirical evidence that the efficacy of using contract adjustment to address an exchange disruption is contingent on the interdependence structure of the dyad. Recent work calls for

identifying relationship conditions that make contract negotiation beneficial (Bode et al., 2011; Lumineau & Malhotra, 2011). Researchers suggest that the relative power of exchange partners will influence the relationship between a firm's use of contract and relationship outcomes (White, Joplin, & Salama, 2007). Our study found that interdependence structure may not directly affect relationship continuity; instead, it significantly moderates the capacity of contract adjustments in renewing the relationship. On one hand, a buyer's advantageous position over its supplier allows for better control and coordination of the relationship. Thus, it makes the positive effect of contract adjustment stronger and moves the optimal level of contract adjustment for relationship continuity to a higher level. On the other hand, a high level of buyer advantage also implies potential for conflict and distrust (Anderson & Weitz, 1989; Handfield & Bechtel, 2002), which explains a stronger negative effect of contract adjustment after it exceeds the optimal point. In this way, our study explores and demonstrates the nuanced role of dependence advantage in influencing the effectiveness of *ex post* contract adjustment.

Interestingly, we find that increased joint dependence between the buyer and seller enhances the positive effect of contract adjustment on relationship continuity regardless of the level of contract adjustment. This finding lends support to the studies examining the dark side of contract adjustments (Luo, 2002; Puranam & Vanneste, 2009; Eberl et al., 2015) by identifying the relationship context in which contract adjustments show their dark side. That is, in buyer-supplier relationships with low joint dependence, a high degree of contract adjustments indeed produces low returns. However, the finding further extends these studies by showing that in highly interdependent buyer-supplier relationships, the cooperative motivation and process embedded in such relationships can offset the potential distrust and rigidity introduced by extensive contract adjustments and diminish their dark side. Our results show that under high

joint dependence, the relationship between contract adjustment and relationship continuity is no longer inverted-U-shaped, but J-shaped.

Furthermore, our finding extend Eberl et al. (2015) who find that formal rules have both bright side of promoting cooperation when viewed as a tool to avoid ambiguity and dark side of undermining cooperation when viewed as an instrument to sanction and monitor. We delineate the relationship condition that makes the different effects of formal rules on cooperation salient. That is, highly interdependent relationship structures highlight the bright side of formal rules at learning and avoiding ambiguity, which promotes cooperation. In contrast, in relationships with low interdependence, overly relying on formal rules is likely to be viewed as a signal of a partner's tendency to sanction and monitor, which triggers distrust and hurts cooperation. Moreover, our findings add to Eberl et al. (2015)'s study by showing that regardless of the type of relationships, a moderate amount of adjustments in formal rules are likely to highlight its cooperation-promoting effect rather than its potential to undermine cooperation.

5.2. Managerial implications

Practically, supply chain managers should not only learn and codify technical knowledge from the collaboration process, but also codify lessons learned from exchange disruptions. Exchange disruptions are unavoidable in B2B relationships. It is reported that about 75% of organizations experience an exchange disruption every year (BCI, 2015), and a survey by the World Economic Forum revealed that more than 80% of organizations are interested in building the resilience of their supply chain relationships to exchange disruptions.

Given these facts, we recommend that supply chain managers compare the benefits and costs of continuing the relationship versus terminating it after experiencing exchange disruptions. If a decision is made to continue the relationship, managers should consider adjusting the formal

rules, policies, and principles outlined in their contractual relationships to accommodate new learning gained from exchange disruptions. Some successful examples of contract adjustments can be seen in the collaboration between Softstar and HW Inc. (Mayer & Argyres, 2004) and between British Airport Authority and its first-tier suppliers of infrastructure projects (Gil, 2009). In both cases, contracts were adjusted over time as the two parties gained experience working together, and the contract adjustment led to improved collaboration.

Meanwhile, supply chain managers should be cautioned against adjusting contracts excessively as they may damage trust and restrict strategic flexibility within the relationship. Extensive contract adjustments are especially harmful when a firm has a power advantage over its exchange partner as it aggravates the competitive atmosphere of the relationship. In such relationships, a moderate level of contract adjustments is a wise choice as it maximizes the chance of renewing the relationship after an exchange disruption.

Furthermore, when relying on contract adjustments to cope with exchange disruptions, supply chain managers should evaluate the interdependence level of the relationship. If interdependence is high in a relationship, supply chain managers can freely adjust contracts without incurring much of the potential downside of such adjustments. Exchange partners in mutually dependent relationships are motivated to learn and maintain cooperation, which enhances the functioning of contract adjustments at documenting learning and avoiding ambiguity. However, if interdependence is low in a relationship, supply chain managers should engage in a moderate level of contract adjustments as a high level of adjustment can precipitate relationship termination.

