What Is a Relationship Worth? Repeated Exchange and the Development and Deployment of Relational Capital

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Organization scholars have highlighted the value of relationships in fostering effective exchange, suggesting that repeated exchange creates a relational asset with latent value derived from elevated social connections, norms, and simple expectations of exchange continuity. Yet the empirical evidence supporting such claims remains largely indirect. As a consequence, few studies have been able to directly examine how contextual factors shape the accumulation of this relational asset or define its value in application. We directly measure the value of relationships between suppliers and a large buyer, using the buyer’s choices in Internet-enabled procurement auctions to estimate the degree to which stronger relationship histories with suppliers increase willingness to pay for high-volume commodity-like parts. Our setting also allows us to examine how this willingness to pay for relationships is shaped by the social context in which they develop and by the exchange context in which they are subsequently deployed, while minimizing the confounding influence any private individual interests have on the choice of exchange partners. Our empirical analysis suggests that, even for commodity parts, prior repeated exchange between firms constitutes a valuable relational asset. We also find evidence that suggests that both social mechanisms and incentive considerations underpin the value of relational capital. Further, we find that relational capital exhibits more value when exchange hazards are greater.

Key words: relational capital; procurement; buyer-supplier relationships; social capital; relational governance

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Introduction
An extensive literature in sociology, economics, and organization theory documents the important role that relationships play in supporting exchange. This research examines the effects of interorganizational relationships, measured as a historic pattern of exchange, on a variety of outcomes such as the structure of contractual agreements (e.g., Gulati 1995a, Anand and Khanna 2000, Poppo and Zenger 2002, Vanneste and Puranam 2010), the selection of exchange partners (e.g., Levinthal and Fichman 1988, Gulati 1995b), and the performance of alliances (e.g., Seabright et al. 1992, Zollo et al. 2002). A common explicit or implicit conclusion across this broad literature is that patterns of repeated exchange create a relational asset (Arrijo et al. 2001), sometimes called relational capital (Kale et al. 2000),1 with latent value derived from elevated social connections, norms, trust, and simple expectations of exchange continuity. Moreover, prior literature highlights factors that promote the development of relational capital, and prior literature, largely in transactions cost economics, defines factors that influence its value when deployed. However, despite the economic importance of this relational asset to a range of exchange outcomes, few studies have been able to measure or infer directly the economic value that accrues within these relationships of repeated exchange. As a consequence, few studies have been able to directly measure how contextual factors shape the development of this relational asset or define how its value in deployment varies by exchange context.2

The dearth of studies of this type (for exceptions, see Bidwell and Fernandez-Mateo 2010, Chatain 2011) reflects several significant empirical challenges in measuring the latent value in exchange relationships. First, measuring value developed through a pattern of exchange requires unusual data. Although we commonly examine and observe the exchanges selected by firms, inferring the value assigned to a given exchange relationship also requires data on alternative exchanges and prices proposed but not selected. Second, the choice of exchange partners is made by individuals—individuals who may have private interests in the choice of exchange partners that diverge from the interests of the firm, or more precisely, from its owners. Thus, a pattern of repeated interorganizational exchange generates both efficiency benefits to the firm and private benefits to individuals within the firm. Private and firm-level efficiency benefits are theoretically intertwined, but they are by no means fully overlapping. Consequently, estimates of firm-level economic value in exchange may be distorted by the influence of these private benefits. Third, idiosyncratic factors that are unobservable to the researcher may shape initial choices that then persist and thereby render the assignment of value to relationships a purely spurious outcome. In particular, variation in the capability of
suppliers may shape both initial decisions and their persistence, thereby contaminating efforts to estimate value in relationships.

In this paper, we exploit a unique setting that enables us to overcome or at least minimize these impediments to measuring the value associated with a history of repeated exchange. We perform an in-depth study of the procurement patterns of a large industrial manufacturer. We examine how this manufacturer allocates multiyear supply contracts for nearly $60 million\(^7\) of its highest volume and most commodity-like parts. Our study focuses on parts sourced by this manufacturer via Internet-enabled reverse auctions, which provide extensive data about the supplier bids that are both accepted and rejected, including the price offers of each.\(^4\) Although in many procurement settings the buyer’s representatives have the opportunity to significantly skew the selection of supplier toward friends (Uzzi 1997) by concealing price information or failing to negotiate aggressively with other potential suppliers (Eccles 1981, Gargiulo and Benassi 1999, Anderson and Jap 2005, Villena et al. 2011), in our setting, considerable efforts have been taken to reduce the scope for this type of agency problem to affect supplier selection. For instance, prices are made fully transparent to each of the bidding suppliers and are observable to all members of the buying organization. Moreover, supplier selection is placed in the hands of corporate or division-level professionals rather than plant-level managers, with selection decisions carefully scrutinized by a central procurement office. Although it does not eliminate the possibility of distortions in prices and supplier selection, this removal of decision authority from those possessing the relationships limits the scope for private benefits or friendship ties to influence these outcomes, and it provides us with additional confidence that the results we report reflect relationships’ true economic value to the firm.\(^5\)

A final attractive feature of this setting is that the prescreening of suppliers limits the degree to which measurements of relationship value can be driven by (unobserved) quality differences in production among suppliers, yet the length and exclusivity of the contracts put up for bid still provides the opportunity for relationships to create value. The buyer we study employed technical experts to prescreen each potential supplier, and it limited bidders in each reverse auction only to suppliers that were designated as fully capable of fulfilling these contracts. Therefore, we do not observe bids from suppliers whose production quality levels are too low. Moreover, as we argue in greater detail below, for these parts, the ability to provide higher quality than what is required for the end product has little impact on supplier choice, as these differences do not enable the manufacturer to raise prices to its end customers.

Although prescreening addresses the asymmetric information problem regarding the supplier’s capabilities to perform, a moral hazard problem remains. The supplier retains considerable latitude in choosing effort that shapes quality over the lifetime of the contract, in choosing its willingness to adapt to demand conditions or supply disruptions, and in choosing to support supply chain optimization. Thus, the buyer still must assess which suppliers will choose to perform on these dimensions, including making the necessary and agreed-upon firm-specific investments (Williamson 1985, Klein et al. 1978). Failure to make such firm-specific investments can be considered a form of holdup, as discussed in the transactions cost literature. Our theorizing and empirical analysis, therefore, focuses on how prior exchange relationships affect the manufacturer’s forward-looking assessment of value in relationships—value that reflects both the likelihood and the cost of these potential pitfalls.

With the ability to measure the value associated with historical exchange in this unique setting, we then address how the conditions under which historical exchange occurred shape the formation of relational capital and how governance challenges influence the perceived value of this latent relational asset when deployed in support of exchange.\(^6\) Thus, we examine two key sets of questions suggested by the literature. First, how does the social context in which repeated exchange occurs affect the development of relational capital? Specifically, we argue that closer physical proximity, shared language, and stable production technology promote more rapid accumulation of value through repeated exchange. Our empirical analysis of this question contributes to the literature that examines factors that affect the development of trust and social capital through repeated interaction (e.g., Gulati and Szymanski 1998, Popo et al. 2008, Vanbeeste et al. 2012). Second, how do exchange attributes influence the value generated by prior repeated exchange? Here, we draw on prior literature that predicts these attributes affect the value generated by prior exchange. Here, we draw on prior literature that predicts that relationships have greater value when exchange hazards increase. Specifically, we draw on transaction cost economics to suggest that exchanges requiring specialized assets, involving demand uncertainty, or involving the production of complex parts elevate the value of historic patterns of exchange. Our well-documented, granular analysis of the impact of exchange hazards on the value of relationships contributes to the transaction cost literature, which has mainly focused on how relationships affect the choice of governance mode, rather than on how these relationships provide differential value with a single mode.

We estimate the impact of historic patterns of exchange on supplier selection using a discrete choice model (McFadden 1973), similar to Hoetker (2005). Our analysis yields a number of insights. First, we find evidence that the presence of a historic pattern of exchange with a supplier raises the value to the buyer of selecting that supplier, even when procuring well-specified, highly standardized parts in a setting geared toward cost
reductions. We calculate that the increase in willingness to pay associated with a 1% increase in relationship length is 0.04%–0.13% and 0.01%–0.04% (95% confidence intervals) for a 1% increase in the dollar value of prior exchange in this setting. We perform numerous robustness checks that demonstrate the stability of these figures across alternative measurements of relationship history and validate that they are not the result of purely spurious correlation. Our findings complement those of Dyer and Chu (2003), who find that in the auto industry, suppliers who trust a buyer economize on ex post governance costs. Second, we find evidence that prior exchange exerts greater influence on subsequent supplier selection when these prior exchanges were conducted with suppliers that share a common language, that are more proximate, and that have greater expectations about exchange continuity. These results suggest that valuable relational assets accrue as a function of social connections and that the development of these connections is more likely to occur when the shadow of the future is stronger. Thus, similar to the findings of Agarwal et al. (2010) in the laboratory, our evidence suggests that scholars should pay attention to both social and incentive-based considerations in explaining the value generated by relationships. Finally, we present evidence that historic patterns of exchange with a supplier raise its value to the buyer more for subsequent exchanges defined by more severe exchange hazards. Consistent with theories of vertical integration (Klein et al. 1978, Williamson 1985), prior exchange is given more weight in partner selection for exchanges that require investment in relationship-specific assets. A one-standard-deviation increase in our measure of asset specificity increases the importance of relationship history by roughly 50%. Although Gulati and Nickerson (2008) show that interorganizational trust has a differential impact across different discrete transactional modes (i.e., make, buy, or ally), our results suggest that the value of relationships varies within a discrete alternative as well.

Theory and Hypotheses

We focus our theoretical development on explaining the relationships among historical patterns of exchange, buyer willingness to pay, and supplier selection in an online industrial procurement setting. Prior literature drawing from both economics and sociology suggests that buyers will likely prefer potential suppliers with whom they have a history of prior exchange. The sociological line of reasoning argues that repeated interaction generates a latent asset with the potential to deliver value in future exchange. The origin of this valuable relational asset stems from the simple fact that repeated exchanges form embedded social relationships (Granovetter 1985). Through repeated exchange, social relations across organizations deepen. This promotes norms of flexibility, supports information exchange, and generates commitment to mutual problem solving, all of which facilitate the requisite adaptation vital to sustained and effective exchange (Uzzi 1997, Dyer and Singh 1998, Poppo and Zenger 2002). Repeated exchange also promotes personal attachments among individuals within these organizations (Dore 1983, Gerlach 1992) that further support the required adaptation. As exchange partners accumulate a shared history, the resulting trust generates an expectation of future behavior that, as Bradach and Eccles (1989, p. 104) describe, “alleviates the fear that one’s exchange partner will act opportunistically.” Kale et al. (2000, p. 221) label this asset “relational capital” and argue that it emerges through “a history of close relationships” and resides in individual-level attachments that support “mutual trust, respect, and friendship.”

A separate line of reasoning focuses simply on how repeated exchange affects incentives to perform ex post. A history of exchange may affect expectations about the likelihood of future exchange (Parkhe 1993), which in turn affects the present value of cooperation relative to shirking on the agreement (Klein and Leffler 1981, Bull 1987, MacLeod 2007). Recently, more nuanced game-theoretic arguments have been advanced that connect more directly with the sociological view. Chassang (2010, p. 448), for example, shows that as common history grows, a less-well-informed player learns to monitor its partner, which “allows players to establish more efficient cooperative routines.” In another view, managers over time develop potentially path-dependent “relational contracts” that facilitate better ex post performance when cooperation is voluntary (Gibbons 2010, Gibbons and Henderson 2013). Thus, partner-specific knowledge or routines and relational contracts between organizations develop in a history-dependent way and may comprise valuable, if intangible, relational assets as well.

