*Strategic Management Journal*
*Strat. Mgmt. J.*, **37**: 724–741 (2016)
Published online EarlyView 23 April 2015 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/smj.2374
*Received 14 September 2011*; *Final revision received 6 January 2015*

# WHEN CAN YOU TRUST "TRUST"? CALCULATIVE TRUST, RELATIONAL TRUST, AND SUPPLIER PERFORMANCE

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*Our research empirically assesses two distinct bases for trust: calculative trust, based on a structure of rewards and penalties, versus relational trust, a judgment anchored in past behavior and characterized by a shared identity. We find that calculative trust and relational trust positively influence supplier performance, with calculative trust having a stronger association than relational trust. Yet, important boundary conditions exist. If buyers invest in supplier-specific assets or when supply side market uncertainty is high, relational trust, not calculative trust, is more strongly associated with supplier performance. In contrast, when behavioral uncertainty is high, calculative trust, not relational trust, relates more strongly to supplier performance. These results highlight the value of examining distinct forms of trust.* 

## INTRODUCTION

Cooperative strategy is a dominant paradigm for examining interfirm exchanges, with risk, relationships, and trust as focal constructs (e.g., Dyer and Singh, 1998; Parmigiani and Rivera-Santos, 2011; Poppo and Zenger, 2002; Ring and Van de Ven, 1994). While trust supports interfirm exchanges because it enables "confident expectations and a willingness to be vulnerable" (Rousseau *et al.,* 1998: 394), distinct types of trust exist. With *calculative trust*, managers believe that the costs and benefits of complying with the business agreement will outweigh those associated with self-interested, opportunistic actions (Parkhe, 1993; Srinivasan and Brush, 2006; Williamson, 1993). In contrast, *relational trust* arises from social relationships when there are strong beliefs about the goodwill, honesty, and good faith efforts of others, which mitigate risk by aligning core values (Bromiley and Harris, 2006; Ring, 1996; Zaheer and Harris, 2005).

Whereas calculative trust and relational trust co-exist and characterize most business relationships (Lewicki, Tomlinson, and Gillespie, 2006; Rousseau *et al.,* 1998; Schilke and Cook, 2015), empirical work tends to treat trust as an aggregate construct (Handley and Angst, 2014; Zaheer and Harris, 2005; but see Saparito, Chen, and Sapienza, 2004). This aggregation is problematic because an emerging empirical literature suggests whether one should rely on trust or relational norms depends on the specific situation, yet these works do not examine alternative forms of trust (e.g., Goerzen, 2007; Krishnan, Martin, and Noorderhaven, 2006; Poppo, Zhou, and Zenger, 2008b). Accordingly, two important questions remain unanswered:

Keywords: trust; transaction cost economics; cooperative strategy; supply chain management
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(1) how do calculative and relational trust affect exchange performance? and (2) how do transactional attributes moderate the relationships between calculative/relational trust and exchange performance?

To address these questions, we focus on the roles of calculative and relational trust in vertical exchanges, particularly on how trust affects *supplier performance*, i.e., the buyer's evaluation of the supplier's task performance (e.g., Cannon and Perreault, 1999; Mesquita and Brush, 2008; Zaheer, McEvily, and Perrone, 1998). Extending the existing theoretical literature, we explore the different decision rules and logic associated with calculative and relational trust. Calculative trust relies on a forward-looking decision rule: a continual reassessment of relative payoffs for whether it pays to cooperate. This decision rule requires deliberate processing and accuracy. In contrast, relational trust is anchored in the past, arising from repeated interaction. As a decision rule, it functions as a heuristic, a shortcut that avoids conscious deliberation (Lewicki and Brinsfield, 2011; Molina-Morales and Martínez-Fernández, 2009; Uzzi, 1997). We then discuss how each form of trust may or may not augment performance in three settings where the supplier may renege on its performance agreement: (1) *asset specificity* (i.e., the buyer makes sunk investments in supplier-specific assets); (2) *supply market uncertainty* (i.e., unpredictable changes in the supply market); and (3) *behavioral uncertainty* (i.e., unobservability and incomplete information regarding the supplier's processes and activities) (e.g., Schepker *et al.,* 2014).

Our study contributes to extant trust literature in several ways. First, for decades, many have deemed the atomistic assumption used by transaction cost economics (TCE) as superficial both because relationships shape expectations, and because a reliance on such expectations (e.g., trust) may both foster or derail economic exchange (e.g., Granovetter, 1985; Ring, 1996; Uzzi, 1997). Our paper is among the few that empirically distinguish relational trust from calculative trust to show that both types on average are positively influential, yet calculative trust is more influential. Our second contribution shows how distinct decision logics—accurate, deliberate calculation for calculative trust and a "we" heuristic for relational trust—reconcile prior views on when a reliance on trust becomes more or less effectual. Consistent with our logic, calculative trust is less effectual when the supplier has invested in supplier-specific assets or supply-side market uncertainty exists. Alternatively, relational trust becomes more effective for these two settings. For behavioral uncertainty, calculative trust becomes more effective, yet we find no support for our hypothesis that relational trust also becomes more effective. Overall, our results demonstrate important limitations as well as strengths associated with a reliance on calculative and relational trust in buyer-supplier exchanges.

## THEORETICAL FRAMEWORK

Trust refers to "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another" (Rousseau *et al.,* 1998: 395). In interorganizational relationships, trust denotes an exchange partner's expectation that the other party can be relied on, will behave as predicted, and will act fairly (Zaheer *et al.,* 1998). It fosters perceptions of stability, enhances bilateral coordination, and limits performance losses that would otherwise occur because of self-interest and opportunism. Empirical studies validate this focus: trust and its related normative conventions are associated with lower transaction costs, greater knowledge transfer, and better exchange performance (e.g., Artz and Brush, 2000; Gulati and Nickerson, 2008; Li, Poppo, and Zhou, 2010; Poppo and Zenger, 2002; Zaheer *et al.,* 1998).

### Calculative versus relational trust

Trust, however, has different bases. Drawing from transaction cost economics, implicit contracting, and game theory (Axelrod, 1984; Williamson, 1996), scholars propose that a structure that aligns incentives with rewards can lead to stable, predictable outcomes. This approach can be applied to trust, "a term with many meanings … [to] define and delimit the elusive notion of trust" (Williamson, 1993: 453). Calculative trust informs expectations by deliberately and rationally assessing forward-looking conditions: It requires calculations of benefits and costs, and hinges on the relative values of cheating (e.g., net costs of termination) and cooperation (Bromiley and Harris, 2006; Lewicki *et al.,* 2006). When it is high, parties believe that cooperation and performance goals will



DOI: 10.1002/smj

be achieved because falling short of them leads to penalties, including exchange termination (Parkhe, 1993). Thus, sanctions, the expected payoffs of rewards over the penalties, decrease opportunistic behavior, regulate exchanges, and preserve cooperation.

Others argue that a relational foundation of trust best describes long-standing, stable business relationships (Granovetter, 1985; Gulati, 1995; Ring and Van de Ven, 1994). Ongoing interaction lets parties accumulate experiences, form expectations of each other, and develop shared values and normative conventions that define how parties will work together (Bercovitz, Jap, and Nickerson, 2006; Macneil, 1980). Relational trust arises when social relations evolve to a state in which each partner can expect to act according to the other's preferences and priorities (Lewicki *et al.,* 2006; Saparito *et al.,* 2004). With high relational trust, partners develop a mutual understanding and shared identity in which they "'think like' the other, 'feel like' the other, and 'respond like' the other" (Lewicki and Bunker, 1996: 122–123). Such mutuality helps partners make decisions for each other, reduces the risk of opportunistic behavior, increases timely adaptation, and improves joint outcomes.