Moreover, we recommend managers be aware that a highly interdependent buyer-supplier relationship can increase supply chain resilience to disruptions. Although interdependence has

been discussed to increase a supply chain's vulnerability to disruptions (Fiskel et al., 2015), our findings show that a highly interdependent relationship is also able to recover from disruptions by allowing supply chain partners to freely adjust the rules and terms of collaboration to accommodate uncertainties and changes. Supply chain collaborations can thus benefit not only from the dedicated assets in mutually dependent relationships, but also from resilience to disruptions built in mutually dependent relationships.

5.3. Limitations and direction for future research

The findings should be interpreted in light of the following limitations. First, while the majority of studies on contract governance use cross-sectional studies (Cao & Lumineau, 2015), the cross-sectional nature of data collection prevents us from making strong causal claims for the hypothesized paths. Future research may consider collecting longitudinal data or conducting in-depth case interviews to better understand the detail of contract evolution in interfirm relationships. Second, we collect data from two key informants from buyer firms to minimize common method bias. While it is difficult to obtain objective performance data, it is worthwhile for future studies to consider collecting objective supplier performance data from either a buyer or supplier firm to cross-validate the findings of the current study. Third, the data are collected from the largest emerging market, China, a world manufacturing power with increasing concerns regarding quality defects, violations of intellectual property rights, and other exchange disruptions (Fredendall et al., 2016). While China provides an appropriate research setting for our study, future research may corroborate our findings in mature markets and developed economies.

6. Conclusions

Building on contract learning literature, the current study examines whether contracts go through adjustments as exchange partners learn from exchange disruptions and the outcome of such adjustments. Using data collected from two types of senior managers at each of 272 buyer firms (544 senior managers) in China, we find that *ex ante* contract detail fosters *ex post* contract adjustments. Contract adjustments subsequently has an inverted-U-shaped relationship with relationship continuity after exchange disruptions. That is, a moderate amount of contract adjustments is likely to result in the optimal return, whereas too high or too low levels of adjustments may be inadequate at promoting relationship continuity after exchange disruptions. Furthermore, we find the inverted U-shaped relationship between contract adjustments and relationship continuity is moderated by the interdependence structure of a buyer-supplier relationship. Dependence asymmetry can strengthen the positive effect of contract adjustments yet aggravate the negative effect of extensive contract adjustments on relationship continuity, while joint dependence can offset the negative effect of extensive contract adjustments. We find that in a buyer-supplier relationship with high joint dependence, extensive contract adjustments remain to be beneficial for relationship continuity after exchange disruptions.

References

Accenture. (2006). Keeping ahead of supply chain risk and uncertainty.

Aiken, L. S., & West, S. G. (1991). *Multiple Regression: Testing and Interpreting Interactions*: Newbury Park, CA;Sage Publications.

Amato, P. R., & DeBoer, D. D. (2001). The transmission of marital instability across generations: Relationship skills or commitment to marriage? *Journal of Marriage & Family, 63*(4), 1038.

Anderson, E., & Jap, S. D. (2005). The dark side of close relationships. *MIT Sloan Management Review, 46*(3), 75-82.

Anderson, E., & Weitz, B. (1989). Determinants of continuity in conventional industrial channel dyads.. *Marketing Science, 8*(4), 310-323.

Antia, K. D., & Frazier, G. L. (2001). The severity of contract enforcement in interfirm channel relationships.. *Journal of Marketing, 65*(4), 67-81.

Argyres, N. S., Bercovitz, J., & Mayer, K. J. (2007). Complementarity and evolution of contractual provisions: An empirical study of IT services contracts. *Organization Science, 18*(1), 3-19.

Ariño, A., & Reuer, J. J. (2004). Designing and renegotiating strategic alliance contracts. *Academy of Management Executive, 18*(3), 37-48.

Business Continuity Institute (2015). Supply chain resilience report 2015. 7th Annual Survey, available at: http://www.bcifiles.com/bci-supply-chain-resilience-2015.pdf.

Bode, C., & Wagner, S. M. (2015). Structural drivers of upstream supply chain complexity and the frequency of supply chain disruptions. *Journal of Operations Management, 36*, 215-228.

Bode, C., Wagner, S. M., Petersen, K. J., & Ellram, L. M. (2011). Understanding responses to supply chain disruption: Insights from information processing and resource dependence perspectives. *Academy of Management Journal, 54*(4), 833-856.

Camerre, C., & Knez, M. (1996). Coordination, organizational boundaries and fads in business practices. [Article]. *Industrial & Corporate Change, 5*(1), 89-112.

Cannon, J. P., & Perreault, W. D., Jr. (1999). Buyer-seller relationships in business markets. *Journal of Marketing Research, 36*(4), 439-460.

Cao, Z., & Lumineau, F. (2015). Revisiting the interplay between contractual and relational governance: A qualitative and meta-analytic investigation. *Journal of Operations Management, 33–34*(0), 15-42.

Casciaro, T., & Piskorski, M. J. (2005). Power imbalance, mutual dependence, and constraint absorption: A closer look at resource dependence theory. *Administrative Science Quarterly, 50*(2), 167-199.