In summary, a broad consensus across a wide range of literature argues that continued and repeated exchange generates a valuable asset that is both “created and leveraged through relationships” (Nahapiet and Ghoshal 1998, p. 244), that provides assurances against the threat of ex post opportunism, and that facilitates adaptation and problem solving. Suppliers with which the buyer has had more extensive repeated exchange are more likely to have codeveloped these relational assets and should therefore be more appealing to the buyer than other suppliers. Thus, we hypothesize the following.

**Hypothesis 1 (H1). A history of repeated exchange, i.e., a relationship history, with a supplier raises the buyer’s willingness to pay for the supplier’s parts, ceteris paribus.**

**Determinants of the Formation of Relational Capital Through Repeated Exchange**

We expect valuable relational capital to accumulate with repeated exchange, but the context in which these
exchanges occur may significantly affect the pace at which value accumulates (see Vanneste et al. 2012 for a meta-analysis of these phenomena). In other words, some histories of repeated exchange are more likely to generate valuable relational assets than others. We developed focused hypotheses for our setting here based on two key contextual factors highlighted in the literature: the level of future expectations for exchange and the social context in which exchange occurs. In many ways, these have emerged as alternative explanations for the origin of value in repeated exchange. With a measure of value in relationships, we can examine the role of each of these mechanisms.

Expectations of future exchange that operate during the period of repeated exchange may shape the investments that each party makes to joint problem solving. Alternatively, these expectations may simply influence the strength of interpersonal ties that form and the degree of trust that emerges. In no small part, the choice between sustained long-term cooperation and short-term self-interested behavior depends on an agent’s view of the time horizon for future exchange (Heide and Miner 1992). In particular, factors that undermine expectations of relationship continuity hinder—or even render ineffective—efforts to develop relationship-specific assets (Azoulay et al. 2010).

The technological environment is a key factor that shapes expectations of continuity. Technological uncertainty, or turbulence, shifts the relative value of suppliers’ underlying production technologies and with it the buyer’s preferences for exchange partners (Afuah 2000, Rowley et al. 2000, Lazzarini et al. 2008). Such turbulence in underlying production technology causes sellers to adjust their expectations of the time horizon over which buyers will persist in seeking exchange with them. A technological change, for example, may cause buyers to switch to an entirely new technology outside the existing supplier’s area of expertise. As a consequence, the presence of technological turbulence in regard to the technology associated with a given part may diminish the value that accumulates through exchange relationships. By contrast, when the technology surrounding a particular part involves low technological uncertainty or low turbulence, where buyers are confident that existing suppliers will remain capable in the future, the shadow of the future extends, and repeated exchange is more likely to generate relational assets of substantial value. Thus, we hypothesize as follows.

Hypothesis 2 (H2). Ceteris paribus, when technological change limits the shadow of the future, repeated exchange (relationship history) raises the buyer’s willingness to pay for the supplier’s parts at a slower rate.

As noted above, a broad literature suggests that relational assets are embedded in social mechanisms and individual-level attachments. Stronger social ties are associated with a greater capacity for the relationship to generate value (Nahapiet and Ghoshal 1998), and both formal and informal socialization processes can improve the development of relational capital (Cousins et al. 2006). Two factors that moderate the development of social ties through repeated exchange are common language and distance. Language barriers increase the cost of developing social relations (Maynard and Peräkylä 2006). Similarly, physical proximity increases the likelihood of social interactions (Gieryn 2000) and has been shown to influence the formation of friendships (Marmaros and Sacerdoti 2006) and network structures (Liu 2009). If social attachments are a primary vehicle through which productive future exchange relationships are supported, then a given exchange history should lead to the development of higher levels of relational capital if conducted with suppliers who share a common language and with suppliers who are located close to the buyer. Therefore, we hypothesize the following.

Hypothesis 3A (H3A). Ceteris paribus, when a common language facilitates communication and interaction, a history of repeated exchange with a supplier raises the buyer’s willingness to pay for the supplier’s parts at a faster rate.

Hypothesis 3B (H3B). Ceteris paribus, when close proximity reduces the costs of engaging in social interactions, a history of repeated exchange with a supplier raises the buyer’s willingness to pay for the supplier’s parts at a faster rate.

Determinants of Relational Capital’s Value in Use

While the rate at which value accrues in a relationship may depend on the social context and expectations of continuity, the value of any given relational asset derived from a historic exchange relationship will depend on the exchange setting to which it is applied. Thus, consistent with transaction cost logic, relational capital generated from prior exchange is more valuable for some exchanges than for others. Implicit (or explicit) in much of the literature on interorganizational relations is the principle that firms match the scope of relational embeddedness to the attributes of an exchange or task (Uzzi 1997). Prior work demonstrates a link between the presence of complex or hazardous exchange and the use of governance forms that promote sustained exchange relations (Poppo and Zenger 2002, Pisano et al. 1988, Pisano 1989, Gulati 1995a, Lazzarini et al. 2004). Gulati and Nickerson (2008) extend this reasoning and show that when exchange hazards necessitate that transactions be conducted in an alliance rather than at arms’ length, interorganizational trust has a greater impact on transaction performance (see also Puranam and Vanneste 2009). We suspect that relational capital functions similarly; i.e., it serves as a mechanism for governing hazardous exchange. Prior exchange should be associated with a
greater increase in the likelihood of selection (i.e., is more valuable) in settings where exchange hazards are more substantial than where exchange hazards are rather trivial. We briefly articulate three exchange attributes that affect the value of relational capital in our procurement setting.

First, the value in relationships should be shaped by the complexity of the part or product to be supplied. The more complex the part or product, the more problematic the scope of exchange hazards. Under these circumstances, there is simply more that can go wrong in production, and there are more details and contingencies that must be addressed in the process of contracting (Masten 1984). With a complex part, small deviations from product specifications may render the parts unusable. Thus, to rely solely on contracts to support such an exchange requires exceedingly precise measurement and assessment of quality. However, when products are complex, measuring their quality may be exceptionally costly (Barzel 1982). Costly measurement reduces the effectiveness of courts in distinguishing between competing arguments of the buyer and supplier (Tirole 1999). As a result, the threat of shading on quality and of postcontractual holdup by the supplier increase with increased complexity (Williamson 1985). Consequently, in such a setting, a history of exchange and the relational asset that it generates may alleviate fears of (and incentives for) opportunistic behavior. Thus we hypothesize as follows.

**Hypothesis 4A (H4A).** *Ceteris paribus, the greater the complexity of the parts, the more a history of repeated exchange with a supplier raises the buyer’s willingness to pay for the supplier’s parts.*

Second, the need for buyer-specific investments in production equipment and human capital may also elevate the value of a history of repeated exchange. Such investments enhance the capability of the supplier to satisfy the buyer’s needs. These investments are typically made ex post, i.e., after a contractual agreement to exchange is reached. Because such investments have limited or no application when deployed in alternative uses, sellers (or buyers) fear that any returns they receive from investing in these assets will be appropriated by the buyer (or seller) through postcontractual renegotiations (Klein et al. 1978, Williamson 1985). Consequently, both the buyer and seller are reluctant to make investments in the absence of adequate safeguards (Klein et al. 1978). Although vertical integration is a common remedy, the presence of relational capital offers an alternative governance remedy to support and safeguard these forms of cospecialization and capability-enhancing investments (Gulati 1995b, Jones et al. 1997). Expectations of continuity, reciprocity norms, and personal attachments embedded in this relational asset provide suppliers with economic incentives to make these investments after agreeing to terms. Confidence in the expected longevity of the exchange provides the time horizon necessary to accumulate the return required to justify cospecialized investments. Similarly, common language or interorganizational routines that emerge through repeated interaction may lower the costs of making and monitoring these investments (Monteverde 1995, Dyer and Singh 1998). Consequently, when exchange requires cospecialization, buyers place particular value on suppliers with whom they possess a historic pattern of exchange. Thus, we hypothesize the following.

**Hypothesis 4B (H4B).** *Ceteris paribus, the greater the need for investment in relationship-specific assets (asset specificity) to produce the parts, the more a history of repeated exchange with a supplier raises the buyer’s willingness to pay for the supplier’s parts.*

Third, the need for adaptation in an exchange may also elevate the value of a historical exchange relationship. Efficient adaptation is a key feature of successful buyer–supplier relationships (Williamson 1985). Adaptation is of particularly great value in the face of demand shocks. As buyers confront fluctuations in demand for their own products, these fluctuations are passed along to suppliers in the form of reduced or accelerated demand for suppliers’ output. Such uncertainty precipitates a need for a supplier to adapt by increasing or decreasing output or by holding inventory to accommodate these fluctuations. Thus, if demand for the exchanged product is highly uncertain and volatile, buyers will particularly value suppliers with incentives or a propensity to adapt flexibly to both the peaks and valleys in demand. Relational capital developed through prior exchange provides buyers with confidence in the supplier’s incentives and general propensity to adapt. Hence, we hypothesize the following.

**Hypothesis 4C (H4C).** *Ceteris paribus, the greater the difficulty in predicting demand (demand variability) for a given part, the more a history of repeated exchange with a supplier raises the buyer’s willingness to pay.*

**Empirical Setting**

We test these hypotheses by examining the procurement operations of a large, global diversified manufacturing company in the midwestern United States. We refer to this company as Buyco. We focus on the subset of parts that Buyco procures via online procurement auctions (or “reverse auctions”). Today most large industrial firms use online procurement auctions to acquire significant portions of their inputs (Tunca and Wu 2009). In a typical online reverse auction, a buyer specifies a particular product or service it seeks to procure and then invites suppliers, often prequalified, to submit bids electronically to supply given quantities of these inputs. Suppliers
observe others’ bids and, if they choose, submit progressively lower bids in response. In a typical auction, bid prices rapidly fall immediately prior to the close. For buyers, the benefits of online procurement auctions relative to bilateral negotiations include broadening the supplier base by enabling suppliers in distant locations to compete more easily, economizing on time spent communicating and negotiating with potential suppliers, and reducing product costs as a result of increased competition and bid transparency (Jap 2002). Suppliers may benefit as well, as personnel costs and commissions related to sales and contract negotiations are reduced. Several studies suggest that reverse auctions are more likely to be successful (and therefore more likely to be adopted) when the products or services to be procured are easily specified (Jap 2002, Smeltzer and Carr 2003) and when the required degree of prior cospecialization is limited (Argyres and Zenger 2012), thereby rendering multiple parties capable of supplying the part (Emiliani and Stec 2002, Jap 2003).

Starting in 2000, Buyco emerged as one of the country’s larger users of Internet-enabled reverse auctions, with the clear objective of reducing procurement costs. Based on interviews with procurement personnel, Buyco believed that that Internet-enabled reverse auctions would identify and attract new suppliers and enable Buyco to extract price reductions from existing suppliers with which it had established relationships. By 2006, a significant fraction of Buyco’s total procurement of components and services occurred through reverse auctions. Consistent with the prior work cited above, parts that required very high degrees of design innovation, ongoing design integration, or cospecialization were unlikely to be procured via reverse auction.¹⁰ Thus, compared with studies that examine the procurement of innovative components (Hoetker 2005), information technology services (Vanneste and Puranam 2010), or legal services (Chatain 2011), these are not transactions for which relationships should be expected, a priori, to carry tremendous value.