Whereas ongoing exchanges feature both calculative and relational trust in varying degrees (Rousseau *et al.,* 1998), these types of trust are distinct constructs with different logics and decision rules. The central logic underlying calculative trust is incentives, a rational assessment of well-structured rewards and punishments. Accordingly, calculative trust relies on a forward-looking decision rule: a continual reassessment of relative payoffs for whether it pays to cooperate (Saparito *et al.,* 2004). This decision rule requires deliberate processing and accuracy. In contrast, relational trust is anchored in the past, arising from repeated interaction. A shared identity is the strongest form of social attachment that may develop as parties consider each other's interests as if they were their own. As a decision rule, relational trust functions as a heuristic, a shortcut to rational assessment, based on the overall quality of the relationship rather than each single transaction (Rousseau *et al.,* 1998; Uzzi, 1997). It enables the "navigation of increasingly complex interpersonal environments by simplifying the information processing task" (Lewicki and Brinsfield, 2011: 117; Poppo, Zhou, and Ryu, 2008a).

## Transactional attributes and risk

Self-interest can threaten performance in business-to-business exchanges (Williamson, 1996). This literature commonly points to transactional attributes that increase the risk that parties will defect from business agreements to achieve gains: three of the most examined are asset specificity, market uncertainty, and behavioral uncertainty (e.g., Schepker *et al.,* 2014). *Asset specificity* refers to customized investments specific to the exchange made by one party that cannot be deployed for alternative uses. In this study, we focus on *buyer asset specificity*, which means the buyer has invested in supplier-specific assets and risks sizable sunk costs if the exchange is terminated. Since these assets cannot be redeployed to other transactions, the supplier may hold up the buyer. For example, the supplier may renege on the initial terms to extract a greater share of the buyer's quasi-rent. It may also not prioritize optimal delivery of products and ship late, not procure the required quality inputs, or submit invoices that misrepresent its operational costs (Wathne and Heide, 2000).

*Market uncertainty* refers to unpredictable changes in external environments. In this study, we focus on *supply market uncertainty*, which refers to unpredictability in supply prices, vendor support, and the supplier's manufacturing technologies and product design (Cannon and Perreault, 1999). Because uncertainty creates instability that is difficult for managers to understand and respond to, it challenges exchanges by requiring adaptation (Carson, Madhok, and Wu, 2006).

*Behavioral uncertainty* refers to the extent to which one party cannot effectively observe or evaluate the activities of the other party. When behavioral uncertainty arises, the other party is more likely to misbehave or not disclose information in order to maximize self-gain (Schepker *et al.,* 2014). In our study, when the buyer cannot readily observe and verify supplier activities, the supplier can hide actions such as undersupplying effort or ignoring critical processes or requirements (Cannon and Perreault, 1999).

In the next section, we will examine how calculative/relational trust influences exchange performance and how these transactional attributes moderate the effects of trust on performance. Figure 1 summarizes our conceptual model.

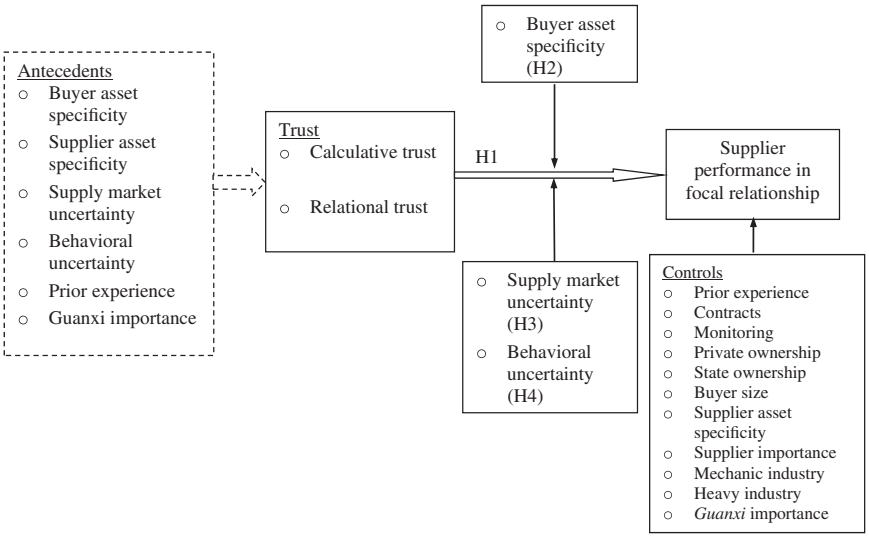


Figure 1. The conceptual model. Dashed lines = Stage 1 model; solid lines = Stages 2 and 3 models

## HYPOTHESES

### Direct effects of trust

Calculative trust "permits economic actors to deal with each other, but in guarded ways" (Ring, 1996: 152) because exchange partners try hard to meet performance goals only when noncompliance delivers a penalty, the most severe of which is exchange termination (e.g., Parkhe, 1993; Telser, 1980). When partners believe rewards and punishment are well specified for the particular transaction, the benefits derived from executing the specified task outweigh the net costs from not doing so (Williamson, 1993). This motivates each party to fulfill its performance obligations. As a forward-looking logic, calculation implies that buyers and suppliers will assess the rewards and punishment for each new transaction, proceeding only when the transaction projects net gains (Poppo *et al.,* 2008a; Williamson, 1993). As Parkhe (1993) indicates, parties choose to cooperate when they expect payoffs from a series of exchanges; the longer their expectation of time horizon, the greater the perceived benefits from cooperation. Thus, the forward-looking rational assessment of calculative trust incentivizes parties to achieve desired performance.

*Hypothesis 1a: Calculative trust is positively associated with supplier performance*.

By showing "good faith in the intent and reliability of partner behavior" (Krishnan *et al.,* 2006: 896), relational trust should also foster supplier performance. When relational trust exists, the buyer and its supplier hold common beliefs and commitment to the partnership. These beliefs harmonize interests, curtail potential opportunistic behavior, and motivate exchange parties to comply with and commit to joint goals (Ouchi, 1980; Ring and Van de Ven, 1994). As a heuristic, relational trust also facilitates decision making. Because relational trust provides "a degree of structure and stability to one's perception of a situation or relationship" (Lewicki and Brinsfield, 2011: 110), the buyer does not need to continually monitor the other, collect information, fully examine the current situation (e.g., construct if-then scenarios), and reassess the relationship (Dyer and Singh, 1998). The supplier thus has the autonomy to make decisions on behalf of both parties that fulfill its performance expectations. Therefore, we predict that

*Hypothesis 1b: Relational trust is positively associated with supplier performance*.

### Moderating effects of transactional attributes

*Asset specificity*

While the relationship between trust and exchange performance is well documented, it remains unclear how asset specificity moderates this relationship when trust is partitioned into its calculative and relational components. Asset specificity is generally



DOI: 10.1002/smj

coded as a "hazard" that erodes the positive effect of trust. Based on their different decision logics, we argue that this view is relevant to calculative trust, not relational trust. The "we" heuristic associated with relational trust transforms the hazard view of asset specificity to a pledge of the buyer's commitment to the supplier. We develop this logic below.

When a buyer has not invested in supplier-specific assets, the buyer can easily switch to an alternative supplier should its performance be low. As a result, if the perceived rewards over punishment are high, suppliers are motivated to achieve explicit performance targets because any misconduct is tied to negative economic consequences while meeting performance goals are rewarded, including renewed business (Parkhe, 1993; Williamson, 1993). However, when buyer asset specificity is high, it creates a situation of asymmetric dependence—the buyer cannot exit the relationship without considerable out-of-pocket costs. Such sunk costs reduce the effectiveness of calculative trust. Even though rewards and punishments exist, incentives are misaligned because only the buyer is bound by sunk costs. The supplier knows it can haggle over costs, shirk, or try to extract a quasi-rent from the buyer because the buyer's specific sunk costs motivate continuance. Thus, even though both parties perceive a well-structured system of rewards and punishments, the supplier can shirk. This misalignment may erode performance because the supplier knows it can slack on its commitments without much, if any, penalty. Therefore, we predict that, when assets are specific, calculative trust is less effective at incentivizing supplier performance.