Cavusgil, S. T., Deligonul, S., & Chun, Z. (2004). Curbing foreign distributor opportunism: An examination of trust, contracts, and the legal environment in international channel relationships.. *Journal of International Marketing, 12*(2), 7-27.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly, 35*(1), 128-152.

Craighead, C.W., Blackhurst, J., Rungtusanatham, M.J., & Handfield, R.B. (2007).The severity of supply chain disruptions: design characteristics and mitigation capabilities. *Decision Science, 38(1),*131–156.

Cruz Machado,V.,Durate,S.,2010.Tradeoffsamongparadigmsinsupplychain

Eberl, P., Geiger, D., & Aßländer, M. S. (2015). Repairing trust in an organization after integrity violations: The ambivalence of organizational rule adjustments. *Organization Studies, 36*(9), 1205-1235.

Emerson, R. M. (1962). Power-dependence relations. *American Sociological Review, 27*(1), 31-41.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50.

Fiksel, J., Polyviou, M., Croxton, K.L., & Pettit, T.J. (2015). From risk to resilience: learning to deal with disruption, *MIT Sloan Management Review, 56(2),* 79-86.

Fredendall, L. D., Letmathe, P., & Uebe-Emden, N. (2016). Supply chain management practices and intellectual property protection in China: Perceptions of Mittelstand managers. *International Journal of Operations & Production Management, 36*(2), 135-163.

Gaski, J. F. (1984). The theory of power and conflict in channels of distribution. *Journal of Marketing, 48*(3), 9-29.

Geyskens, I., Steenkamp, J.-B. E. M., Scheer, L. K., & Kumar, N. (1996). The effects of trust and interdependence on relationship commitment: A trans-Atlantic study. *International Journal of Research in Marketing, 13*(4), 303-317.

Ghoshal, S., & Moran, P. (1996). Bad for practice: A critique of the transaction cost theory. *The Academy of Management Review, 21*(1), 13-47.

Gil, N. (2009). Developing cooperative project client-supplier relationships: How much to expect from relational contracts?. *California Management Review, 51*(2), 144-169.

Gilliland, D. I., Bello, D. C., & Gundlach, G. T. (2010). Control-based channel governance and relative dependence. *Journal of the Academy of Marketing Science, 38*(4), 441-455.

Gu, F. F., & Wang, D. T. (2011). The role of program fairness in asymmetrical channel relationships.. *Industrial Marketing Management, 40*(8), 1368-1376.

Gulati, R., & Sytch, M. (2007). Dependence asymmetry and joint dependence in interorganizational relationships: Effects of embeddedness on a manufacturer's performance in procurement relationships. *Administrative Science Quarterly, 52*(1), 32-69.

Hamilton, B. H., & Nickerson, J. A. (2003). Correcting for endogeneity in strategic management research. *Strategic Organization, 1*(1), 51-78.

Handfield, R. B., & Bechtel, C. (2002). The role of trust and relationship structure in improving supply chain responsiveness. *Industrial Marketing Management, 31*(4), 367–382.

Heide, J. B., & John, G. (1988). The role of dependence balancing in safeguarding transaction-specific assets in conventional channels. *Journal of Marketing, 52*(1), 20-35.

Hendricks, K. B., & Singhal, V. R. (2005). An empirical analysis of the effect of supply chain disruptions on long-run stock price performance and equity risk of the firm.. *Production & Operations Management, 14*(1), 35-52.

Hibbard, J. D., Kumar, N., & Stern, L. W. (2001). Examining the impact of destructive acts in marketing channel relationships.. *Journal of Marketing Research, 38*(1), 45-61.

Inkpen, A. C., & Currall, S. C. (2004). The coevolution of trust, control, and learning in joint ventures. *Organization Science, 15*(5), 586-599.

Jaccard, J., Turrisi, R., & Wan, C.K. (1990). Interaction Effects in Multiple Regression. Sage Publications, Newbury Park, CA.

Jap, S. D. (2001). Perspectives on joint competitive advantages in buyer–supplier relationships. *International Journal of Research in Marketing, 18*(1–2), 19-35.

Jap, S. D., & Anderson, E. (2003). Safeguarding interorganizational performance and continuity under ex post opportunism. *Management Science, 49*(12), 1684-1701.

Jap, S. D., & Ganesan, S. (2000). Control mechanisms and the relationship life cycle: Implications for safeguarding specific investments and developing commitment. *Journal of Marketing Research, 37*(2), 227-245.

Jiang, B. (2009). The effects of interorganizational governance on supplier's compliance with SCC: An empirical examination of compliant and non-compliant suppliers. *Journal of Operations Management, 27*(4), 267-280.

Johnson, J. S., & Sohi, R. S. (2016). Understanding and resolving major contractual breaches in buyer-seller relationships: A grounded theory approach. *Journal of Academy of Marketing Science, 44*(2), 185-205.

Kamalahmadi, M., & Parast, M.M. (2016). A review of the literature on the principles of enterprise and supply chain resilience: Major findings and directions for future research. *International Journal of Production Economics*, *171(1),* 116-133.