Buyco invested heavily in staff and systems to support the use of reverse auctions across its businesses. It created a procurement department in the corporate office that was responsible for training division managers to conduct reverse auctions, sharing best practices in procurement across the organization, qualifying potential suppliers, and coordinating reverse auctions for parts used by multiple divisions. A procurement auction, or competitive bid event (CBE), as Buyco labeled it, began by identifying bundles of items that Buyco believed could be efficiently supplied by a single supplier. A given CBE could include a single bundle of such products or several bundles. Buyco typically restricted the bundles in a CBE to a single narrowly defined commodity category (e.g., plastic parts, stamped parts, fasteners). Once a common bundle or set of bundles was identified, Buyco scheduled a CBE. These events were not strictly reverse auctions, because frequently the lowest bidder was not awarded the business. Rather, Buyco used the event to solicit bids from invited suppliers.

For each bundle of products, information was provided to each invited bidder about supply requirements, including technical drawings, quality specifications, delivery requirements, and demand forecasts. A detailed contract, specifying the length of the agreement, monitoring rights, and enforcement clauses, was also provided. Bidding was conducted for all bundles in a CBE concurrently, although the scheduled end time for each bundle sometimes differed by a few minutes. Suppliers entered bids separately for each bundle that they wished to supply. These bids reflected the delivered price to Buyco. Bidder firms observed the levels of others’ bids in some cases, and in other cases, they observed only their rank relative to rivals’ bids. Once Buyco selected a supplier as the winner, final bids and other contract terms were binding for Buyco and the winning supplier. The majority of contracts specified prices and other terms of exchange for three years.¹¹

Prequalification of Suppliers

Buyco established a list of invited suppliers through a process of prequalification, restricting the bid events only to those firms assessed to have the capabilities to produce and deliver procured items at the quality levels and quantities needed. According to standard documents provided by Buyco to potential bidders,

[Buyco] has rigorously reviewed supplier information to determine which suppliers are qualified to participate in this bid opportunity. Qualified suppliers have been invited to bid on a [bundle-by-bundle] basis. [Buyco], working with [auctioneer], will grant [bundle]-level access to suppliers.

The process of prequalifying suppliers was performed by a dedicated team of procurement professionals, who traveled extensively to evaluate suppliers. Limiting the bidding only to suppliers believed to be capable of fulfilling the contract was deemed to be important for the integrity of the auction.¹²

Selection of Supplier

Following the close of the auction, Buyco selected a single supplier for each bundle in the CBE based on price and other relevant factors, including, presumably, relational capital with the supplier.¹³ Awards for CBEs conducted at the corporate level often involved consultation between corporate procurement officers and divisional staff, and a consensus agreement was reached about which supplier would be awarded the supply contract. For CBEs conducted at the division level, divisional supply chain managers acting on behalf of plant managers and division general managers chose the supplier.
In interviews, corporate procurement managers indicated that although they remained wary about the potential for division managers to overpay for familiar suppliers (because of friendship ties or risk aversion), the electronic sourcing system “forced more discipline” on supplier choice by “shining a light on decisions in a much more public way [than sealed negotiations].” According to one procurement manager, division managers would “need to have a good explanation when not awarding to the low bidder,” and “anything that is not quantifiable [is] looked at very critically.” The collaborative nature of the selection process, transparency of alternatives and decisions, and organizational norms requiring careful justification of supplier choice all worked together to limit the influence of private benefits or personal affinity on partner selection.14

From our discussions with Buyco personnel, it was clear that although prequalification limited bidding to suppliers expected to be capable of meeting Buyco’s quality standards, residual uncertainty remained about (a) whether the supplier would choose to deliver high quality over the lifetime of the agreement, (b) whether it could adjust rapidly to swings in end-customer demand and be willing to take back inventory if requested, (c) whether it would make appropriate investments to help Buyco optimize the supply chain, and (d) whether the supplier would respond appropriately to unforeseen crises, including whether it would assist if crises hit other suppliers.15 Moreover, inside the organization, it was thought that “friends” were likely to be more reliable, more flexible, and more valuable in the face of crises.16 Further, our discussions also revealed that although some bidders might be capable of producing at quality levels that exceeded those specified by the auction documents, excess quality was used as a tiebreaker rather than as a rationale for paying a higher price. In general, Buyco set quality levels in response to end-customer requirements and believed it unlikely that they could pass on higher costs to customers for quality levels that exceeded these requirements.

Data and Methods

In the following analysis, we examined bids and bidder selection for 562 bundles of items procured through 189 CBEs. These CBEs were conducted during an 18-month period covering April 2005 to September 2006. We focused on economically important transactions, limiting our attention to bid events for which the prior historical spending exceeded $40,000 annually. To reduce an additional source of undesirable heterogeneity, we focused only on items used directly in the manufacturing of final goods sold by Buyco. Thus, we eliminated from consideration auctions for services and indirect (overhead) expenses.17 Table 1 reports summary statistics for all dependent and independent variables as well as their correlations. We describe each variable below.

Dependent Variable

We index bundles by $i$ and bidders by $j$. We index CBEs with $m$. As multiple bundles may be procured during a single CBE, $i$ is nested within $m$. In the discussion below, we use $m$ when necessary to indicate that the relevant variation occurs across CBEs rather than across bundles.

For each of the 562 bundles in our sample, we recorded the identity of each bidder that submitted a valid bid prior to the close of each auction. These data were manually extracted from Web pages generated by the application service provider that managed Buyco’s online auctions. To ascertain the identity of the winning supplier, we matched the bid data with a management database provided to us by Buyco. Observations in the sample are formed by bidder–bundle pairs. For each bidder–bundle pair, the dependent variable, $y_{ij}$, takes on the value 1 if the bidder $j$ is awarded the contract to supply bundle $i$ and 0 if $j$ places a valid bid for item $i$ but does not win. (If $j$ does not bid on $i$, the bidder–bundle pair does not form an observation.) On average, there are nearly 5.4 bidders per bundle. As a single bidder is chosen for each bundle, the mean value of the dependent variable is 0.185.

Independent Variables

Relationship History. We measured the extent of prior exchange between Buyco and supplier $j$ at the time of the CBE $m$ in three distinct ways: a dummy variable indicating whether any commercial relationship existed between Buyco and the supplier in the four quarters preceding the bid event (any relationship $j_m$), the dollar value of sales from the supplier to Buyco during that time (a measure of relationship intensity, log(sales $j_m$)), and the number of consecutive quarters in which the supplier and Buyco had an exchange relationship at the time of the bid event (a measure of relationship length, log(length $j_m$)). We refer to these measures as $h_{jm}$. To obtain these measures, we employed a central accounting database used by Buyco that contains monthly data on the dollar value of all transactions with parts suppliers from 2002 to midyear 2006.18 In all, this database contained more than a million transactions with more than 20,000 distinct suppliers. We used text-matching algorithms and visual inspection to correct for different spellings of suppliers in this database, an unfortunately common occurrence. We aggregated the part-level data to create a cumulative measure of each distinct supplier’s quarterly dollar sales to Buyco. Of the 944 unique bidders in our data set, 55% had prior exchange relations with Buyco between 2002 and 2006. Thirty-eight percent of the bidders had yearly average transactions in excess of $100,000, and 17% had yearly average transactions in excess of $1 million. Because this database did not provide historic exchange information...
Table 1 Descriptive Statistics and Correlations for Analysis of Bidder Selection

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<td>(1) Bidder wins the auction</td>
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<td>(2) Any relationship (in prior four quarters?) (1=yes)</td>
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<td>(3) Log(sales) (in prior four quarters + 1,000)</td>
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<td>3.41</td>
<td>0.134</td>
<td>0.859</td>
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</tr>
<tr>
<td>(4) Log(length) (in consecutive quarters with sales to Buyco + 1)</td>
<td>1.24</td>
<td>1.18</td>
<td>0.133</td>
<td>0.885</td>
<td>0.927</td>
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</tr>
<tr>
<td>(5) Log(bid) (in U.S.$)</td>
<td>11.84</td>
<td>1.37</td>
<td>-0.099</td>
<td>-0.013</td>
<td>-0.011</td>
<td>-0.028</td>
<td></td>
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</tr>
<tr>
<td>(6) Multinational</td>
<td>0.270</td>
<td>0.444</td>
<td>0.019</td>
<td>0.238</td>
<td>0.167</td>
<td>0.160</td>
<td>0.084</td>
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</tr>
<tr>
<td>(7) Log(distance) (between bidder HQ and Buyco HQ; in miles)</td>
<td>7.84</td>
<td>1.33</td>
<td>-0.099</td>
<td>-0.197</td>
<td>-0.221</td>
<td>-0.240</td>
<td>-0.054</td>
<td>0.073</td>
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</tr>
<tr>
<td>(8) Corruption Perceptions Index (2006)</td>
<td>5.78</td>
<td>1.93</td>
<td>0.317</td>
<td>0.317</td>
<td>0.258</td>
<td>0.290</td>
<td>0.025</td>
<td>0.341</td>
<td>-0.542</td>
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</tr>
<tr>
<td>(9) Log(savings) (for other items in the same CBE)</td>
<td>8.46</td>
<td>2.03</td>
<td>0.068</td>
<td>-0.092</td>
<td>-0.084</td>
<td>-0.111</td>
<td>-0.117</td>
<td>-0.129</td>
<td>0.160</td>
<td>-0.194</td>
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</tr>
<tr>
<td>(10) Log(other bids) (for other items in the same CBE)</td>
<td>1.35</td>
<td>0.874</td>
<td>-0.010</td>
<td>-0.076</td>
<td>-0.031</td>
<td>-0.066</td>
<td>-0.278</td>
<td>-0.129</td>
<td>0.098</td>
<td>-0.195</td>
<td>0.307</td>
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</tr>
<tr>
<td>(11) Technological change</td>
<td>0.399</td>
<td>0.956</td>
<td>-0.077</td>
<td>0.040</td>
<td>0.050</td>
<td>0.042</td>
<td>-0.048</td>
<td>-0.058</td>
<td>0.144</td>
<td>-0.100</td>
<td>0.049</td>
<td>-0.278</td>
<td></td>
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</tr>
<tr>
<td>(12) Common language</td>
<td>0.475</td>
<td>0.499</td>
<td>0.083</td>
<td>0.234</td>
<td>0.242</td>
<td>0.271</td>
<td>0.047</td>
<td>0.011</td>
<td>-0.611</td>
<td>0.646</td>
<td>-0.143</td>
<td>-0.105</td>
<td>-0.128</td>
<td></td>
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<tr>
<td>(13) Close proximity</td>
<td>0.482</td>
<td>0.500</td>
<td>0.213</td>
<td>0.212</td>
<td>0.206</td>
<td>0.248</td>
<td>0.042</td>
<td>-0.063</td>
<td>-0.824</td>
<td>0.606</td>
<td>-0.211</td>
<td>-0.181</td>
<td>-0.173</td>
<td>0.778</td>
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<tr>
<td>(14) Complexity</td>
<td>0.336</td>
<td>0.958</td>
<td>-0.094</td>
<td>0.037</td>
<td>0.057</td>
<td>0.052</td>
<td>0.059</td>
<td>-0.024</td>
<td>0.059</td>
<td>-0.010</td>
<td>0.071</td>
<td>0.188</td>
<td>0.678</td>
<td>-0.042</td>
<td>-0.101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(15) Asset specificity</td>
<td>0.312</td>
<td>0.972</td>
<td>-0.109</td>
<td>0.005</td>
<td>-0.313</td>
<td>0.030</td>
<td>0.123</td>
<td>-0.046</td>
<td>0.084</td>
<td>-0.068</td>
<td>0.050</td>
<td>0.046</td>
<td>0.542</td>
<td>-0.082</td>
<td>-0.155</td>
<td>0.600</td>
<td></td>
</tr>
<tr>
<td>(16) Demand predictability</td>
<td>0.250</td>
<td>1.05</td>
<td>-0.045</td>
<td>0.079</td>
<td>0.044</td>
<td>0.066</td>
<td>-0.081</td>
<td>-0.040</td>
<td>-0.052</td>
<td>0.043</td>
<td>-0.006</td>
<td>0.119</td>
<td>0.404</td>
<td>0.031</td>
<td>-0.021</td>
<td>0.463</td>
<td>0.462</td>
</tr>
</tbody>
</table>

Notes: N = 3,029. For Corruption Perceptions Index, higher scores indicate lower levels of corruption. Correlations with absolute value greater than 0.035 are statistically significant at the p < 0.05 level.
prior to 2002, we top-coded the relationship length measure at 12 quarters. The mean relationship length measure in the sample is 3.5 quarters, and the median is 4. In Table 1, we report the natural logs of both measures, shifted by a constant to avoid taking the log of 0 (when no relationship exists).