*Hypothesis 2a: The positive relationship between calculative trust and supplier performance is weaker when buyer asset specificity is high than when it is low.*

In contrast to calculation, when relational trust exists, exchange parties share a common identity and favor a decision to do the right thing for the relationship (Lewicki and Brinsfield, 2011). This shared identity alters the meaning and expected behavior arising from a specialized investment: both partners are committed to work together to fully utilize the specialized investment, rather than to take advantage of it. Accordingly, relational trust makes a buyer's investment in supplier-specific assets a credible signal of commitment, not an asymmetry to be exploited (Gambetta, 2009). Furthermore, with relational trust, parties use the "we" heuristic to make decisions in accordance with collective goals (Uzzi, 1997). For example, as Srinivasan and Brush (2006) show, when the buyer credibly commits to the relationship and the supplier reciprocates this goodwill, supplier performance increases. In contrast, when asset specificity is low, the requirement for transaction-specific adaptations is low because the exchange process is largely standardized (Cannon and Perreault, 1999). Accordingly, relational trust is less needed to coordinate routine exchanges. Thus, we predict that

*Hypothesis 2b: The positive relationship between relational trust and supplier performance is stronger when buyer asset specificity is high than when it is low.*

### *Market uncertainty*

Prior work presents mixed views on whether market uncertainty strengthens or weakens the effect of trust on performance. Rousseau *et al.* (1998) indicate that, because trusting parties can work jointly to deal with uncertainty, trust is most valuable when uncertainty exists; if there is no uncertainty, there is no need for trust to coordinate exchanges (see also Ring and Van de Ven, 1994; Zajac and Olsen, 1993). In contrast, others argue that uncertainty increases the information processing demands required to navigate the future. Because trusting parties are less likely to search adequately for information outside of the relationship, trust is less suitable to effective adaptation to environmental changes (Krishnan *et al.,* 2006; Lewicki and Brinsfield, 2011). By focusing on the distinct decision logics associated with relational and calculative trust, we explain why both views are accurate: market uncertainty weakens the effect of calculative trust, but bolsters the impact of relational trust.

As described earlier, the efficacy of calculative trust hinges on incentive alignment. Under low levels of market uncertainty, well-structured rewards and penalties effectively align incentives: parties will find cooperation more valuable than defection because they can obtain stable information to accurately assess the trade-offs. However, if the supplier's operating environment is highly uncertain, important factors such as pricing, product specifications, and technologies are changing constantly (Krishnan *et al.,* 2006). In such conditions,



DOI: 10.1002/smj

the reward structure is less likely to accurately map how uncertainties affect exchange behavior and outcomes, making parties less assured whether cooperation is still favored. As a result, when market uncertainty is high, calculative trust is less effective in enabling continuous adaptation and motivating performance.

*Hypothesis 3a: The positive relationship between calculative trust and supplier performance is weaker when supply market uncertainty is high than when it is low.*

In contrast, we argue that relational trust may be more beneficial when supply markets are uncertain. With relational trust, exchange parties expect to continue to work together and adapt jointly to external changes. This commitment is based on previous interactions that give rise to positive expectations of a shared future (Lewicki and Brinsfield, 2011). By providing a bilateral orientation to adaptation, relational trust ensures continuous cooperation despite uncertainty (Lado, Dant, and Tekleab, 2008). Moreover, as a decision heuristic, relational trust favors a "we" orientation toward quick and continuous coordination, a critical practice for adapting successfully to uncertain environments (Li *et al.,* 2010; Luo, 2003). As a result, relational trust enables parties to "act as if the future were more certain" (Rousseau *et al.,* 1998; Zajac and Olsen, 1993: 140). In contrast, relational trust is less needed for supply markets with lower uncertainty, because continuous and efficient adaptation is less necessary.

*Hypothesis 3b: The positive relationship between relational trust and supplier performance is stronger when supply market uncertainty is high than when it is low.*

### *Behavioral uncertainty*

Whether trust can deter malfeasance stemming from unobservable behavior is a central proposition for those who focus on the value of relational quality (Granovetter, 1985; Uzzi, 1997). Contrary to the logic of prior hypotheses regarding the limitations of calculation, when behavioral uncertainty exists, we predict that calculative trust has a stronger impact on performance. For calculative trust, unobserved behavior is disciplined through expected payoffs in which rewards depend on expected outcomes. When behavioral uncertainty is high, it is hard to observe the inputs or activities of the other party. Yet, with calculative trust, the party's final output can be evaluated, and rewards and sanctions can be effectively applied. For example, if the buyer detects low-quality output, it can punish the supplier by terminating the business agreement, which causes net losses for misbehavior (Parkhe, 1993; Telser, 1980). In addition, forward-looking assessments remind parties to perform well in order to acquire additional business in the future, even though their behavior is difficult to assess (Poppo *et al.,* 2008a). Thus, by aligning rewards and punishments with outcomes, calculative trust reduces the risk of misconduct and motivates better performance. In contrast, a strong structure for metering rewards and punishments is less critical for more transparent transactions.

*Hypothesis 4a: The positive relationship between calculative trust and supplier performance is stronger when behavioral uncertainty is high than when it is low.*

We also predict that relational trust should be more valuable when behavioral uncertainty is high. Ouchi (1980) argues that a "clan" culture is most beneficial for tasks defined by behavioral ambiguity—the harmony of shared interests and goals aligns joint action, and results in effective task performance. Thus, both parties will align their goals and act to achieve the mutual performance objectives despite the inability to observe the other. Relational trust also enables heuristic problem solving such that the whole relationship rather than each individual transaction is emphasized. This joint orientation is more valuable when behavioral uncertainty exists because it generates positive beliefs and interpretation of each other's actions (Krishnan *et al.,* 2006)—the buyer can trust the supplier in good faith even though accurate information about the supplier's processes and procedures are lacking. In contrast, if "actions could be undertaken with complete certainty," relational trust is less efficacious (Rousseau *et al.,* 1998: 395). Thus, relational trust is more effective at high levels of behavioral uncertainty.

*Hypothesis 4b: The positive relationship between relational trust and supplier performance is stronger when behavioral uncertainty is high than when it is low.*



DOI: 10.1002/smj

## METHODOLOGY

### Sampling and data collection

TCE focuses on the "make-or-buy" decision (Williamson, 1996), and supply chain management emphasizes how buyers manage their suppliers to enhance exchange performance (e.g., Cousins *et al.,* 2006). Consistent with this tradition, we examined buyer–supplier relationships of manufacturing firms, and collected the data from firms located in two major areas of China, Beijing, and Shanghai. In China, social relationships (e.g., *guanxi*) underlie and coordinate business-to-business transactions, and as the country transitions to a more market-driven economy, contracts are increasingly used to safeguard investment risks (Zhou and Poppo, 2010). As a result, relational and calculative trust are both common in China, making this context suitable to test our conceptual framework.

We first developed an English version of the questionnaire that independent translators then back-translated into Chinese to ensure conceptual equivalence. To ensure the content and face validity of the measures, we conducted five in-depth interviews with senior purchasing managers and asked each respondent to verify that our measures were relevant and complete. From their responses, we revised a few questionnaire items to enhance their clarity. Then, we conducted a pilot study with 24 purchasing professionals who not only answered all the items but also provided feedback on the design and wording of the questionnaire. We finalized the questionnaire based on the results of the pilot study.

For the final survey, we randomly selected a sample of 600 firms from a list of Chinese manufacturing companies located in the four-digit Chinese Standard Industrial Classification codes 1311–4290. These firms spanned diverse industries (e.g., materials, plastics, electronics, apparel, food). For each firm, a senior purchasing manager was the key informant because our interviews revealed that these managers know most about relationships with suppliers.