Kimel, D. (2007). The choice of paradigm for theory of contract: Reflections on the relational model. *Oxford Journal of Legal Studies, 27*(2), 233-255.

Kotabe, M., Martin, X., & Domoto, H. (2003). Gaining from vertical partnerships: Knowledge transfer, relationship duration, and supplier performance improvement in the U.S. and Japanese automotive industries. *Strategic Management Journal, 24*(4), 293-316.

Kumar, N., Scheer, L. K., & Steenkamp, J.-B. E. M. (1995). The effects of perceived interdependence on dealer attitudes. *Journal of Marketing Research, 32*(3), 348-356.

Lane, P. J., Koka, B. R., & Pathak, S. (2006). The reification of absorptive capacity: A critical review and rejuvenation of the construct. *The Academy of Management Review, 31*(4), 833-863.
Li, J. J., Poppo, L., & Zhou, K. Z. (2010). Relational mechanisms, formal contracts, and local knowledge acquisition by international subsidiaries. *Strategic Management Journal, 31*(4), 349-370.
Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology, 86*(1), 114-121.
Liu, Y., Luo, Y., & Liu, T. (2009). Governing buyer-supplier relationships through transactional and relational mechanisms: Evidence from China. *Journal of Operations Management, 27*(4), 294-309.
Lohr, S. (2011). Stress test for the global supply chain. *New York Times*.
Lumineau, F., Fréchet, M., & Puthod, D. (2011). An organizational learning perspective on the contracting process. *Strategic Organization, 9*(1), 8-32.
Lumineau, F., & Henderson, J. E. (2012). The influence of relational experience and contractual governance on the negotiation strategy in buyer-supplier disputes. *Journal of Operations Management, 30*(5), 382-395.
Lumineau, F., & Malhotra, D. (2011). Shadow of the contract: How contract structure shapes interfirm dispute resolution. *Strategic Management Journal, 32*(5), 532-555.
Luo, Y. (2002). Contract, cooperation, and performance in international joint ventures. *Strategic Management Journal, 23*(10), 903-919.
Malhotra, D., & Lumineau, F. (2011). Trust and collaboration in the aftermath of conflict: The effects of contract structure. *Academy of Management Journal, 54*(5), 981-998.
Mayer, K. J., & Argyres, N. S. (2004). Learning to contract: Evidence from the personal computer industry. *Organization Science, 15*(4), 394-410.
Mooi, E. A., & Gilliland, D. I. (2013). How contracts and enforcement explain transaction outcomes. *International Journal of Research in Marketing, 30*(4), 395-405.
Morgan, R. M., & Hunt, S. D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing, 58*(3), 20-20.
Nelson, R. R., & Winter, S. G. (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.
Neter, J., Wasserman, W., & Kutner, M. H. (1990). *Applied Linear Statistical Models*: Homewood, IL:Irwin.
Podsakoff, P. M., MacKenzie, S. B., Jeong-Yeon, L., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879.
Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management, 12*(4), 531.
Poppo, L., & Zhou, K. Z. (2014). Managing contracts for fairness in buyer–supplier exchanges. *Strategic Management Journal, 35*(10), 1508-1527.
Poppo, L., Zhou, K. Z., & Zenger, T. R. (2008). Examining the conditional limits of relational governance: specialized assets, performance ambiguity, and long-standing ties. *Journal of Management Studies, 45*(7), 1195-1216.
Puranam, P., & Vanneste, B. S. (2009). Trust and governance: Untangling a tangled web. *Academy of Management Review, 34*(1), 11-31.
Rindfleisch, A., & Moorman, C. (2003). Interfirm Cooperation and Customer Orientation. *Journal of Marketing Research, 40 (4)*, 421-436.
Roehrich, J., & Lewis, M. (2014). Procuring complex performance: Implications for exchange governance complexity. *International Journal of Operations & Production Management, 34*(2), 221-241.
Samaha, S. A., Palmatier, R. W., & Dant, R. P. (2011). Poisoning relationships: Perceived unfairness in channels of distribution.. *Journal of Marketing, 75*(3), 99-117.
Schepker, D. J., Oh, W.-Y., Martynov, A., & Poppo, L. (2014). The many futures of contracts: Moving beyond structure and safeguarding to coordination and adaptation. *Journal of Management, 40*(1), 193-225.
Scholten, K., & Schilder, S. (2015). The role of collaboration in supply chain resilience. *Supply Chain Management: An International Journal*, *20 (4),* 471-484.
Selnes, F., & Sallis, J. (2003). Promoting relationship learning. *Journal of Marketing, 67*(3), 80-95.