**Offered Price.** For each bid, we obtained \( bid_{ij} \), the value of the bid in U.S. dollars, from the online auctioneer. This value reflects the product of unit price offered by the bidder and the number of units that Buyco anticipates purchasing. The mean bid in the sample is $138,700, and the mean winning bid is $103,770. Bids range as low as $1,000 and as high as $8 million. In the analysis, we employ the natural log of \( bid_{ij} \) to focus on percent differences in price and to reduce potential heteroskedasticity. We include bid price, of course, primarily as a control variable; incorporating it into the analysis allows us to calibrate the relative importance of relationship history.

**Expectations of Continuity and Governance Hazards.** We developed assessments of expectations of continuity and governance hazards through expert ratings of the attributes of items in a CBE. Building on prior empirical work in transaction cost economics, we developed and administered a questionnaire to procurement experts at Buyco. We pretested our questionnaire with a cross-functional team at Buyco that included both engineers and procurement experts to ensure that our questions were well understood. Based on our interviews with Buyco’s procurement staff, we concluded that because common parts were clustered within a CBE, the heterogeneity in procured products was largely at the level of the CBE.\(^{19}\) For each CBE, the expert raters were supplied with detailed descriptions and drawings of the bundle of products within the CBE. Each expert then scored the products in each CBE along several dimensions using a seven-point Likert scale, comparing them to the universe of products sourced via reverse auctions.\(^{20}\) Using these survey data, we obtained measures of exchange attributes relating to above-mentioned governance challenges: \( complexity_m \) of the parts procured, \( asset specificity_m \) of production equipment, and \( demand predictability_m \) over time.

To provide a proxy measure for expectations of exchange continuity, i.e., the shadow of the future, we asked each expert to rate the degree to which the technology to supply \( m \) had undergone rapid technological change in the prior five years. Our maintained assumption is that suppliers typically choose to bid to supply the same types of products over time. If this is the case, then repeated exchange between Buyco and a supplier for a product fabricated with rapidly changing technology was conducted in the absence of a strong shadow of the future—and may fail to create valuable ties as a result. Conversely, repeated exchange between Buyco and a supplier for a product fabricated with stable technologies is conducted under a stronger shadow of the future—and may be associated with building more valuable interorganizational ties.

Table A.1 in the appendix reports the survey questions used to measure each construct, along with interrater reliability measures, each of which meets acceptable levels. To facilitate the analysis and interpretation of results in which these characteristics are interacted with \( h_{jm} \), we employ as measures the z-scored average of the experts’ ratings.

**Costs of Communication/Developing Social Connections.** We posit that social connections form more easily when transacting parties share a common language (Maynard and Peräkylä 2006) and when proximity enables more frequent, in-person contact (see Liu 2009 for a review of the literature on spatial proximity and social connections). Using data provided by the auctioneer (augmented by online searches), we identify the location of the supplier’s headquarters and construct a dummy variable, \( common language_j \), which equals 1 if the bidder’s headquarters is located in an English-speaking country.\(^{21}\) Additionally we construct a dummy variable, \( close proximity_j \), if the supplier’s headquarters is less than the median distance from Buyco’s headquarters, as calculated by geomapping software.

**Other Control Variables.** We construct additional control variables that affect the relative attractiveness of bidder \( j \)’s offer. Because prior studies have suggested that multinational firms are drawn from a different ability distribution than single-country firms (see Caves 2007 for a discussion), we construct a dummy variable, \( multinational_j \), that takes the value of 1 if the firm owns facilities in multiple countries.\(^{22}\) Further, results from models that seek to explain bilateral trade between nations emphasize that distance is an important explanatory variable. We calculate the distance, between Buyco’s headquarters (HQ) and the supplier’s HQ as the log of the distance in miles. To account for differences in contract enforcement between countries, we incorporate as a control Transparency International’s 2006 Corruption Perceptions Index in the bidder’s home country. To account for a potential preference for dealing with partners who share a common language, we incorporate \( common language \) as a direct control in our analysis as well.

Finally, to account for potential economies of scope, we construct two measures of bidder \( j \)’s bidding strategy in other auctions in the CBE. \( Savings_{jm} \) measures the difference between \( j \)'s bids and the second-highest bids in other auctions in the CBE, summed over all auctions other than \( i \) in \( m \) in which \( j \) chose to bid. This variable takes on a positive value only if \( j \) is the low bidder for other bundles in the CBE. \( Other bids_{jm} \) simply measures the number of other bids in the CBE in which bidder \( j \) submitted a valid bid.
**Auction-Level Summary Statistics**

We report detailed auction-level summary statistics in Table A.2 in the appendix. In our sample, the award goes
to the lowest bidder in 43.2% of auctions, the average
premium paid by Buyco over the lowest bid is 6.7%,
and the median premium is 0.5%. Bidders with sales to
Buyco in the prior four quarters represented 58.6% of all
bids and 71.4% of awards. This variation in premiums
and exchange histories across bidders enables us to iden-
tify the value that Buyco associates with these exchange
histories and the factors that moderate their value.

**Discrete Choice Model**

To examine the impact of relationship history on supplier
selection and Buyco’s implicit willingness to pay for
longer relationships, we estimated McFadden’s discrete
choice model (McFadden 1973, Domencich and McFad-
den 1975). We followed an approach similar to Hoetker
(2005) but differ in three key dimensions. First, we
limited the set of alternatives to those potential suppliers
that bid in the auction. Second, our data permitted us to
incorporate the price offered by each supplier who sub-
mitted a bid. Finally, we examined the choice of a single
buyer. Let \( p_{ij} \) represent the log of \( j \)'s bid for item \( i \), let
\( h_{jm} \) be the measure of relationship history, and let \( x_{ijm} \)
be a vector of the remaining control variables describing
the bidder and its bid strategy in the CBE. Absent mod-
erating factors, we can model the utility Buyco obtains
for selecting bidder \( j \) for item \( i \) in CBE \( m \) as

\[
U_{ijm} = \beta_1 p_{ij} + \beta_2 h_{jm} + \gamma' x_{ijm} + \varepsilon_{ijm},
\]

(1)

where \( \varepsilon_{ijm} \) is drawn from an extreme value distribution
and represents factors that are unobservable to the ana-
ylist and are independent of the coefficients and the inde-
pendent variables. We cluster standard errors on \( m \) to
allow for potential nonindependence within a CBE.

Let \( \theta_{ijm} = (p_{ij}, h_{jm}, x_{ijm}) \). The probability, then, that
supplier \( i \) is awarded the contract is

\[
P(y_{ijm} = 1 | \theta_{ijm}) = \frac{\exp(\beta_1 p_{ij} + \beta_2 h_{jm} + \gamma' x_{ijm})}{\sum_{\text{all bidders}(b) \text{ for } i} \exp(\beta_1 p_{ib} + \beta_2 h_{bm} + \gamma' x_{ibm})}.
\]

(2)

Equation (2) represents a conditional logit equation that
can be estimated via maximum likelihood.23

With price (or bid values) as one of the dependent
variables, an attractive feature of Equation (1) is that the
estimates can be used to calculate the change in price
\( \Delta p_{ij} \) that is required to offset a change in relationship
history, \( \Delta h_{jm} \), holding all else constant. By Equation (1),
\( \Delta p_{ij} = - (\beta_2 / \beta_1) \Delta h_{jm} \) is the value that Buyco can trade
for \( \Delta h_{jm} \) keeping its utility constant; i.e., it is Buyco’s
willingness to pay for \( \Delta h_{jm} \).

To test the moderating influences of the shadow of the future (H2)
and report the results in Table 2. In the conditional logit
specification we employed, coefficients are identified
solely based on differences between the bid decisions
and characteristics of bidder \( j \) within a given auction
bundle \( i \). Throughout the table we report robust standard
errors, clustered on the bid event \( m \). To streamline the
exposition of the results, we drop variable subscripts in
the discussion below and refer to \( h_{jm} \) as the relationship
history.

In column (1) of Table 2, we report model estimates
using control variables only. On the whole, these coeffi-
cients have the expected signs, although significance lev-
eels vary. Higher bid prices within an auction reduce the
probability that the bid is selected. This effect is statisti-
cally significant at the \( p < 0.001 \) level and is econom-
cally large—simulations of a five-bidder auction using
mean values in the data indicate that a 1% increase in
price reduces the probability of winning the award by
9.5%.24 Similarly, the impact of supplier distance from
Buyco headquarters is statistically significant at the \( p < 
0.01 \) level. Simulations indicate that a 1% increase in
distance is associated with a 0.4% decrease in the like-
lihood that the bidder wins the award. Better corruption
scores in the supplier’s home country and lower bids in
other auctions in the CBE are positively associated with
the likelihood of winning the award, although these coeffi-
cients are only marginally significant. The coefficient
on multinational is also positive, but not significantly
different from zero. The absence of a significant coeffi-
cient here is consistent with the idea that the invited
bidders have been effectively prescreened for produc-
capability. There also seems to be no independent effect
of common language once other controls are included.

Finally, this regression indicates a positive partial cor-
relation between a supplier’s likelihood of winning and
repeated exchange, we extend Equation (1) to include an
interaction term between \( h_{jm} \) and technological change,.
As the technological change variable is z-scored, we can
interpret the coefficients as representing the differential
impact of a one-standard-deviation change in techno-
logical change on an increment of \( h_{jm} \). Similarly, we
test H3A by incorporating interactions between \( h_{jm} \) and
common language, and H3B by incorporating interac-
tions between \( h_{jm} \) and close proximity, respectively, into
Equation (1). Because these measures do not exhibit
much independent variation (all U.S. suppliers have both
common language = 1 and close proximity = 1),
we examine them in the estimations one at a time.
Finally, to examine whether more severe governance
hazards raise the value associated with prior repeated
exchange (H4A, H4B, and H4C), we incorporate interac-
tions between \( h_{jm} \) and complexity, asset specificity,
and demand predictability, respectively.