We recruited and trained interviewers to conduct the survey onsite; the interviewers visited the managers in their offices, presented the survey, clarified any questions, and collected the survey after completion. This process is a useful way to obtain quality data in emerging economies (Li, Poppo, and Zhou, 2008). The interviewers first contacted managers by telephone to solicit their cooperation. To motivate their participation, the managers were informed of the academic nature of the study and the confidentiality of their responses, and were offered an incentive in the form of a summary report. Two hundred and eighty-six managers from different firms agreed to participate, 213 of whom were interviewed onsite. Informants selected one of their firms' major suppliers located in China and answered the survey questions about exchanges with that supplier. After eliminating two surveys with missing data, we obtained 211 complete responses, for an effective response rate of 35.2 percent.

Most of the firms (60.2%) had 100–1,000 employees; 52.1 percent had more than US$3 million in annual sales revenue; 16.6 percent were state-owned; 59.2 percent were private; and 24.2 percent were public firms. On average, respondents had worked for 11.3 years in the industry and 6.9 years with their company. A comparison between the responding and nonresponding firms using multivariate analysis of variance indicated no significant differences in terms of key firm characteristics (i.e., industry type, firm ownership, number of employees, and annual sales revenues) (Wilks's $\Lambda = 0.83$; $F = 1.26$; $p = 0.49$), which suggested that nonresponse bias was not a concern.

To validate our key informant approach, we used Podsakoff and Organ's (1986) post hoc technique to select 24 firms randomly from participating firms and conducted onsite interviews one year later with two purchasing managers or directors from each firm. Of the two managers, one was the previous participant and the other was a new informant. We obtained responses from 38 managers from 19 firms. The interrater reliability between the two managers' responses ranged from 0.88 (calculative trust) to 0.83 (supplier performance) (all $p$s $< 0.001$). The test–retest reliability of the same managers' responses in these two interviews ranged from 0.87 (supplier performance) to 0.72 (asset specificity) (all $p$s $< 0.001$), demonstrating the consistency of the responses (cf. Li *et al.,* 2008). We also collected additional data from both the buyers and their suppliers and obtained a matched dataset of 28 buyer-supplier dyads. The results indicated high consistency of buyer and supplier's perceptions of focal constructs (e.g., $r = 0.82$ for relational trust). These results indicated that our key informant approach was valid (Homburg *et al.,* 2012).



DOI: 10.1002/smj

## Measures

Table A1 lists the questionnaire items. We developed the measures of calculative and relational trust based on the conceptual works of Lewicki and Bunker (1996) and Rousseau *et al.* (1998). The measure of *calculative trust* consists of three items. Two items assess the strength of rewards and punishments that sanction cooperative behavior in the interorganizational exchange (see Lewicki and Bunker, 1996: 119–120), and one item captures the degree of exchange continuity. According to the repeated game logic, the expectation of doing business in the long run allows exchange parties to reward or punish prior moves (Axelrod, 1984). For *relational trust*, its highest level is shared identity (Lewicki and Bunker, 1996; see also Maguire, Phillips, and Hardy, 2001). Our measure has three items: shared identification, shared understanding, and thinking like one another, each of which reflects the degree to which a shared identity exists and enables one party to trust the other to act on its behalf (see Lewicki and Bunker, 1996: 122–123). Our items are highly consistent with Saparito *et al.*'s (2004) measures of self-interest assumption and relational trust in the service (banking) sector.

Our measure of *buyer asset specificity* (Buyer AS) comes from Cannon and Perreault (1999) and captures buyers' specific investments in product features, personnel, inventory and distribution, and capital equipment and tools to accommodate suppliers' needs. We adapted a measure of *market uncertainty* from Cannon and Perreault (1999) to examine the environmental changes in the supply market with respect to pricing, product features and specifications, vendor support services, technology, and product supply. On the basis of Brown, Dev, and Lee (2000), we developed a measure of *behavioral uncertainty* that assesses how difficult it is to evaluate the other party's activities.

We adapted the measure of *supplier performance* from Cannon and Perreault (1999) and Zaheer *et al.* (1998). It examines supplier performance in the focal exchange relationship with respect to product quality, timeliness of delivery, after-sales support, and total value received.

### *Controls*

We controlled for several sources of heterogeneity. First, we considered *prior partner experience* because the accumulation of experiences is necessary to support trust (Lewicki and Bunker, 1996). We measured it with the logarithm of the years that the firm had done business with its supplier. We also controlled for two formal governance mechanisms, *explicit contracts* and *monitoring*, with measures adapted from Lusch and Brown (1996) and Dahlstrom and Nygaard (1999), respectively.

We also controlled for the effects of *buyer ownership* and *buyer size*. Because prior work suggested that state-owned, private, and public listed firms may behave differently (Peng, 2003), we used two dummy variables: *private* and *state-owned*, with public listed firms as the baseline. We used the logarithm of the employee number to indicate buyer size. We controlled for *supplier asset specificity* (Supplier AS) and *supplier importance*. Supplier AS was adapted from Cannon and Perreault (1999). Supplier importance was indicated by the percentage of the manufacturer's total annual demand for the component obtained from the supplier. We used two dummy variables to control for differences in the primary industry in which the buyer operated: *mechanics* and *heavy* (e.g., chemicals, materials, automobile), with others (e.g., consumer products such as apparel, furniture, and food) as the baseline. Given the prevalent use of personal social ties (i.e., *guanxi*) to coordinate exchanges in China, we adapted the measure from Child, Chung, and Davies (2003) to control for *guanxi importance* in the market.

### *Construct validity*

We followed Anderson and Gerbing (1988) in refining the multiple-item measures and assessing their construct validity. We ran exploratory factor analyses for each multiple-item variable, which resulted in factor solutions as theoretically expected. Reliability analyses also showed that these measures possess satisfactory coefficient reliability. Then, we ran confirmatory factor analysis for a 10-factor model. Table A1 reports the results of this analysis, including the goodness-of-fit index, factor loadings, and composite reliability.

Because the chi-square test is sensitive to sample size, we relied on the comparative fit index (CFI), incremental fit index (IFI), and root mean square error of approximation (RMSEA) to evaluate the model fit (Anderson and Gerbing, 1988). As Table A1 shows, all the fit indexes were at or above common thresholds (CFI = 0.90, IFI = 0.90, and RMSEA = 0.07); therefore, the model fits the data satisfactorily. Further, the composite reliabilities



DOI: 10.1002/smj

of all the constructs ranged from 0.72 to 0.92, above the 0.70 benchmark. The average variance extracted for every construct was higher than the 0.50 cutoff (Fornell and Larcker, 1981). Thus, these measures demonstrate satisfactory convergent validity.

We assessed the discriminant validity of the measures in two ways. First, we ran pairwise chi-square difference tests for all multiple-item scales to determine whether the restricted model (correlation fixed at 1.0) fit the data significantly worse than the freely estimated model did (correlation estimated freely). All the chi-square differences were highly significant (e.g., supplier performance vs. calculative trust: $\Delta\chi^2(1) = 220.24$, $p < 0.001$), in support of discriminant validity (Anderson and Gerbing, 1988). We also performed Fornell and Larcker's (1981) more stringent test and found that the average variance extracted for each construct was greater than its highest shared variance with other constructs (see Table A1), further supporting discriminant validity. Overall, these results showed that our measures possessed satisfactory reliability and validity. Table 1 presents the means, standard deviations, and correlations for the constructs.

### *Common method assessment*

Because information about the dependent and independent variables came from the same respondent, we recognized the potential for common method bias and assessed it in two ways. First, we ran a Harman one-factor test (Podsakoff and Organ, 1986), which loads all the perceptual items into an exploratory factor analysis. Factor 1 accounted for only 26.32 percent of the variance, indicating that common method bias was unlikely to be a major concern in our data. Second, we used a method variance (MV) marker test, which uses a scale theoretically unrelated to at least one construct in the model as the MV marker to proxy for common method variance (Lindell and Whitney, 2001). We used a four-item scale to measure a manufacturer's physical resources (Cronbach's $\alpha = 0.90$) and adjusted the construct correlations and statistical significance by the lowest positive correlation ($r = 0.011$) between the MV marker and other variables. None of the significant correlations was insignificant after this adjustment (see Table 1). Therefore, common method bias is unlikely to be a serious concern.