Sheffi Y., & Rice, J.B. Jr. (2005). A supply chain view of the resilient enterprise. *MIT Sloan Management Review. 47(1)*, 41-48.
Shervani, T. A., Frazier, G., & Challagalla, G. (2007). The moderating influence of firm market power on the transaction cost economics model: An empirical test in a forward channel integration context. *Strategic Management Journal, 28*(6), 635-652.
Vanneste, B. S., & Puranam, P. (2010). Repeated interactions and contractual detail: Identifying the learning effect. *Organization Science, 21*(1), 186-201.
Vlaar, P. W. L., Van den Bosch, F. A. J., & Volberda, H. W. (2006). Coping with problems of understanding in interorganizational relationships: Using formalization as a means to make sense. *Organization Studies, 27*(11), 1617-1638.
Vlaar, P. W. L., Van Den Bosch, F. A. J., & Volberda, H. W. (2007). Towards a dialectic perspective on formalization in interorganizational relationships: How alliance managers capitalize on the duality inherent in contracts, rules and procedures. *Organization Studies, 28*(4), 437-466.
Wang, D. T., Gu, F. F., & Dong, M. C. (2013). Observer effects of punishment in a distribution network. *Journal of Marketing Research, 50*(5), 627-643.
Wang, Q., Craighead, C. W., & Li, J. J. (2014). Justice served: Mitigating damaged trust stemming from supply chain disruptions. *Journal of Operations Management, 32*(6), 374-386.
Watson, D. (1982). The actor and the observer: How are their perceptions of causality divergent? *Psychological Bulletin, 92*(3), 682-700.
White, G. O., Joplin, J. R. W., & Salama, M. F. (2007). Contracts and conflict resolution strategies in foreign ventures: A transaction cost perspective. *International Journal of Conflict Management, 18*(3/4), 376-390.
Wieland, A., & Wallenburg, C.M. (2013). The influence of relational competencies on supply chain resilience: a relational view. *International Journal of Physical Distribution & Logistics Management*, *43(4)*, 300-320.
Williamson, O. (1985). *The Economic Institutions of Capitalism*: New York: Free Press.
Whipple, J.M., Lynch, D.F., & Nyaga, G.N. (2010). A buyer's perspective on collaborative versus transactional relationships, *Industrial Marketing Management, 39(3),* 507-518.
Wuyts, S., & Geyskens, I. (2005). The formation of buyer-supplier relationships: Detailed contract drafting and close partner selection.*Journal of Marketing, 69*(4), 103-117.
Zaheer, A., & Venkatraman, N. (1995). Relational governance as an interorganizational strategy: An empirical test of the role of trust in economic exchange. *Strategic Management Journal, 16*(5), 373-392.
Zhou, K. Z., & Xu, D. (2012). How foreign firms curtail local supplier opportunism in China: Detailed contracts, centralized control, and relational governance. *Journal of International Business Studies 43(7)*, 677-692.
Zhou, K. Z., Zhang, Q., Sheng, S., Xie, E., & Bao, Y. (2014). Are relational ties always good for knowledge acquisition? buyer–supplier exchanges in China. *Journal of Operations Management, 32*(3), 88-98.
Zollo, M., & Winter, S. G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science, 13*(3), 339-351.

Figure 1 A conceptual framework of contract learning in the aftermath of exchange disruptions.