**Results**

We estimated the discrete choice model described above
and report the results in Table 2. In the conditional logit
specification we employed, coefficients are identified
solely based on differences between the bid decisions
and characteristics of bidder \( j \) within a given auction
bundle \( i \). Throughout the table we report robust standard
errors, clustered on the bid event \( m \). To streamline the
exposition of the results, we drop variable subscripts in
the discussion below and refer to \( h_{jm} \) as the relationship
history.

In column (1) of Table 2, we report model estimates
using control variables only. On the whole, these coeffi-
cients have the expected signs, although significance lev-
eels vary. Higher bid prices within an auction reduce the
probability that the bid is selected. This effect is statisti-
cally significant at the \( p < 0.001 \) level and is econom-
cally large—simulations of a five-bidder auction using
mean values in the data indicate that a 1% increase in
price reduces the probability of winning the award by
9.5%.24 Similarly, the impact of supplier distance from
Buyco headquarters is statistically significant at the \( p < 
0.01 \) level. Simulations indicate that a 1% increase in
distance is associated with a 0.4% decrease in the like-
lihood that the bidder wins the award. Better corruption
scores in the supplier’s home country and lower bids in
other auctions in the CBE are positively associated with
the likelihood of winning the award, although these coeffi-
cients are only marginally significant. The coefficient
on multinational is also positive, but not significantly
different from zero. The absence of a significant coeffi-
cient here is consistent with the idea that the invited
bidders have been effectively prescreened for produc-
capability. There also seems to be no independent effect
of common language once other controls are included.

Finally, this regression indicates a positive partial cor-
relation between a supplier’s likelihood of winning and
Table 2  Conditional Logit Analysis of the Impact of Relationship History and Moderating Factors on the Likelihood a Bidder Wins a Contract

<table>
<thead>
<tr>
<th>Relationship history measure</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$h_{jm}$ (H1)</td>
<td>None</td>
<td>Any</td>
<td>Log</td>
<td>Log</td>
<td>Any</td>
<td>Log</td>
<td>Log</td>
<td>Any</td>
<td>Log</td>
<td>Log</td>
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<tr>
<td></td>
<td>relationship</td>
<td>(sales)</td>
<td>(length)</td>
<td>relationship</td>
<td>(sales)</td>
<td>(length)</td>
<td>relationship</td>
<td>(sales)</td>
<td>(length)</td>
<td>relationship</td>
</tr>
<tr>
<td></td>
<td>1.00**</td>
<td>0.137**</td>
<td>0.399**</td>
<td>0.930**</td>
<td>0.130**</td>
<td>0.373**</td>
<td>1.02**</td>
<td>0.165**</td>
<td>0.462**</td>
<td></td>
</tr>
<tr>
<td>Factors affecting formation of relationship value</td>
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<tr>
<td>$h_{jm} \times $ Technological change$_m$ (H2)</td>
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<tr>
<td>$h_{jm} \times $ Common language$_m$ (H3A)</td>
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<tr>
<td>$h_{jm} \times $ Close proximity$_m$ (H3B)</td>
<td></td>
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<td>Factors affecting value of relationship in exchange</td>
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<tr>
<td>$h_{jm} \times $ Complexity$_m$ (H4A)</td>
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<tr>
<td>$h_{jm} \times $ Asset specificity$_m$ (H4B)</td>
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<tr>
<td>$h_{jm} \times $ Demand variability$_m$ (H4C)</td>
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</tr>
<tr>
<td>Log(bid$_j$)</td>
<td>-4.96**</td>
<td>-5.40**</td>
<td>-5.45**</td>
<td>-5.44**</td>
<td>-5.71**</td>
<td>-5.75**</td>
<td>-5.76**</td>
<td>-5.77**</td>
<td>-5.82**</td>
<td>-5.81**</td>
</tr>
<tr>
<td>(0.778)</td>
<td>(0.793)</td>
<td>(0.817)</td>
<td>(0.822)</td>
<td>(0.861)</td>
<td>(0.880)</td>
<td>(0.894)</td>
<td>(0.890)</td>
<td>(0.903)</td>
<td>(0.909)</td>
<td></td>
</tr>
<tr>
<td>Log(distance)$_j$/Close proximity$_j$</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>(0.088)</td>
<td>(0.088)</td>
<td>(0.083)</td>
<td>(0.086)</td>
<td>(0.086)</td>
<td>(0.093)</td>
<td>(0.086)</td>
<td>(0.096)</td>
<td>(0.102)</td>
<td>(0.111)</td>
<td>(0.122)</td>
</tr>
<tr>
<td>Corruption Perceptions Index$_j$</td>
<td>0.114†</td>
<td>0.061</td>
<td>0.075</td>
<td>0.063</td>
<td>0.065</td>
<td>0.073</td>
<td>0.065</td>
<td>0.064</td>
<td>0.064</td>
<td>0.062</td>
</tr>
<tr>
<td>Multinational$_j$</td>
<td>0.167</td>
<td>0.043</td>
<td>0.063</td>
<td>0.116</td>
<td>0.030</td>
<td>0.023</td>
<td>0.094</td>
<td>0.084</td>
<td>0.092</td>
<td>0.139</td>
</tr>
<tr>
<td>(0.189)</td>
<td>(0.187)</td>
<td>(0.186)</td>
<td>(0.181)</td>
<td>(0.165)</td>
<td>(0.167)</td>
<td>(0.179)</td>
<td>(0.181)</td>
<td>(0.184)</td>
<td>(0.178)</td>
<td></td>
</tr>
<tr>
<td>Common language$_j$</td>
<td>-0.254</td>
<td>-0.221</td>
<td>-0.156</td>
<td>-0.168</td>
<td>-0.672</td>
<td>-1.18</td>
<td>-0.458†</td>
<td>0.134</td>
<td>0.132</td>
<td>-0.106</td>
</tr>
<tr>
<td>(0.295)</td>
<td>(0.272)</td>
<td>(0.268)</td>
<td>(0.270)</td>
<td>(0.335)</td>
<td>(0.557)</td>
<td>(0.309)</td>
<td>(0.205)</td>
<td>(0.261)</td>
<td>(0.272)</td>
<td></td>
</tr>
<tr>
<td>Log(savings)$_j$ (for other items in the CBE)</td>
<td>0.120†</td>
<td>0.161†</td>
<td>0.170†</td>
<td>0.163†</td>
<td>0.146†</td>
<td>0.150†</td>
<td>0.146†</td>
<td>0.154†</td>
<td>0.150†</td>
<td>0.150†</td>
</tr>
<tr>
<td>(0.079)</td>
<td>(0.085)</td>
<td>(0.087)</td>
<td>(0.087)</td>
<td>(0.069)</td>
<td>(0.070)</td>
<td>(0.071)</td>
<td>(0.066)</td>
<td>(0.069)</td>
<td>(0.070)</td>
<td></td>
</tr>
<tr>
<td>Log(other bids)$_j$ (for other items in the CBE)</td>
<td>-0.264†</td>
<td>-0.239</td>
<td>-0.274†</td>
<td>-0.239</td>
<td>-0.191</td>
<td>-0.239†</td>
<td>-0.189</td>
<td>-0.166</td>
<td>-0.215†</td>
<td>-0.165</td>
</tr>
<tr>
<td>(0.173)</td>
<td>(0.189)</td>
<td>(0.187)</td>
<td>(0.190)</td>
<td>(0.186)</td>
<td>(0.184)</td>
<td>(0.182)</td>
<td>(0.176)</td>
<td>(0.174)</td>
<td>(0.175)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>3029</td>
<td>3029</td>
<td>3029</td>
<td>3029</td>
<td>3029</td>
<td>3029</td>
<td>3029</td>
<td>3029</td>
<td>3029</td>
<td>3029</td>
</tr>
<tr>
<td>Wald $\chi^2$</td>
<td>78.16</td>
<td>152.2</td>
<td>141.0</td>
<td>134.8</td>
<td>135.6</td>
<td>130.4</td>
<td>113.2</td>
<td>131.6</td>
<td>148.5</td>
<td>122.9</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-757.4</td>
<td>-725.7</td>
<td>-722.9</td>
<td>-725.4</td>
<td>-702.2</td>
<td>-699.5</td>
<td>-705.3</td>
<td>-702.7</td>
<td>-698.6</td>
<td>-705.5</td>
</tr>
<tr>
<td>Pseudo-$R^2$</td>
<td>0.1104</td>
<td>0.1477</td>
<td>0.1509</td>
<td>0.1481</td>
<td>0.1753</td>
<td>0.1785</td>
<td>0.1717</td>
<td>0.1738</td>
<td>0.1787</td>
<td>0.1715</td>
</tr>
</tbody>
</table>

Notes: In columns (2), (5), and (8), relationship history is measured as a dichotomous variable that equals 1 if there is a relationship with the bidder in the year prior to the bid event and 0 otherwise. In columns (3), (6), and (9), relationship history is measured as the log of sales in U.S. dollars in 12 months preceding the bid event. In columns (4), (7), and (10), the log of the relationship length plus 1 is used. Robust standard errors, clustered on bid event, are in parentheses. Columns (1)-(7) use log(distance) as a control variable; columns (8)-(10) use close proximity.

†p < 0.1; •p < 0.05; **p < 0.01 (one-sided tests for hypothesized relationships; two-sided tests for control variables).
placing competitive bids for other items in the CBE, but a negative partial correlation with the gross number of bids placed by the supplier in the CBE.

We examine H1 individually in columns (2), (3), and (4) using any relationship, log(sales), and log(length), respectively, as measures of \( h_{max} \). Consistent with our prediction in H1, the coefficients on each relationship history measure are positive and significantly different from zero at the \( p < 0.01 \) level. The estimated coefficients correspond to willingness-to-pay calculations of 0.025% and 0.073% for a 1% increase in the sales- and length-relationship history measures, respectively. (Both estimates yield estimated increases in willingness to pay of 8.5% for a one-standard-deviation increase in the respective relationship measures.) These estimates strongly support H1.

In columns (5)–(10), we examine how factors affecting the formation of relationship value and exchange attributes moderate the impact of relationship history on bidder selection. Because there is insufficient independent variation between common language—and nearly all American and Canadian suppliers have values equal to 1 for both variables—we estimate models containing interactions with only one of these two variables at a time. In columns (5), (6), and (7), we simultaneously test H2, H3A, and H4A/B/C, respectively, by incorporating interaction terms between the three measures of relationship history and technological change, common language, complexity, asset specificity, and demand predictability in the conditional logit model. In columns (8), (9), and (10), we repeat the analysis substituting relationship history \( \times \) close proximity for relationship history \( \times \) common language. These specifications test H3B as well as H2 and H4A/B/C. To avoid placing undesirable restrictions on the functional form of the distance relationship and its interaction, we replace distance with the discrete variable close proximity in these regressions.

Across each of these specifications, we find strong support for H2. The estimated coefficients on relationship history \( \times \) technological change have the predicted sign and are significantly different from zero at the \( p < 0.01 \) level. The estimates also show support for H3A. The coefficients on relationship history \( \times \) common language have the predicted sign and are significantly different from zero at the \( p < 0.05, p < 0.05 \), and \( p < 0.1 \) levels, respectively. H3B is not supported. Although the coefficients on relationship history \( \times \) close proximity all have the expected sign, they are not statistically significant. In unreported regressions we replace close proximity with distance (interactions and main effects) and find results that are also of the correct sign, but not significant.