## ANALYSES AND RESULTS

In our model, calculative trust (CT) and relational trust (RT) are likely to be endogenous. Transactional attributes may increase the likelihood that parties lie, cheat, misrepresent information, thereby threatening effective cooperation (Williamson, 1996). In response, managers "select" appropriate governance mechanisms to safeguard transactions. Thus, proper model specification should include transactional attributes as the antecedents of calculative and relational trust: buyer asset specificity (BAS), supplier AS (SAS), market uncertainty (MU), and behavioral uncertainty (BU). Similarly, prior experience (PE) is necessary to support trust (Gulati, 1995). *Guanxi* (GI) is also important for trust development (Li *et al.,* 2008). To correct for this potential endogeneity, we used a three-stage least squares analysis (Hamilton and Nickerson, 2003).

In Stage 1, as specified in Equation 1, we regressed two types of trust against BAS, SAS, MU, BU, PE, and GI to obtain predicted values of relational trust and calculative trust. The results (see Table 2) indicate that calculative trust is significantly related to market uncertainty (b = -0.23, $p < 0.01$), behavioral uncertainty (b = 0.20, $p < 0.01$), prior experience (b = 0.30, $p < 0.01$), and *guanxi* importance (b = 0.24, $p < 0.01$); relational trust is significantly related to buyer asset specificity (b = 0.12, $p < 0.05$), supplier asset specificity (b = 0.23, $p < 0.01$), market uncertainty (b = 0.24, $p < 0.01$), behavioral uncertainty (b = -0.34, $p < 0.01$), prior experience (b = 0.25, $p < 0.01$), and *guanxi* importance (b = 0.19, $p < 0.01$). These results support the use of the three-stage model to correct for the potential endogeneity of calculative trust and relational trust. We then obtained residuals that are free of influence from asset specificity, market uncertainty, behavioral uncertainty, prior experience, and *guanxi* importance.

$$\begin{aligned} \mathrm{CT} &= b_0 + b_1(\mathrm{BAS}) + b_2(\mathrm{SAS}) + b_3(\mathrm{MU}) \\ &\quad + b_4(\mathrm{BU}) + b_5(\mathrm{PE}) + b_6(\mathrm{GI}) + e, \\ &\text{to obtain } \mathrm{CT}_{\mathrm{residual}} = \mathrm{CT} - \mathrm{CT}_{\mathrm{predicted}}. \end{aligned}$$

$$\begin{aligned} \mathrm{RT} &= b_0 + b_1(\mathrm{BAS}) + b_2(\mathrm{SAS}) + b_3(\mathrm{MU}) \\ &\quad + b_4(\mathrm{BU}) + b_5(\mathrm{PE}) + b_6(\mathrm{GI}) + e, \\ &\text{to obtain } \mathrm{RT}_{\mathrm{residual}} = \mathrm{RT} - \mathrm{RT}_{\mathrm{predicted}}. \end{aligned} \quad (1)$$

Table 1. Basic descriptive statistics of the constructs

| Construct | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Supplier performance | | 0.44 | 0.27 | −0.10 | 0.02 | −0.37 | 0.30 | 0.37 | −0.35 | 0.11 | −0.06 | 0.13 | −0.02 | 0.27 | −0.17 | 0.06 | −0.04 |
| 2. Calculative trust | 0.45 | | 0.33 | −0.05 | 0.15 | −0.19 | 0.30 | 0.32 | −0.41 | 0.05 | −0.04 | 0.04 | 0.03 | 0.17 | −0.17 | 0.07 | 0.16 |
| 3. Relational trust | 0.28 | 0.34 | | 0.26 | 0.28 | −0.27 | 0.31 | 0.15 | −0.09 | −0.10 | 0.09 | 0.15 | 0.34 | 0.41 | −0.10 | −0.04 | 0.07 |
| 4. Buyer AS | −0.09 | −0.04 | 0.27 | | 0.35 | 0.15 | −0.04 | −0.09 | 0.32 | −0.15 | 0.04 | 0.02 | 0.39 | 0.00 | 0.02 | 0.00 | −0.04 |
| 5. Supply market uncertainty | 0.03 | 0.16 | 0.29 | 0.36 | | 0.21 | −0.08 | 0.09 | 0.25 | −0.07 | −0.05 | 0.07 | 0.36 | −0.05 | −0.09 | −0.05 | 0.10 |
| 6. Behavioral uncertainty | −0.36 | −0.18 | −0.26 | 0.16 | 0.22 | | −0.31 | −0.08 | 0.45 | −0.04 | −0.04 | −0.16 | 0.15 | −0.27 | 0.12 | −0.06 | 0.28 |
| 7. Prior experience | 0.31 | 0.31 | 0.32 | −0.03 | −0.07 | −0.30 | | 0.08 | −0.36 | −0.13 | 0.18 | 0.23 | 0.09 | 0.37 | −0.05 | 0.00 | −0.14 |
| 8. Contracts | 0.38 | 0.33 | 0.16 | −0.08 | 0.10 | −0.07 | 0.09 | | −0.18 | −0.07 | −0.12 | 0.08 | −0.03 | 0.00 | −0.12 | 0.09 | −0.06 |
| 9. Monitoring | −0.34 | −0.40 | −0.08 | 0.33 | 0.26 | 0.46 | −0.35 | −0.17 | | −0.16 | 0.02 | −0.10 | 0.26 | −0.04 | 0.08 | −0.12 | 0.09 |
| 10. Private firm | 0.12 | 0.06 | −0.09 | −0.14 | −0.06 | −0.03 | −0.12 | −0.06 | −0.15 | | −0.55 | −0.34 | −0.13 | −0.02 | −0.11 | 0.10 | 0.05 |
| 11. State-owned firm | −0.05 | −0.03 | 0.10 | 0.05 | −0.04 | −0.03 | 0.19 | −0.11 | 0.03 | −0.54 | | 0.26 | 0.04 | 0.13 | 0.12 | −0.10 | −0.07 |
| 12. Buyer size | 0.14 | 0.05 | 0.16 | 0.03 | 0.08 | −0.15 | 0.24 | 0.09 | −0.09 | −0.33 | 0.27 | | 0.01 | 0.08 | −0.01 | −0.04 | −0.16 |
| 13. Supplier AS | −0.01 | 0.04 | 0.35 | 0.45 | 0.37 | 0.16 | 0.10 | −0.02 | 0.27 | −0.12 | 0.05 | 0.02 | | 0.10 | −0.05 | −0.04 | −0.03 |
| 14. Supplier importance | 0.28 | 0.18 | 0.42 | 0.01 | −0.04 | −0.26 | 0.38 | 0.01 | −0.03 | −0.01 | 0.14 | 0.09 | 0.11 | | −0.16 | 0.06 | −0.01 |
| 15. Mechanics | −0.16 | −0.16 | −0.09 | 0.03 | −0.08 | 0.13 | −0.04 | −0.11 | 0.09 | −0.10 | 0.13 | 0.00 | −0.04 | −0.15 | | −0.35 | 0.11 |
| 16. Heavy | 0.07 | 0.08 | −0.03 | 0.01 | −0.04 | −0.05 | 0.01 | 0.10 | −0.11 | 0.11 | −0.09 | −0.03 | −0.03 | 0.07 | −0.34 | | −0.07 |
| 17. *Guanxi* importance | −0.03 | 0.17 | 0.08 | −0.03 | 0.11 | 0.29 | −0.13 | −0.05 | 0.10 | 0.06 | −0.06 | −0.15 | −0.02 | 0.00 | 0.12 | −0.06 | |
| 18. MV marker (physical) | 0.12 | 0.05 | 0.08 | 0.08 | 0.01 | 0.10 | 0.15 | −0.03 | 0.13 | −0.18 | 0.08 | 0.15 | 0.16 | 0.07 | 0.10 | −0.09 | −0.07 |
| **Mean** | 4.90 | 5.35 | 4.47 | 3.24 | 3.93 | 3.92 | 1.42 | 4.92 | 3.16 | 0.59 | 0.17 | 5.15 | 3.75 | 46.14 | 0.27 | 0.23 | 5.12 |
| ***SD*** | 1.06 | 1.07 | 1.37 | 1.36 | 1.06 | 1.37 | 0.60 | 1.23 | 1.35 | 0.49 | 0.37 | 1.02 | 1.29 | 29.03 | 0.45 | 0.42 | 1.18 |
| **Min** | 1.00 | 3.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 3.91 | 1.00 | 1.00 | 0.00 | 0.00 | 1.33 |
| **Max** | 7.00 | 7.00 | 7.00 | 6.50 | 6.40 | 7.00 | 3.69 | 7.00 | 6.33 | 1.00 | 1.00 | 8.99 | 6.50 | 100 | 1.00 | 1.00 | 7.00 |