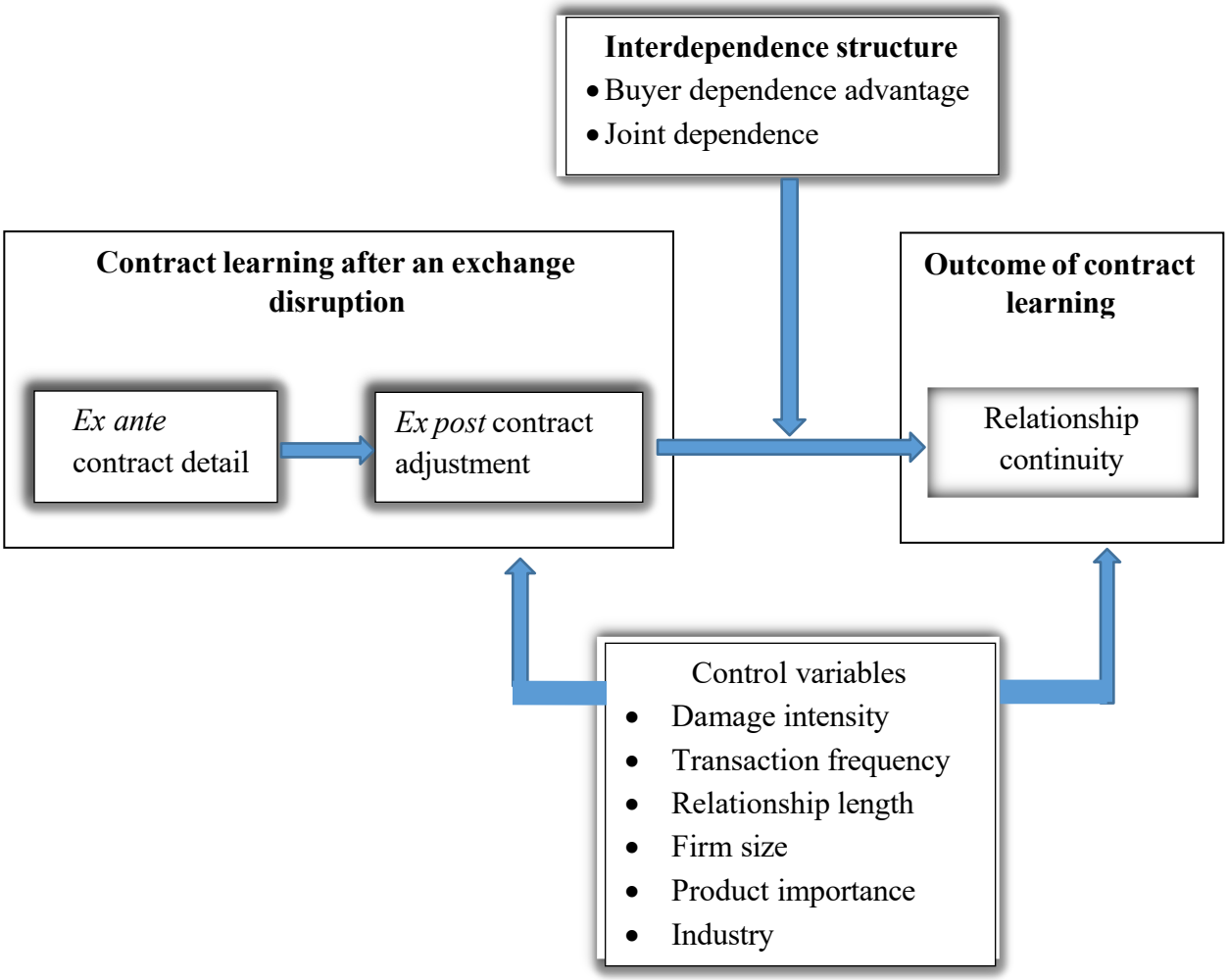


Table 1
Descriptive statistics and correlations.

		1	2	3	4	5	6	7	8	9	10	11
1	Contract detail	**.875**	.606**	.410**	-.150*	.459**	.183**	-.333**	.167**	.015	.340**	.239**
2	Contract adjustment	.613**	**.688**	.395**	-.078	.497**	.165**	-.211**	.097	.018	.372**	.127*
3	Joint dependence	.420**	.405**	--	.037	.318**	.059	-.168**	.218**	.028	.372**	.047
4	Buyer dependence advantage	-.130*	-.060	.053	--	-.122*	-.129*	.209**	-.141*	.099	-.191**	-.085
5	Relationship continuity	.468**	.506**	.330**	-.103	**.802**	.335**	-.462**	.180**	.097	.400**	.136*
6	Relationship length	.197**	.179**	.075	-.110	.346**	--	-.313**	.247**	.182**	.336**	-.047
7	Damage intensity	-.310**	-.190**	-.148*	.222**	-.437**	-.291**	--	-.338**	-.117	-.519**	-.162**
8	Transaction frequency	.181**	.112	.231**	-.122*	.194*	.260**	-.315**	--	-.037	.383**	.074
9	Firm size	.032	.035	.045	.114	.112	.196**	-.098	-.018	--	.076	.014
10	Product importance	.351**	.452**	.383**	-.171**	.410**	.347**	-.493**	.393**	.092	**.809**	.054
11	Industry	.252**	.142*	.063	-.067	.151*	-.029	-.142*	.090	.031	.070	--
12	MV Marker	.047	-.196*	.017	-.149*	-.073	-.146*	-.079	-.075	-.097	-.115	.043
	Mean	6.059	5.857	10.411	.491	5.075	4.464	2.805	4.170	5.794	5.562	0.757
	Standard Deviation	0.895	0.906	3.243	.758	1.075	2.410	1.441	1.272	1.192	1.074	0.429

Note: * $p < .05$; ** $p < .01$ (two-tailed); N = 272.
Zero-order correlations are below the diagonal; adjusted correlations for the potential common method variance (Lindell and Whitney, 2001) are above the diagonal. Average Variance Extracted (AVE) is shown on the diagonal of the matrix for latent variables and is in bold type.

Table 2
Standardized regression results of *ex post* contract adjustment.

Variables	**Contract adjustment**	
	Model 1	Model 2
Control Variables		
Relationship length	.046 (.746)	.005 (.100)
Intensity of damage	.061 (.928)	.135 (2.414)
Transaction frequency	-.083 (-1.351)	-.088 (-1.706)
Firm size	-.032 (-.564)	-.017 (-.360)
Supplier's product importance	.492** (7.273)	.365** (6.302)
Industry	.117* (2.099)	.005 (.094)
Direct Effect		
Contract detail		.535** (10.391)
F change	12.147**	107.978**
R^2	.223	.455
R^2		.232

Note: * $p < .05$, ** $p < .01$ (two-tailed), t-values are in parentheses.

Table 3
2SLS standardized regression results of relationship continuity.