Of the three factors hypothesized to affect the value of a relationship in exchange, asset specificity seems to be the most important. In each specification, the coefficients on relationship history \( \times \) asset specificity are positive and significantly different from zero at the \( p < 0.05 \) or \( p < 0.01 \) level. By contrast, only the estimated coefficients on the interaction terms with complexity and any relationship prove statistically significant (in columns (5) and (8), respectively), and all of the interaction terms involving demand predictability are small and statistically indistinguishable from zero. On the whole, we interpret these results as providing strong support for H4B, very weak support for H4A, and no support at all for H4C.

Although specifications that incorporate multiple interactions are appropriate for testing our hypotheses, they make interpreting the magnitude of the interaction terms difficult, as the moderating factors are not uncorrelated and the average values of the interacted variables may shift the estimates of the main effect. To look more clearly at the magnitude of these moderating factors, we examine each interaction independently. We report the results in Table 3. Panel A reports the interactions between the six moderating factors and any relationship. Panel B repeats the analysis using log(sales) as the measure of relationship history, and panel C employs log(length) as the relationship history measure.

A few observations are noteworthy. First, moving from one standard deviation below the mean to one standard deviation above the mean of technological change reduces the value associated with relationship history by 38%–55%, depending on the relationship measure used (see columns (1a), (1b), and (1c) in Table 3). Second, the estimates also suggest that for suppliers in common language countries, relationship history is associated with almost double the value as for suppliers in non-common language countries. Third, estimates indicate that at two standard deviations below the mean of asset specificity, relationship history has almost no impact on supplier selection, whereas at two standard deviations above the mean, it is worth roughly twice as much as when asset specificity is at mean levels (see columns (4a), (4b), and (4c)). Fourth, it is noteworthy that for two of the three measures, the coefficients on relationship history \( \times \) close proximity are statistically significant and of the expected sign; this is encouraging for the theory and suggestive of an effect. Finally, it is worth noting that the estimates in Table 3 corroborate with those reported in Table 2.

Robustness

We have argued that we measure the economic value to the firm associated with prior exchange, yet in practice, the decision to select a supplier reflects an aggregation of perceptions and preferences across individuals in the organization, as shaped by organizational norms and the allocation of decision rights within the firm. As a result, it is possible that behavioral factors or internal authority relationships may affect decision making.
### Table 3  Conditional Logit Analysis of Individual Moderating Factors Affecting the Impact of Relationship History on the Likelihood a Bidder Wins a Contract

<table>
<thead>
<tr>
<th>Panel A: Relationship history measure is any relationship</th>
<th>(1a)</th>
<th>(2a)</th>
<th>(3a)</th>
<th>(4a)</th>
<th>(5a)</th>
<th>(6a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any relationship (in prior 4 quarters? (1 = yes)</td>
<td>1.12**</td>
<td>0.675**</td>
<td>0.786**</td>
<td>0.956**</td>
<td>0.951**</td>
<td>0.996**</td>
</tr>
</tbody>
</table>
| Any relationship × Technological change<br>
| sales<br>
| length | -0.257* | (0.123) | | | | |
| Any relationship × Common language<br>
| sales<br>
| length | 0.884* | (0.268) | | | | |
| Any relationship × Close proximity<br>
| sales<br>
| length | 0.421* | (0.250) | | | | |
| Any relationship × Complexity<br>
| sales<br>
| length | 0.203* | (0.121) | | | | |
| Any relationship × Asset specificity<br>
| sales<br>
| length | 0.463** | (0.131) | | | | |
| Any relationship × Demand variability<br>
| sales<br>
| length | 0.009 | (0.121) | | | | |
| Wald \(\chi^2\) | 177.8 | 178.2 | 170.93 | 182.9 | 179.2 | 182.2 |
| Pseudo-R\(^2\) | 0.1503 | 0.1548 | 0.1489 | 0.1494 | 0.1557 | 0.1478 |

<table>
<thead>
<tr>
<th>Panel B: Relationship history measure is log(sales)</th>
<th>(1b)</th>
<th>(2b)</th>
<th>(3b)</th>
<th>(4b)</th>
<th>(5b)</th>
<th>(6b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(sales(_{jm})) (to Buyco in prior 4 quarters + 1,000)</td>
<td>0.171**</td>
<td>0.081**</td>
<td>0.103**</td>
<td>0.131**</td>
<td>0.134**</td>
<td>0.133**</td>
</tr>
</tbody>
</table>
| Log(sales\(_{jm}\)) × Technological change<br>
| sales<br>
| length | -0.065** | (0.019) | | | | |
| Log(sales\(_{jm}\)) × Common language<br>
| sales<br>
| length | 0.141** | (0.033) | | | | |
| Log(sales\(_{jm}\)) × Close proximity<br>
| sales<br>
| length | 0.077** | (0.032) | | | | |
| Log(sales\(_{jm}\)) × Complexity<br>
| sales<br>
| length | 0.026† | (0.018) | | | | |
| Log(sales\(_{jm}\)) × Asset specificity<br>
| sales<br>
| length | 0.056** | (0.018) | | | | |
| Log(sales\(_{jm}\)) × Demand variability<br>
| sales<br>
| length | 0.025† | (0.018) | | | | |
| Wald \(\chi^2\) | 183.9 | 184.0 | 184.6 | 184.4 | 178.6 | 185.9 |
| Pseudo-R\(^2\) | 0.1590 | 0.1622 | 0.1563 | 0.1523 | 0.1576 | 0.1525 |

<table>
<thead>
<tr>
<th>Panel C: Relationship history measure is log(length)</th>
<th>(1c)</th>
<th>(2c)</th>
<th>(3c)</th>
<th>(4c)</th>
<th>(5c)</th>
<th>(6c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(length(_{jm})) (consecutive quarters selling to Buyco + 1)</td>
<td>0.467**</td>
<td>0.262**</td>
<td>0.328**</td>
<td>0.388**</td>
<td>0.379**</td>
<td>0.399**</td>
</tr>
</tbody>
</table>
| Log(length\(_{jm}\)) × Technological change<br>
| sales<br>
| length | -0.133* | (0.055) | | | | |
| Log(length\(_{jm}\)) × Common language<br>
| sales<br>
| length | 0.321** | (0.101) | | | | |
| Log(length\(_{jm}\)) × Close proximity<br>
| sales<br>
| length | 0.110 | (0.095) | | | | |
| Log(length\(_{jm}\)) × Complexity<br>
| sales<br>
| length | 0.052 | (0.054) | | | | |
| Log(length\(_{jm}\)) × Asset specificity<br>
| sales<br>
| length | 0.186** | (0.054) | | | | |
| Log(length\(_{jm}\)) × Demand variability<br>
| sales<br>
| length | 0.015 | (0.050) | | | | |
| Wald \(\chi^2\) | 165.5 | 167.4 | 166.5 | 167.8 | 163.4 | 167.9 |
| Pseudo-R\(^2\) | 0.1519 | 0.1546 | 0.1494 | 0.1489 | 0.1561 | 0.1484 |

**Notes.** For each regression, \(N = 3,029\). We include, but do not report, control variables from column (1) in Table 2 in each of the regressions above. Columns (1), (2), (4), (5), and (6) use log(distance) as a control variable, and column (3) uses close proximity. Robust standard errors, clustered on bid event, are in parentheses. † \(p < 0.1\); * \(p < 0.05\); ** \(p < 0.01\) (one-sided tests).
An extensive literature examines asymmetric responses to prospective gains and losses, arguing that both individuals and organizations may be excessively risk or loss aversive (e.g., Kahneman and Tversky 1979, Denrell and March 2001). Where potential losses are greater, then, decision makers at Buyco may attach greater risk to working with new suppliers than is economically rational; alternatively, they may attach greater value to working with suppliers with whom there is shared history. We investigate whether decision making at Buyco is influenced by loss aversion by examining empirically whether the importance of relationship history changes as the dollar value of the procured items rises. We divide the completed auctions into four quartiles by the dollar value of the winning bid and create dummy variables for each quartile. We look for evidence of loss aversion by incorporating interaction terms relationship history × second quartile, relationship history × third quartile, and relationship history × fourth quartile in the estimation. If loss aversion plays a major role in supplier selection, we would expect, at a minimum, the coefficients on relationship history × fourth quartile to be positive and significant.

We report the results incorporating these additional interaction terms in Table 4. The coefficients on relationship history × fourth quartile are small and not statistically different from zero, as are the coefficients on the other interaction terms. Thus, the analysis reveals that Buyco places roughly equal weight on relationship history across procurement auctions of all values, and it does not support the view that loss aversion plays a major role in decision making.

We further test whether the locus of decision making influences the value attached to relationship history. We identify whether the CBE was managed centrally by the corporate procurement group or by the division. Differences in the value attached to relationship history across these two auction modes might reflect differing assessments about the strategic versus operational nature of the procurement task (Azoulay et al. 2010), differing assessments of the value of relational capital itself, or differing scope for influencing selection in favor of “overembedded” suppliers. In our sample, 44.6% of items were procured through centrally managed CBES, and 55.4% were procured through division-managed CBES. We create dummy variables for each and reestimate the models incorporating interactions between these and relationship history. We report these results in Table 5. Across each specification, the estimates show that relationship history has nearly identical value in centrally managed and division-managed auctions. We view these results as lending support to our assertion that the transparency of bid information and partner selection limits opportunities to skew supplier selection toward friends. Moreover, they mitigate concerns about problems that might stem from aggregating information and preferences across individuals or those created by internal politics. They are consistent with our contention that our estimates reflect the economic value to the firm created by exchange history.

We undertake a set of additional robustness checks that provide additional confidence that our estimates are not simply spurious correlations resulting from omitted variables. Two-stage instrumental variable procedures to
estimate nonlinear models, especially those with interaction terms, do not produce consistent coefficient estimates (Hausman 2001). We instead focus on a simpler, consistent model: estimating the premium that Buyco pays above the lowest bid as a function of the winning bidder’s characteristics (including its relational capital), others’ relational capital, and other characteristics of the auction and the item. The dependent variable in this model is the percent difference between the winning bidder’s bid and the lowest bid for the item.

We evaluate the potential endogeneity problem by using instrumental variables for the winning bidder’s relationship history. These instruments should be correlated with the bidder’s relationship history, but not with other factors that might affect the price Buyco is willing to pay. The instruments we employ are the log of the gross trade between the United States and the bidder’s home country in 2002 in U.S. dollars, Transparency International’s Corruption Perceptions Index in 2002, and an interaction between these terms. The greater the trade between the two countries historically and the more stable the regime, the more likely Buyco would have been to search for suppliers in this particular country in the past, generating a relationship. In addition, we employ the log of other bidder’s sales to Buyco in the first half of 2003, which should be related to the likelihood that the auction is for an item for which partner experience is valued, but it should also not affect price. Finally, we employ the length of the buyer’s name in Buyco’s database. Buyco employees are more likely to cut corners when entering new firms into the database; those with whom they have been doing business for a long time can be carried over via a cut-and-paste function. Again, this variable will correlate with relational capital but should be unrelated to the price premium.

Table 6 reports the results of this analysis using a Tobit specification to account for the fact that Buyco selects the lowest bidder 43% of the time. We continue to use robust standard errors, clustered on the bid event, to allow for nonindependence of shocks within a bid event. If an omitted variable, such as unobserved differences in quality, were driving both relational capital and price, then we would expect the coefficients on relational capital to fall in the instrumental variable analysis and to potentially become insignificant. On the contrary, we do not find that this is the case. The coefficients on relational capital do not drop when instrumental variables are introduced (see columns (2) and (4)). Despite substantially larger standard errors, these coefficients remain statistically significant. The instrumental variables yield first-stage $R^2$ values of 0.26 and 0.28, respectively, and a generalized Hausman test, which accounts for clustering, yields test statistics of 0.1643 and 0.4208 in comparing the IV estimates to the noninstrumented Tobit estimates. These tests do not rule out endogeneity definitively, but the evidence suggests that the rigorous prequalification of suppliers limits the impact of potential endogeneity in this analysis.