$N = 211$; $p < 0.05$ (two-tailed) for $|r| > 0.13$

Below the diagonal is the zero-order correlation; above the diagonal is the correlation adjusted for potential common method variance with the MV marker technique.

Table 2. Standardized estimates of Stage 1 regression analyses

| Independent variables | Calculative trust b | Relational trust b |
|---|---|---|
| Buyer asset specificity | −0.08 | 0.12* |
| Supplier asset specificity | 0.01 | 0.23** |
| Supply market uncertainty | −0.23** | 0.24** |
| Behavioral uncertainty | 0.20** | −0.34** |
| Prior experience | 0.30** | 0.25** |
| *Guanxi* importance | 0.24** | 0.19** |
| Adjusted $R^2$ | 0.19 | 0.34 |
| Highest VIF | 1.71 | 1.71 |
| Model F | 9.08 | 23.37 |
| DF | 6,204 | 6,204 |

**$p < 0.01$; *$p < 0.05$ (two-tailed)

In Stage 2, we used $CT_{residual}$ and $RT_{residual}$ as the indicators of CT and RT, respectively. That is, we regressed performance against $CT_{residual}$ and $RT_{residual}$ and the controls (see M2 in Table 3).

$$\text{Supplier performance} = b_0 + b_1\left(CT_{residual}\right) + b_2\left(RT_{residual}\right) + b_{controls}\,(\text{Controls}) + e \quad (2)$$

In Stage 3, we added interaction terms to test the moderating effects. To assess the effect of each moderator, we added interactions stepwise as in M3, M4, and M5 and then tested the full model in Equation 3 (M6 in Table 3). Because product terms can incur collinearity, we mean-centered the variables before we constructed the interaction terms (Aiken and West, 1991). We checked for multicollinearity by assessing the variance inflation factors associated with each of the predictors in our models. The highest value of these factors is 2.03, well below the 10.0 benchmark, thus indicating multicollinearity was not an issue. Table 3 reports the regression results of the controls-only model (i.e., M1), as well as the second- and third-stage models.

As Table 3, Model 2 shows, both calculative ($b = 0.35$, $p < 0.01$) and relational ($b = 0.12$, $p < 0.05$) trust related positively to supplier performance, in support of Hypotheses 1a and 1b. Calculative trust is more strongly associated with performance than relational trust is.

We used the full model (M6 in Table 3) to test the interaction hypotheses. Hypothesis 2 assesses the moderating role of buyer asset specificity. The interaction effect of calculative trust × buyer asset specificity is negative ($b = -0.15$, $p < 0.01$), and that of relational trust × buyer asset specificity is positive ($b = 0.12$, $p < 0.05$). These findings support Hypotheses 2a and 2b.

Hypothesis 3 examines the moderating effect of market uncertainty. The interaction effect of calculative trust × market uncertainty is negative ($b = -0.13$, $p < 0.05$), and that of relational trust × market uncertainty is positive ($b = 0.14$, $p < 0.05$), in support of Hypotheses 3a and 3b.

Hypothesis 4 examines the moderating effect of behavioral uncertainty. The interaction effect of calculative trust × behavioral uncertainty is positive ($b = 0.14$, $p < 0.05$), and that of relational trust × behavioral uncertainty is insignificant ($b = 0.04$, $p > 0.10$). These findings support Hypotheses 4a, but not 4b.

To gain more insight into the interaction effects, we followed Aiken and West's (1991) procedure and conducted simple slope tests for significant interactive terms. For Hypothesis 2, we split the buyer asset specificity variable into two groups—low (one standard deviation below the mean) and high (one standard deviation above the mean)—and estimated the effect of calculative/relational trust on performance for both levels. We find that calculative trust is strongly related to performance when buyer asset specificity is low (simple slope $b = 0.66$, $p < 0.01$), but not when it is high ($b = 0.11$, $p > 0.10$). Relational trust is not significantly related to supplier performance ($b = -0.03$, $p > 0.10$) when buyer asset specificity is low, but is positively related to performance when

$$\begin{aligned}\text{Performance} = {} & b_0 + b_1\left(CT_{residual}\right) + b_2\left(RT_{residual}\right) + b_{controls}\text{Controls} \\ & + c_1\left(CT_{residual} \times BAS\right) + c_2\left(RT_{residual} \times BAS\right) + c_3\left(CT_{residual} \times MU\right) \\ & + c_4\left(RT_{residual} \times MU\right) + c_5\left(CT_{residual} \times BU\right) + c_6\left(RT_{residual} \times BU\right) + e. \end{aligned} \quad (3)$$




DOI: 10.1002/smj

Table 3. Standardized estimates of regression analyses

| Independent variables | Supplier performance | | | | | |
|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 |
| *Control variables* | | | | | | |
| Prior experience | 0.10† | 0.13* | 0.13* | 0.13* | 0.11† | 0.11† |
| Contracts | 0.31** | 0.20** | 0.22** | 0.20** | 0.18** | 0.20** |
| Monitoring | −0.35** | −0.16* | −0.15* | −0.17* | −0.16* | −0.17* |
| Private firm | 0.13† | 0.12† | 0.10 | 0.11† | 0.11† | 0.09 |
| State-owned firm | 0.00 | 0.00 | −0.02 | −0.01 | −0.03 | −0.05 |
| Buyer size | 0.09 | 0.08 | 0.08 | 0.08 | 0.09 | 0.09 |
| Supplier AS | 0.07 | 0.04 | 0.04 | 0.02 | 0.04 | 0.02 |
| Supplier importance | 0.22** | 0.14* | 0.13* | 0.14* | 0.13* | 0.12* |
| Mechanic | −0.07 | −0.02 | −0.02 | −0.01 | 0.01 | 0.01 |
| Heavy | −0.05 | −0.04 | −0.04 | −0.05 | −0.03 | −0.05 |
| *Guanxi* importance | 0.04 | 0.06 | 0.07 | 0.07 | 0.06 | 0.07 |
| *Direct effects* | | | | | | |
| Buyer asset specificity (AS) | | −0.03 | 0.00 | −0.02 | −0.04 | 0.00 |
| Supply market uncertainty (MU) | | 0.11† | 0.12* | 0.15* | 0.10† | 0.14* |
| Behavioral uncertainty (BU) | | −0.23** | −0.25** | −0.22** | −0.23** | −0.24** |
| Calculative trust (CT) | **H1a:** | 0.35** | 0.34** | 0.34** | 0.34** | 0.31** |
| Relational trust (RT) | **H1b:** | 0.12* | 0.13* | 0.13* | 0.14* | 0.11† |
| *Interactions* | | | | | | |
| CT × buyer AS | **H2a:** | | −0.16** | | | −0.15** |
| RT × buyer AS | **H2b:** | | 0.11* | | | 0.12* |
| CT × supply market uncertainty | **H3a:** | | | −0.14* | | −0.13* |
| RT × supply market uncertainty | **H3b:** | | | 0.12* | | 0.14* |
| CT × behavioral uncertainty | **H4a:** | | | | 0.13* | 0.14* |
| RT × behavioral uncertainty | **H4b:** | | | | 0.02 | 0.04 |
| Adjusted $R^2$ | 0.35 | 0.48 | 0.51 | 0.50 | 0.50 | 0.53 |
| $R^2$ change | | 0.13** | 0.03** | 0.02* | 0.02* | 0.05** |
| Highest VIF | 1.61 | 1.92 | 1.94 | 1.94 | 2.00 | 2.03 |
| Model F | 11.52 | 13.45 | 13.93 | 13.20 | 12.70 | 12.34 |
| DF | 11,199 | 16,194 | 18,192 | 18,192 | 18,192 | 22,188 |

**$p < 0.01$; *$p < 0.05$; †$p < 0.10$ (two-tailed)

it is high (b = 0.27, $p < 0.01$). These results suggest that calculative trust works better when buyer asset specificity is low, whereas relational trust is more effective when it is high.