Variables	Relationship Continuity		
	Model 1	Model 2	Model 3
Control Variables			
Relationship length	.191** (3.399)	.173** (3.232)	.182** (3.681)
Damage intensity	-.237** (-3.880)	-.256** (-4.345)	-.242** (-4.389)
Transaction frequency	-.041 (-.730)	-.015 (-.281)	-.043 (-.862)
Firm size	.016 (.307)	.020 (.404)	.008 (.166)
Supplier's product importance	.098 (1.498)	.047 (.677)	.020 (.311)
Industry	.066 (1.258)	.060 (1.216)	.059 (1.278)
Contract detail	.250** (4.204)	.120 (1.818)	.112 (1.847)
Joint dependence	.139* (2.338)	.133* (2.288)	-.108 (-1.513)
Buyer dependence advantage	.017 (.319)	-.001 (-.021)	.059 (1.007)
Direct Effects			
Contract adjustment (CA)		.220** (2.951)	.282** (3.923)
CA^2		-.138* (-2.454)	-.222** (-3.956)
Interaction Effects			
CA × Joint dependence			.227** (4.276)
CA × Buyer dependence advantage			.132** (2.858)
CA^2 × Joint dependence			.351** (5.214)
CA^2 × Buyer dependence advantage			-.148* (-2.512)
F change	16.471**	14.317**	12.495**
R^2	.371	.436	.532
$\mathbf{R}^2$		.065	.096

Note: * $p < .05$, ** $p < .01$ (two-tailed), t-values are in parentheses.

Figure 2 Curvilinear effect of contract adjustment on relationship continuity.

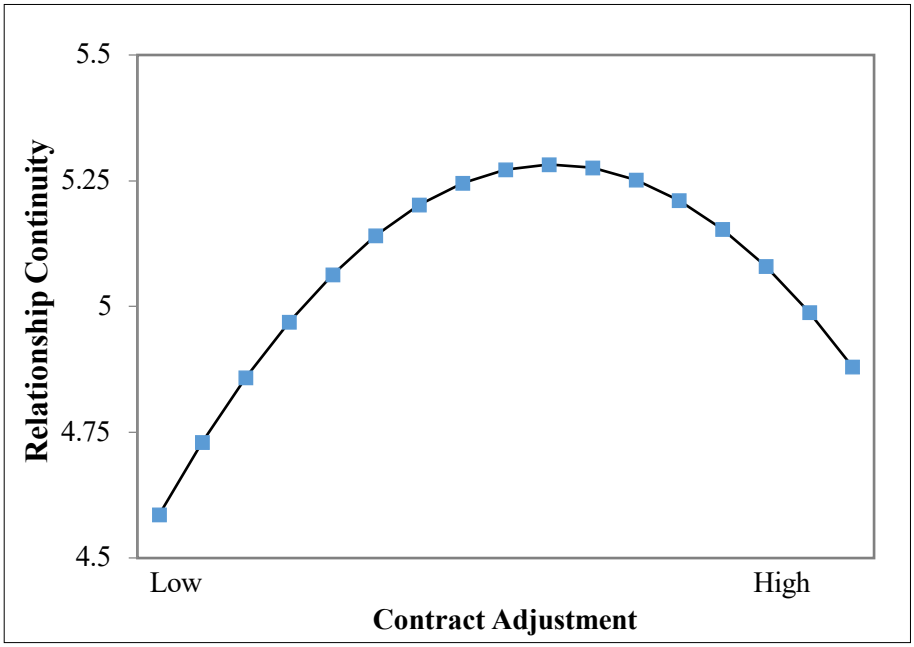


Figure 3 The moderating effect of buyer dependence advantage on the relationship between contract adjustment and relationship continuity.