Finally, in a series of unreported regressions, we examine the robustness of our results to alternative measures of relationship history. These alternative measures include dichotomous variables indicating that sales in the prior year exceeded $10,000 and $100,000, sales measures based on 24- and 36-month periods, the raw number of consecutive quarters (unlogged) of buyer–supplier exchange, and a relationship length measure based not on consecutive quarters of exchange. Estimates using
these alternative measures continue to provide support for H1, H2, H3A, and H4B, whereas H4A is sup-
ported by estimates in some specifications, but not oth-
ers, and H3B is supported only in individual hypothesis
tests (and not the fully interacted specification). These results are consistent with the view that repeated exchange creates relational assets
that a large industrial buyer attaches to a history of prior exchange. Prescreening and selection transparency
give us confidence that our measurements do not simply
reflect capability differences between potential suppliers
or the preferences of managers who wish to steer
business toward friends to satisfy their own private pref-

ers (Elfenbein and Zenger: What Is a Relationship Worth?
Organization Science, Articles in Advance, pp. 1–23, © 2013 INFORMS

Table 6 Instrumental Variable Tobit Analysis of the Relationship Between Price Premium and Winning Bidder’s Relational Capital

<table>
<thead>
<tr>
<th>Measure</th>
<th>Tobit</th>
<th>IV Tobit</th>
<th>Tobit</th>
<th>IV Tobit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures of relationship history</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(sales)</td>
<td>0.0112** (0.0037)</td>
<td>0.0304* (0.0151)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(length)</td>
<td>0.0313** (0.0115)</td>
<td>0.0564† (0.0340)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(average sales) (to Buyco in US$ by competing</td>
<td>-0.0147 (0.0219)</td>
<td>-0.0075 (0.0245)</td>
<td>0.0051 (0.0177)</td>
<td>-0.0089 (0.0236)</td>
</tr>
<tr>
<td>bidders for item i + 1.000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multinational</td>
<td>0.0418 (0.0275)</td>
<td>0.0120 (0.0397)</td>
<td>0.0463† (0.0280)</td>
<td>0.0353 (0.0328)</td>
</tr>
<tr>
<td>Log(distance)</td>
<td>-0.0148 (0.0097)</td>
<td>-0.0154 (0.0147)</td>
<td>-0.0153 (0.0096)</td>
<td>-0.0100 (0.0127)</td>
</tr>
<tr>
<td>Item/auction characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset specificity</td>
<td>0.0442** (0.0171)</td>
<td>0.0457* (0.0185)</td>
<td>0.0453* (0.0179)</td>
<td>0.0404* (0.0176)</td>
</tr>
<tr>
<td>Technological change</td>
<td>0.0033 (0.0111)</td>
<td>0.0090 (0.0127)</td>
<td>0.0036 (0.0110)</td>
<td>0.0054 (0.0116)</td>
</tr>
<tr>
<td>Demand predictability</td>
<td>-0.0073 (0.0148)</td>
<td>-0.0104 (0.0154)</td>
<td>-0.0053 (0.0147)</td>
<td>-0.0065 (0.0147)</td>
</tr>
<tr>
<td>Complexity</td>
<td>-0.0025 (0.0161)</td>
<td>-0.0150 (0.0197)</td>
<td>-0.0013 (0.0169)</td>
<td>-0.0050 (0.0179)</td>
</tr>
<tr>
<td>No. of bids in the auction (dummies for 3, 4, 5, 6, 7, 8+)</td>
<td>Y**</td>
<td>Y**</td>
<td>Y**</td>
<td>Y**</td>
</tr>
<tr>
<td>N</td>
<td>557</td>
<td>557</td>
<td>557</td>
<td>557</td>
</tr>
<tr>
<td>F-statistic/Wald $\chi^2$</td>
<td>4.13</td>
<td>32.24</td>
<td>3.85</td>
<td>44.69</td>
</tr>
<tr>
<td>Log pseudo-likelihood</td>
<td>-93.3</td>
<td>-1,481.5</td>
<td>-720.4</td>
<td>-867.0</td>
</tr>
<tr>
<td>Pseudo-$R^2$</td>
<td>0.2666</td>
<td>—</td>
<td>0.2601</td>
<td>—</td>
</tr>
<tr>
<td>First-stage $R^2$</td>
<td>—</td>
<td>0.2568</td>
<td>—</td>
<td>0.2771</td>
</tr>
</tbody>
</table>

Notes: The dependent variable is the percent difference between the winning bidder’s bid and the lowest bidder’s bid for the item in the auction. The following variables were used as instruments for relational capital: the gross level of trade between the bidder’s home country and the United States in 2002, measured in U.S. dollars; Transparency International’s Corruption Perceptions Index in 2002; an interaction between the trade and corruption measures; the number of characters of the bidder’s name in the application service provider database; and the control variables listed above. Robust standard errors, clustered on bid event, are in parentheses.

† $p < 0.1$ (two-sided test); * $p < 0.05$; ** $p < 0.01$.

Discussion
We study how relationship history impacts buyer willingness to pay in a unique setting that is particularly well suited for such inquiry. We exploit information about bids accepted and rejected, including the price offers associated with each bid to infer the economic value of relationships. We find evidence that relationships create value even in a setting that is geared toward cost reductions and otherwise has characteristics of arms-length transactions, i.e., commodity parts that can be well specified in a contract. The value created by past exchange is economically meaningful: point estimates indicated that a one-standard-deviation increase in measures of relationship history is associated with an increase in willingness to pay of 8.5% (95% confidence interval: 3.8%–14.5%) and 5.2%–14.9% for log(sales) and log(length), respectively. These results are consistent with the view that repeated exchange creates relational assets

This page contains the copyright notice and terms of use for the journal. The text is presented in a readable format, with tables and formulas clearly visible. The discussion section is highlighted, indicating its importance in the context of the research. The alternative measures are discussed, and the implications of their findings are elaborated upon. The table provides a comprehensive view of the instrumental variable tobit analysis, with detailed specifications and results. The notes at the end of the table provide additional context for interpretation of the statistical tests and standard errors. The discussion section ties these findings back to the broader context of relationship value, emphasizing the economic significance of relationship history in industrial transactions.
with latent value. We hypothesize that repeated exchange leads to the formation of these relational assets more rapidly (or more effectively) in some contexts than in others and that these assets create greater value in governing transactions characterized by greater exchange hazards. The results are consistent with most, but not all, of our hypotheses. Figure 1 summarizes the results of our hypothesis tests.

The results of our statistical analysis square largely with qualitative information gleaned through interviews with several Buyco procurement specialists. Over time, Buyco has become increasingly sophisticated in handicapping suppliers and doing so differentially depending on the nature of the transaction. These handicaps play a greater role as the needs of Buyco become more complex. Moreover, within the organization, some suppliers were informally referred to as friends, and the notion that friends were necessary when unexpected problems arose was commonplace. Although our estimates are consistent with reported handicaps of new suppliers (one procurement specialist volunteered, “I need a price reduction of 3%-4% [to select a new supplier]”), we do find it puzzling that demand predictability has no impact on the value associated with a relationship. Responsiveness to demand shocks, willingness to carry excess inventory, and other assistance in optimizing the supply chain was frequently reported as one of the benefits associated with stable supplier relationships. We are less surprised that H4A, that complexity raises the value of relationship history, finds only limited support in our data: transactions involving parts that are very complex were typically not sourced via reverse auction, so the absolute variation in this measure is likely to be limited.

**Limitations**

There are a number of notable limitations to our study. First, our data are all drawn from a single industrial manufacturer procuring standardized parts. This enables extensive and detailed empirical testing, but it limits the generalizability of our empirical results. For example, our estimates of Buyco’s willingness to pay for deeper relationships may not extend to other settings, such as the procurement of more complicated goods or services. Additionally, our measure of the economic value associated with relationship history is purely from the buyer’s perspective. We are unable to observe how relationships may reduce costs for suppliers; these cost reductions may be economically meaningful. Moreover, we examine Buyco’s procurement at a particular point in time. Our sample is drawn from a period in which Buyco emphasized identifying new suppliers and moving production to low-cost countries. This emphasis undoubtedly affected the value attached to relationships with existing suppliers.

Second, our data about relationships are at a high level of aggregation. Our measures are based on total trade between organizations, rather than exchange from a particular supplier factory to a particular Buyco manufacturing plant. We suspect that our results would be strengthened by finer-grained measures of relationship history.

Third, although we are confident that management in our context actively seeks to minimize any distortions

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**Figure 1** Summary of Hypothesis Tests

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: Reduced expectations of continuity hinder formation of relational capital</td>
<td>Supported</td>
</tr>
<tr>
<td>H2: Repeated exchange between supplier and buyer</td>
<td>Supported</td>
</tr>
<tr>
<td>H3A: Lower costs of communication increase speed of relational capital formation</td>
<td>Supported</td>
</tr>
<tr>
<td>H4A: Greater exchange hazards raise value of relational capital</td>
<td>Very limited support</td>
</tr>
<tr>
<td>H4B: Supplier’s value to buyer/buyer’s relative willingness to pay supplier</td>
<td>Supported</td>
</tr>
<tr>
<td>H4C: Supplier’s value to buyer/buyer’s relative willingness to pay supplier</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

---
to the assignment of value to historical exchange that might arise from private benefits rather than firm-level economic benefits to the supplier, these distortions may not be completely eliminated. Indeed, managers at lower levels who possess personal relationships with these suppliers may seek to lobby or influence those responsible for the centralized selection of suppliers. These lingering distortions may elevate the assignment of value to relationships.

Although our results indicate that certain factors are more conducive to the development of relational capital, many interesting interorganizational processes are invisible to us. Dyer and Singh (1998) identify a number of mechanisms that may develop over time through repeated interaction, including the development of problem-solving routines and the introduction of dedicated human capital to manage the relationship. Some of these may be the result of intentional investments by the trading partners. Whereas it would be highly desirable to distinguish between the value that accumulates passively through repeated exchange and the value that comes from investments in relational assets by the firms, we see this as the objective of future work.

Finally, we note that we use the variable technological change as a proxy for whether prior interactions were conducted with expectations of exchange continuity. To the extent that technological change in the past is also correlated with present expectations of continuity, which may also raise the value associated with prior exchange (Poppo et al. 2008), we measure the combined impact of these two factors.

Conclusion

Our intention in this paper is to address the questions “What is the value of a relationship built through repeated exchange?” and “When does repeated exchange lead to the creation of valuable relationships?” We propose that repeated interaction between organizations frequently leads to the development of relational capital, which generates value for future exchange relationships by reducing governance costs and promoting investment in interfirm understanding and routines. Possessing relational capital with a supplier thus increases a buyer’s willingness to pay above what it would pay to source products from an equally capable supplier with whom it had no relational capital. Furthermore, because much of the value of relational capital rests in its ability to mitigate problems of ex post opportunism, it has greater value when exchange hazards are prevalent. Finally, we propose that repeated exchange is more likely to generate relational capital when the costs of social interaction are low, allowing interpersonal connections to form, and that relational capital may fail to form (or have value) absent the shadow of the future. In this industrial procurement setting for commodity parts, we find support, to varying degrees, for these propositions.