For Hypothesis 3, calculative trust is strongly related to performance when market uncertainty is low (b = 0.53, $p < 0.01$). This effect is weaker when it is high (b = 0.22, $p < 0.05$). The effect of relational trust is positive when market uncertainty is high (b = 0.23, $p < 0.01$), but is insignificant when market uncertainty is low (b = -0.01, $p > 0.10$). These findings indicate that calculative trust is more effective when market uncertainty is low, whereas relational trust works better when it is high.

For Hypothesis 4, calculative trust relates more strongly to performance when behavioral uncertainty is high (b = 0.56, $p < 0.01$) than when it is low (b = 0.14, $p < 0.10$). Because the interaction between relational trust and behavioral uncertainty is insignificant, we did not conducted the simple slope test.

## Other effects

As Table 3 shows, prior experience and explicit contracts are positively related to supplier performance, which implies that both prior social relationships and explicit contracts foster better supplier performance. In contrast, monitoring is negatively related to supplier performance, indicating that it may reduce the autonomy of partners and lower their motivation to perform well. Supplier importance is also positively associated with performance, which suggests that more orders from the same supplier help improve its task performance.

Neither buyer nor supplier AS improves performance, which suggest that relational trust appears to



DOI: 10.1002/smj

influence the value-creation potential of AS. Market uncertainty positively affects supplier performance, but behavioral uncertainty negatively affects it. Market uncertainty appears to offer suppliers an opportunity to work hard and adapt to changes in ways that improve their performance; because our sample represents the major suppliers for each buyer, suppliers may see successful adaptation as a way to promote recognition and thus their reputation. Alternatively, when the buyer cannot observe the supplier's activities, suppliers seem to have less motivation to contribute because they cannot be evaluated and rewarded clearly.

## DISCUSSION

### Research implications

Interfirm business transactions rarely depend on only one source of trust (Das and Teng, 2001; Lewicki and Bunker, 1996; Rousseau *et al.,* 1998), yet research seldom examines different bases of trust. This is an important research gap because there is a longstanding debate regarding which form of trust is most reliable (e.g., Ring, 1996; Williamson, 1993), and whether the value of trust weakens when there are opportunities for deceit or change (e.g., Goerzen, 2007; Granovetter, 1985; Krishnan *et al.,* 2006; Poppo *et al.,* 2008b). Our study is among the few that distinguishes between calculative trust and relational trust, and our results contribute to this literature by demonstrating (1) the positive value of both forms of trust; (2) the distinct decision logic associated with each form of trust—accurate, deliberate calculation for calculative trust and a "we" heuristic for relational trust—reconciles prior views on when and whether reliance on trust may become more or less effectual; and (3) three boundary conditions, asset specificity, market uncertainty, and behavioral uncertainty, which influence the effectiveness of calculative trust and relational trust, often in opposing ways.

For most trust scholars, our empirical confirmation of the positive effects for both relational and calculative trust is not surprising. A number of empirical studies show that, at an aggregate level, trust is associated with positive outcomes (e.g., Artz and Brush, 2000; Gulati and Nickerson, 2008; Li *et al.,* 2010; Poppo and Zenger, 2002; Zaheer *et al.,* 1998). Yet, our results shows that calculative trust has a stronger effect than relational trust (its standardized estimate is almost two times larger than that for relational trust, see Table 3), showing the value of developing strong rewards and sanctions. Because significant human interaction and time are required to develop relational trust, this finding highlights the value of the lower-cost strategy of developing effective control/incentive systems. These findings contrast with Saparito *et al.* (2004), who found that relational trust, but not self-interest (i.e., calculative logic), reduces the likelihood of that customer's switch to another bank. Possibly, relational trust is more relevant to customers and to service sectors, whereas for buyer-supplier exchanges in manufacturing sectors, calculative trust is more effective at disciplining and directing the supplier's operational decisions to achieve product performance levels.

More importantly, our study helps resolve several ongoing debates regarding the situations that may erode or even augment the value of trust. By applying the decision logics associated with a reliance of calculative and relational trust against situations in which attributes of the transaction may evoke a unilateral, self-interested response, we show that the effectiveness of relational and calculative trust can be dampened or augmented, often in opposing ways. In line with recent developments (Lewicki and Brinsfield, 2011; McEvily, 2011), we posit that each form of trust influences ongoing decision making through different mental models or decision frames.

Trust represents a cognitive frame that directs problem solving by invoking either a cognitive heuristic (e.g., relational trust) or rational calculation (e.g., calculative trust). Because calculative trust induces performance by aligning incentives through rewards and punishment, a manager's course of action depends on how well the incentive structure directs desired behavior. For situations that are not supported and thus directed through such incentive alignment, performance necessarily declines. Relational trust drives performance through a social commitment to prioritize joint goals over individual interests—the heuristic "we" simplifies and facilitates ongoing decision making and should be broadly invariant to the typical suspects that derail economic exchange.

More pointedly, for calculative trust, we argue that the transaction characteristics of asset specificity and market uncertainty threaten the accuracy of a calculative logic. In contrast, for behavioral uncertainty, its accuracy augments its value. Consistent with this logic, we find that asset



DOI: 10.1002/smj

specificity and market uncertainty weaken the positive association of calculative trust with supplier performance, but behavioral uncertainty increases it. For example, when the buyer cannot easily reverse its sunk investment (e.g., asset specificity), calculative incentives, including punishment and repeat business, are less effectual: the supplier can hedge on performance without sanctions. Similarly, market uncertainty challenges the accuracy of a strong calculus because information is incomplete and changing; as a result, calculative trust relates less strongly to supplier performance. However, for unobservable supplier activities, well-structured incentives discipline supplier performance. This outcomes-based assessment highlights the repercussions of shoddy performance. Our interviews with a global supply manager at Logitech highlight this calculative logic: Logitech's managers told their Chinese suppliers that if they found a copy of Logitech's newest product model on the street, they would curtail the business relationship forever.

In contrast, relational trust has a stronger effect on performance in the presence of specialized assets or market uncertainty. Contrary to self-interest, relational trust appears to alter the meaning of specialization from self-interest to commitment, and alter subsequent actions from reneging to realizing transactional value. For market uncertainty, relational trust enables flexible and continuous adaptation, leading to better supplier performance. Surprisingly, we fail to find support for our hypothesis that relational trust relates more positively to supplier performance when behavioral uncertainty is high. According to Ouchi (1980), because shared identity aligns goals and because heuristic processing generates positive beliefs about each other's actions, relational trust should be most effective when there is behavioral uncertainty (see also Rousseau *et al.,* 1998). However, Granovetter (1985) cautions about the limits of relational trust and the inherent risk of embedded relationships: those who are closest to us are in the best position to deceive us. In balance, the potential positive and negative effects cancel out each other, resulting in an insignificant net effect.