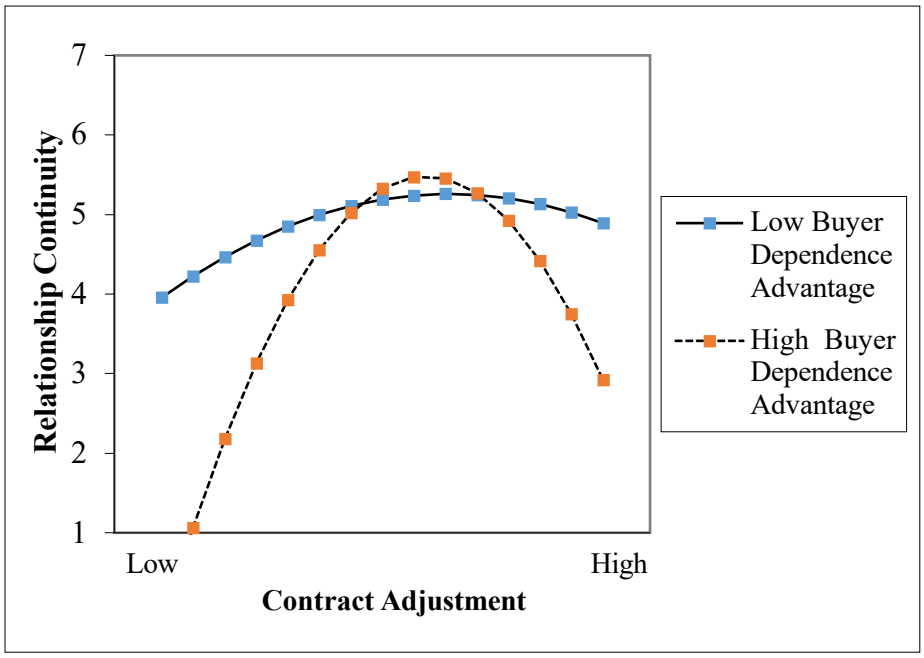
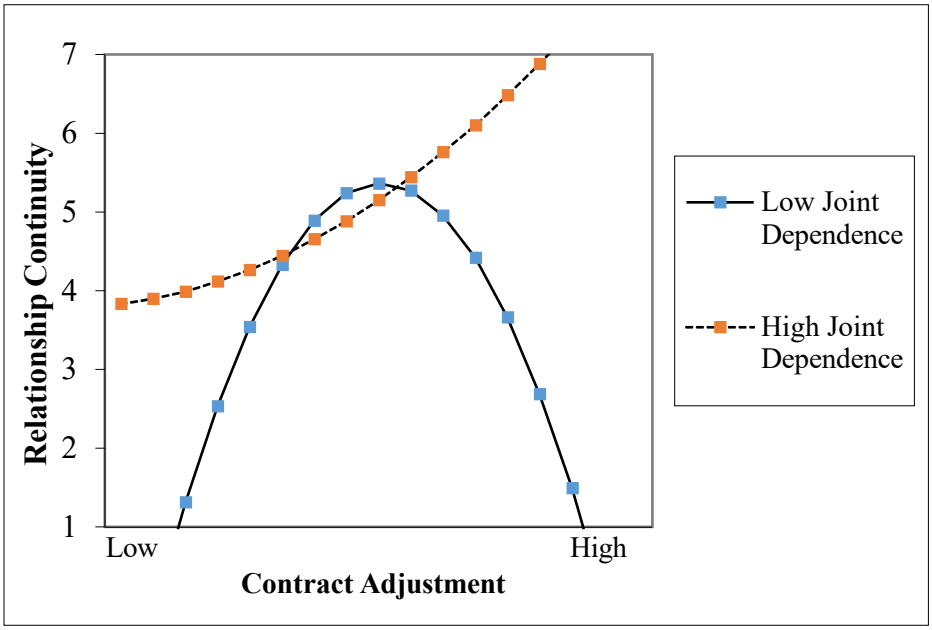


Figure 4 The moderating effect of joint dependence on the relationship between contract adjustment and relationship continuity.



Appendix: Measures

Construct	Description	Std. factor loadings
Contract detail CR = .955; AVE = .875.	Before the supplier-related disruption occurred,	
	• We had detailed contractual agreements with this supplier.	.887
	• We had detailed, customized agreements that outlined the obligations of both parties.	.956
	• We had specific, detailed agreements with this supplier.	.962
Contract adjustment CR = .898; AVE = .688.	After the supplier-related disruption occurred, we made the following changes (to contractual agreements):	
	• We further developed formal rules and policies for doing business with this supplier.	.896
	• We clarified roles and responsibilities specified for this supplier.	.838
	• We further developed formal principles for doing business with this supplier.	.808
	• We refined procedures used to monitor transactions with this supplier.	.772
Relationship continuity CR = .924; AVE = .802.	After taking actions to resolve the incident,	
	• We believe this supplier is now more like a part of our organization.	.889
	• Our cooperation with the supplier is more pleasant than before	.939
	• Our commitment to the supplier has greatly improved	.857
Buyer dependence on supplier CR = .934; AVE =.826.	• If our relationship was discontinued with this supplier, we would have difficulty making up the sales volume in our trading area.	.823
	• It would be difficult for us to replace this supplier.	.983
	• We are quite dependent on this supplier.	.914
Supplier dependence on buyer CR = .947; AVE = .856	• If we discontinued our relationship with this supplier, it would have difficulty making up the sales volume in our trading area.	.914
	• It would be difficult for this supplier to replace us.	.942
	• This supplier is quite dependent on us.	.919
Product importance CR = .927; AVE = .810.	Compared to other products purchased, this supplier's product is	
	• 1= very much unimportant; 7= very much important.	.957
	• 1= unnecessary; 7= very much necessary.	.910
	• 1= low priority; 7= high priority.	.827
Model fit statistics: $\xi^2_{(135)}$ =284.115, GFI =0.904, CFI =0.970, NFI =0.946, IFI =0.971, RMSEA =0.064		

Note: CR =composite reliability; AVE =average variance extracted; GFI= goodness-of-fit index; CFI =comparative fit index; NFI= normed fit index; IFI= incremental fit index; RMSEA= root mean square error of approximation