Our investigation of repeated exchange and relational capital yields a number of provocative insights. The first is that our results suggest that social and incentive-based factors may both be necessary conditions for the formation of valuable relational capital. This finding is similar in spirit to that of Agarwal et al. (2010), who find experimental evidence that alliance success depends on both incentives and communication. However, we contend that, although social and incentive factors underpinning relational capital may be emphasized by distinct sets of scholars, in practice these factors may be deeply intertwined. The formation of socially based relational assets between members of exchanging firms is likely to be influenced by each firm’s expectations about the potential continuity of exchange. Firms may also make conscious attempts to build these relational assets by fostering site visits, taking clients to dinner, inviting suppliers to sporting events, etc. These investments both result from and shape expectations of exchange continuity. Moreover, non-social mechanisms are not executed by automatons, but rather by managers who naturally form social connections. A promising area for future research is developing a better understanding of the interactions between social and non-social factors that generate relational capital.

The second insight is that partner-specific differences in supplier value emerge in an endogenous, path-dependent manner, extending the notion of path dependence beyond the domains explored by Cohen and Levinthal (1990) and Mowery et al. (1996). This contrasts with prevalent views in economics, that partner selection is determined purely by exogenous differences in ability between suppliers or latent “match” parameters that are unobservable (Jovanovic 1979, Terviö 2008). Additionally, our study suggests that as a jointly owned relationship-specific asset, the value of relational capital can, in theory, be appropriated by either party. In this sense it differs from reputation and trustworthiness, each of which is valuable in addressing exchange hazards (Barney and Hansen 1994) but are properties of a single organization (rather than shared by two) and consequently should be fully appropriable. Rather, the final allocation of relational capital’s value will depend on a number of bargaining dynamics, which we explore in related work.

We conclude by pointing out that our results also generally support the broad proposition that relational capital possesses properties consistent with those of physical capital. Scholars have commonly assigned economic properties to relational assets, labeling it capital, or more specifically social capital to represent its capacity to function as a “resource[s] that actors . . . use to pursue their interests . . .” (Baker 1990, p. 619). Some scholars have actively questioned the appropriateness of labeling
these assets as “capital,” questioning whether this social asset really demonstrates the economic properties of capital (Baron and Hannan 1994, Arrow 1999, Solow 1999, Fernandez et al. 2000) or whether, instead, social capital is simply a “bad analogy” (Solow 1999, p. 6) that merits “abandonment” (Arrow 1999). Fernandez et al. (2000, p. 1351) suggest that for “capital” to be an appropriate label, researchers must demonstrate that it possesses economic properties consistent with other common forms of capital, including a clear mechanism for measuring investment (Portes 1998, p. 4), a clear means of calculating returns (Arrow 1999, Fernandez et al. 2000), and a clear understanding of the degree to which this capital is (or is not) “fungible across areas of activity” (Coleman 1988, p. S102; Sobel 2002). Our research suggests that each of these three conditions can be met. As we show, properties of the relationship between buyer and suppliers can be measured, these measures are strongly associated with the buyer’s incremental willingness to pay for the supplier’s parts (relative to an alternative supplier with whom no relationship exists), and these measures are associated with a significantly higher value when exchange demands the supplier invest in relationship-specific assets.

Acknowledgments
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Appendix

Table A.1 Survey on the Characteristics of Parts in a Competitive Bid Event

<table>
<thead>
<tr>
<th>Concept</th>
<th>Question(s)</th>
<th>Median score</th>
<th>Interrater agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance hazards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complexity (α = 0.88)</td>
<td>1. These represent complex parts that are difficult to manufacture.</td>
<td>4</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>2. There is extensive, specialized skill, knowledge, and experience required to generate these parts.</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Very small variations from production specs render these parts completely unusable.</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Asset specificity</td>
<td>To provide these parts, the awarded supplier will need (or has already made, if the incumbent supplier) to make substantial investments in tooling and equipment that are specific to Buyco.</td>
<td>3</td>
<td>0.75</td>
</tr>
<tr>
<td>Demand predictability</td>
<td>There can be a high level of variance month to month or season to season from the forecast demand for these parts.</td>
<td>4</td>
<td>0.67</td>
</tr>
<tr>
<td>Expectations of exchange continuity</td>
<td>The underlying technology required to manufacture these products has changed rapidly over the past five years.</td>
<td>3</td>
<td>0.77</td>
</tr>
</tbody>
</table>

* Questions were scored on a seven-point Likert scale.

* Based on Spearman’s rank correlation coefficient.

Table A.2 Auction Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>S.D.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of difference between winning bid and lowest bid for i</td>
<td>6.7</td>
<td>0.5</td>
<td>14.7</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Log of winning bid for i (US$)</td>
<td>11.55</td>
<td>11.72</td>
<td>1.50</td>
<td>6.89</td>
<td>15.71</td>
</tr>
<tr>
<td>No. of bidders for i</td>
<td>5.73</td>
<td>5</td>
<td>3.51</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>Dispersion of bids for i</td>
<td>16.4</td>
<td>9.0</td>
<td>22.5</td>
<td>0</td>
<td>231</td>
</tr>
<tr>
<td>Price rank of winning bidder for i</td>
<td>2.08</td>
<td>2</td>
<td>1.13</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Relationship history rank of winning bidder for i</td>
<td>2.33</td>
<td>1</td>
<td>1.19</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Award for i goes to lowest bidder</td>
<td>0.432</td>
<td>0</td>
<td>0.496</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Award for i goes to experienced bidder</td>
<td>0.714</td>
<td>1</td>
<td>0.452</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: Based on 562 observations.
Endnotes

1. Kale et al. (2000, p. 221) are the first to use the term in the strategy literature. The term “relational capital” is also used in the negotiation literature to refer to “goodwill” comprising “mutual liking, trust, and the quality of a dyadic relationship” (Curhan et al. 2008, p. 193, italics in original). In this literature, relational capital enables parties to achieve better negotiation outcomes. Ariño et al. (2001, p. 126) develop a related term, “reservoir of relational quality,” to describe the level of trust in a relationship.

2. A handful of papers (e.g., Uzzi 1999, Fernandez and Castilla 2001, Uzzi and Lancaster 2004) examine a related issue: the value associated with social capital. Hellman et al. (2008) examine the strategic behavior by banks, which are more likely to make loans to companies (and at lower prices) with which they have venture capital relationships.

3. This figure represents annual estimates of spending for the parts in question. The modal contract length in our sample is three years.

4. This buyer sources specialized parts (i.e., parts for which cospecialized production investments are required that few are capable of or willing to make) internally and through long-term relationships. Thus, the sample we construct consists of parts most suited to market-based exchange.

5. These mechanisms we describe are not the only mechanisms available to firms to reduce agency problems of this sort. The literature on higher-order routines (e.g., Helfat et al. 2007, Heimeriks et al. 2012) offers an alternative perspective.

6. To use the terminology of Chatain (2011), historical exchange with a supplier may be associated with an expansion in the value that can be created with (by) that supplier. Differences between suppliers in the value-creating potential resulting from prior exchange shape suppliers’ added value (Brandenburger and Stuart 1996).

7. In more complex settings, repeated exchange may lead to the development of client-specific knowledge (Chatain 2011) and/or better understanding of fit between heterogeneous resources and customer needs (Bidwell and Fernandez-Mateo 2010).

8. Although both lines of reasoning suggest that relationships reduce ex post opportunism, they also suggest that relationships provide stronger incentives for building interorganizational routines (Dyer and Singh 1998) such as common problem-solving languages (Monteverde 1995), which may reduce the costs of future exchanges.

9. Industry surveys suggest that upward of one-third of total procurement spending by large industrial firms occurs through online bidding events (CAPS 2006).

10. Consistent with transaction cost logic, these parts or services were more likely to be produced internally or single-sourced (Williamson 1985).

11. Some studies have shown that organizations learn to write better contracts over time (e.g., Mayer and Argyres 2004, Reuer and Arinó 2007). By the time of our study, Buyco had already conducted thousands of online auctions. Thus, we expect that the contracts we studied were already optimally designed.

12. Mares and Swinkels (2008) discuss the distortions generated by including very uncompetitive suppliers in “handicap” procurement auctions. This logic suggests that Buyco’s decision to restrict the pool of bidders to the set of capable potential suppliers is likely to produce more competition and better outcomes for Buyco.

13. Buyco was not required to select any bidder if the price did not fall below a certain reserve threshold.

14. Buyco used a third-party application service provider to organize information about the CBE online and to conduct the auctions themselves. This service provider managed the information flow between Buyco and the bidders and managed the bid solicitation process. The service provider did not select auction winners nor did it retain information about the bidders that were awarded the supply contracts.

15. This residual uncertainty was greatest for suppliers with which Buyco was unfamiliar. Although no official handicap existed, some supply chain managers indicated that they demanded an extra price reduction of a few percent before they would consider new suppliers.

16. One former director of electronic sourcing succinctly stated, “When you have troubles and have issues, you need friends standing by to help you out.”

17. Our initial screening yielded an initial set of 242 CBEs representing procurement activity for 928 item bundles. In roughly 15% of these CBEs, bid data were not recorded. Of the remaining CBEs, there were a substantial number of instances in which no bids were submitted below the reserve price, and thus, no bidder was selected. Furthermore, there were other instances in which only one bidder submitted a bid. Because these observations could not identify the relative importance of price and relationship history, they were dropped. The majority of our sample attrition comes from these three factors. We perform a series of tests comparing the characteristics, including forecast spending, of the missing auctions to those in our sample. The null hypothesis that the mean values of these characteristics are identical was not rejected in a single instance.

18. Prior to 2002, this database is incomplete. Thus, we cannot trace all relationships back to their origin.

19. Recall that products in a CBE were always in the same product category and typically were in a rather narrow range, designed to provide incentives for appropriate bidders to bid in the auctions.

20. We examined a subset of the attributes for which we collected data in this paper. Incorporating the remaining attributes in our empirical analysis does not affect the significance of our results.

21. With the exception of the United States (which we classified as English-speaking), English-speaking countries were countries in which one of the official languages is English.

22. We dropped from our sample bids made by a handful of suppliers whose headquarters we are unable to locate. In no cases did these suppliers win the supply contract.

23. A common critique of the conditional logit specification is that it assumes independence from irrelevant alternatives (IIA). In this setting, however, in which all suppliers are invited to bid, IIA was less likely to be an undesirable assumption. Further, we performed tests suggested by Hausman and McFadden (1984) that do not indicate that IIA is a poor assumption for these data.

24. To generate these calculations, we assume a focal bidder bids against four competing suppliers that submit bids at the 0th,
25th, 50th, and 75th percentiles of the bid premium distribution, respectively.

25The coefficient on the main effect common language indicates that, controlling for other factors including distance, firms in English-speaking countries that had not done business with Buyco before were at a disadvantage for winning the supply contract. One explanation for this result is that, during the period in question, there was a strong push at Buyco to move production to low-cost countries such as Mexico and China, as well as to eastern Europe.

26The quartile cutoffs are $53,000, $144,000, and $315,000, respectively.

27We assume that this value for U.S.-based suppliers is twice that of the United States’ largest trading partner.

28These results are available from the authors upon request.

29Because this calculation involves taking the ratio of two estimated coefficients, we compute 95% confidence intervals via simulation (1,000 draws).

References


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