Overall, our contingency findings challenge the assumption that trust helps reduce the risk arising from transactional attributes (e.g., Ring and Van de Ven, 1994; Rousseau *et al.,* 1998) and may clarify some seemingly conflicting findings on the value of social relationships (e.g., Goerzen, 2007; Krishnan *et al.,* 2006; Poppo *et al.,* 2008a) by showing it is necessary to match transactional attributes with the type of trust. In addition, by taking the buyer's perspective, our results suggest instances in which the buyer should or should not rely on its trusting perceptions given the transactional risk. This approach shows the value of taking a one-sided view of trust, rather than assuming the two sides in a dyad trust each other equally.

## Managerial implications

In practice, our results highlight the importance of establishing a strong calculus for cooperation—rewards and sanctions positively influence outcomes, namely, performance. While this finding is not surprising, as most companies regularly employ performance-level agreements and incentives for repeat or enlarged scope of business, our study also cautions against relying too narrowly on calculation. As evidenced by our data collection effort, many companies have sought to reduce transaction costs by focusing on their "most" important suppliers, and in doing so, they have the opportunity as they work with the suppliers to develop a shared "identity," or more practically, shared, bilateral vision and purpose. Our results point specifically to the value of relational trust when asset specificity and market uncertainty exist, and the value of calculative trust when behavioral uncertainty exists.

## Limitations and further research

Our focus on relational trust is based on the early works of Granovetter (1985) and Uzzi (1997), who criticize the transaction cost logic because its undersocialized view of exchange is problematic. Because we sought to clarify their position, we compared a calculative basis of trust, in which identity is not relevant, to relational trust, in which identity clearly matters (Lewicki *et al.,* 2006; Saparito *et al.,* 2004). Yet, other types of trust exist (McEvily and Tortoriello, 2011), and how they influence supply chain management is a nascent area of research (Malhotra and Lumineau, 2011). Given the likely importance of trust as an information processing shortcut and decision frame, we hope others will extend this line of inquiry.

A second focus of future research is to move beyond cross-sectional research designs to probe the dynamics of trust, relationships, and levels of analysis. Our cross-sectional, single respondent research design, like many in the literature, has



DOI: 10.1002/smj

established the importance of trust, but we know of little empirical work that highlights its dynamics. Case study work and experimental work have established some interesting views on the emergence of collaboration (Agarwal, Croson, and Mahoney, 2010; Faems, Janssens, and Van Looy, 2008), yet more work in this direction is needed to refine our understanding of what, if any, "rules" define how cooperation evolves in more complex economic exchanges (Schilke and Cook, 2013). In addition, our focus on a single respondent does not examine whether asymmetric views of trust exist, an interesting yet understudied topic in the literature (DeJong and Dirks, 2012; Graebner, 2009; Zaheer and Zaheer, 2006).

Despite the prominent role of trust in interfirm exchanges, its alternative bases are rarely empirically examined. Our study distinguishes between calculative trust and relational trust and highlights the value of this approach. While both are associated with greater performance, our results also demonstrate important boundary conditions. Three common situations that may undermine exchange performance dampen or augment the relationship between calculative/relational trust and performance, often in opposing ways. We hope that future work extends this inquiry.

## ACKNOWLEDGEMENTS

The authors thank two anonymous reviewers and Will Mitchell, editor, for their support and thoughtful comments. We also thank Oliver Schilke, John Lafkas, Hilary Schloemer, Zheng Cheng, and colleagues at Strategic Management Society and Academy of Management meetings for useful comments and discussion, and Hanbeen You for his research assistance. This study was supported by University of Kansas, School of Business International Research Grant and by the General Research Fund from the Research Grants Council, Hong Kong SAR Government (Project no. HKU 793613).

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## APPENDIX

Table A1. Measurement items and validity assessment (main model)

| **Calculative trust**: CR = 0.82, AVE = 0.61, HSV = 0.29 | Factor loading |
|---|---|
| 1. Considering rewards and punishments, both parties behave honestly in dealing with each other. | 0.84 |
| 2. The behavior of both parties is trustworthy because the costs and punishments of misconduct are very high. | 0.79 |
| 3. We expect the relationship with this supplier to continue for a long time. | 0.70 |
| **Relational trust**: CR = 0.89, AVE = 0.73, HSV = 0.27 | |
| 1. Both parties would let the other make decisions because we both think like one another. | 0.80 |
| 2. Both parties can effectively act for the other because both share the same understanding of what matters. | 0.87 |
| 3. Both parties are confident that their interests will be fully protected, because both share a common identity. | 0.89 |
| **Supplier performance**: CR = 0.92, AVE = 0.74, HSV = 0.29 | |
| Please rate this supplier's performance on the following aspect (1 = *needs great improvement*, 7 = *excellent*) | |
| 1. Product quality | 0.86 |
| 2. Timeliness of delivery | 0.84 |
| 3. Sales, service, and/or technical support | 0.88 |
| 4. Total value received | 0.85 |
| **Buyer asset specificity:** Please indicate the extent to which your firm has made investments or changes ***specifically to accommodate*** this supplier (1 = *none*, 7 = *a great deal*): CR = 0.90, AVE = 0.70, HSV = 0.24 | |
| 1. Product's features | 0.77 |
| 2. Personnel | 0.87 |
| 3. Inventory and distribution | 0.86 |
| 4. Capital equipment and tools | 0.83 |

Table A1. *Continued*

| **Supply market uncertainty**: CR = 0.85, AVE = 0.54, HSV = 0.19 | Factor loading |
|---|---|
| For this supply market, the following factors are changing (1 = *very infrequently*, 7 = *very frequently*) | |
| 1. Pricing | 0.46 |
| 2. Product feature and specifications | 0.78 |
| 3. Vendor support services | 0.84 |
| 4. Technology used by suppliers | 0.87 |
| 5. Product supply | 0.66 |
| **Behavioral uncertainty**: CR = 0.72, AVE = 0.57, HSV = 0.32 | |
| 1. It is difficult to evaluate if this supplier follows our recommended operating procedures. | 0.86 |
| 2. We don't have accurate reports about this supplier's activities. | 0.84 |
| **Supplier asset specificity:** Please indicate the extent to which the supplier has made investments or changes ***specifically to accommodate*** your request (1 = *none,* 7 = *a great deal*): CR = 0.88, AVE = 0.64, HSV = 0.24 | |
| 1. Product's features | 0.71 |
| 2. Personnel | 0.87 |
| 3. Inventory and distribution | 0.79 |
| 4. Capital equipment and tools | 0.83 |
| **Monitoring**: CR = 0.92, AVE = 0.80, HSV = 0.32 | |
| 1. We spend a lot of time to control quality and quantities of deliveries from this supplier. | 0.90 |
| 2. We watch this supplier closely to make sure on-time delivery occurs. | 0.93 |
| 3. We monitor the operational procedures of this supplier. | 0.86 |
| **Explicit contracts**: CR = 0.91, AVE = 0.71, HSV = 0.16 | |
| In dealing with this supplier, to what degree do you rely on the written contracts (as opposed to shared understanding) to specify (1 = *very low*, 7 = *very high*): | |
| 1. The role of each party | 0.78 |
| 2. The responsibility of each party | 0.92 |
| 3. How each party is to perform | 0.92 |
| 4. What will happen in the case of events occurring unplanned | 0.73 |
| ***Guanxi* importance**: CR = 0.86, AVE = 0.66, HSV = 0.10 | |
| 1. In this market, business depends on good connections with friends and family. | 0.84 |
| 2. In this market, *guanxi* is still very important. | 0.75 |
| 3. In this market, *guanxi* is a requirement for success. | 0.85 |
| **Model fit**: $\chi^2(515) = 1{,}105$, $p < 0.01$; CFI = 0.90, IFI = 0.90; RMSEA = 0.07 | |

CR = composite reliability; AVE = average variance extracted; HSV = highest shared variance with other constructs. If unspecified, the scales are anchored as 1 = *strongly disagree*, 7 = *strongly agree*.