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Contractual Flexibility, Rent Seeking, and Renegotiation Design: An Empirical Analysis of Information Technology Outsourcing Contracts

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This paper examines renegotiation design in contracts for outsourced information technology (IT) services. Whereas prior literature in information systems has highlighted the likelihood of ex post rent seeking engendered by renegotiation, we build upon literature on incomplete contracts to posit that renegotiation can be Pareto improving by incorporating contingencies revealed ex post. Research on contract renegotiation has been hampered by two sets of challenges: the lack of appropriate data and empirical challenges in identification. We circumvent this problem both by appropriate data collection and by employing an identification strategy to address alternate causal explanations. We propose a measure, Pareto improving amendments, to assess renegotiation outcomes that enhance the value from outsourcing by hazard equilibration and by incorporating learning. Using a unique sample of 141 IT outsourcing contracts, we examine the role of decision rights delineated ex ante in enabling Pareto improving amendments and in resolving the trade-off between adaptation and rent seeking. We find that flexibility provisions, termination for convenience rights, and contractual rights whereby vendors are granted rights to reuse know-how are associated with Pareto improving amendments. The results are robust to potential endogeneity of contractual provisions when parties have feasible foresight and to the possibility of adverse selection in the sample. We also examine alternate explanations from the literature on contractual breach. Implications for practitioners and researchers are discussed.

Key words: contractual flexibility; rent seeking; IT outsourcing; incomplete contracts; renegotiation design
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1. Introduction

Although a substantial body of research recognizes that contracting for information technology (IT) services is inevitably incomplete (Han et al. 2011, Koh et al. 2004, Susarla et al. 2010),[1] the role of ex post adaptation has not received sufficient attention. Traditionally, complex IT outsourcing deals were structured through long-term contracts, which promised to foster incentive alignment and promote durable relationship-specific investments (e.g., Joskow 1987). However, the inflexibility and rigidity of long-term contracting deals (Mok 2004, Giera and Parker 2006) led to several contract cancellations midway when vendors failed to meet client expectations about outsourcing (Technology Partners International 2007, Young 2004). Recognizing the need for flexibility, practitioners adopted renegotiations, termed *contract restructuring*, where parties can redefine agreements to reassess initial responsibilities, to clarify expectations, and to incorporate enhanced governance (Ridder 2008) as a means to counter the rigidity of

sourcing arrangements. However, such renegotiations need considerable managerial commitment (Deloitte Consulting 2005) and contingency planning (Huntley 2008). Another inherent risk is the threat of business disruption in renegotiation (Giera and Parker 2006).

Renegotiation design refers to the "design of rules that govern the process of renegotiation" (Aghion et al. 1994, p. 257). Theories of incomplete contracting posit that the ability to renegotiate is an important aspect of contract design, conferring strategic flexibility to adjust the terms of trade ex post to include contingencies not anticipated in the initial contract design (e.g., Aghion et al. 1994, Segal 1999). The primary challenge to achieving ex post adaptation in contracts for outsourced IT services is that of rent seeking, defined as "individually optimal (but socially destructive) haggling over appropriable quasi-rents" (Gibbons 2005, p. 218). In the context of IT outsourcing there are two sources of rents. First, vendors undertake noncontractible specific investments in providing an IT solution tailored to the organizational context in the client firm. Such specific investments are valuable to a client (Chen and Bharadwaj 2009, Han et al. 2011, Poppo and Zenger 1998) and

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[1] We refer throughout to the outsourcer as the client and the outsourcee as the vendor.

result in appropriable quasi-rents (Klein et al. 1978). Second, human capital and process improvements engendered in an IT initiative result in intangible value creation (Brynjolfsson and Hitt 2000). Thus, another rent unique to IT outsourcing may be the ability to redeploy the knowledge and human capital (e.g., Miozzo and Grimshaw 2005) that result as by-products of performing a contracted task. Both vendors and clients could seek to appropriate such rents, which leads to two distinct contractual hazards when renegotiating contracts. Concessions extraction during renegotiation (Masten 1988, Wathne and Heide 2000) and the resultant haggling and bargaining costs lead to maladaptation (Williamson 1985). The underinvestment that results when parties anticipate rent seeking could also erode value from contracting (Hart and Moore 1990).

Research on renegotiation has been hampered by the difficulty of obtaining appropriate empirical proxies. We circumvent that problem by collecting data on outsourcing of complex IT services from 10-Q, 10-K, and 8-K filings of material contracts that are part of public disclosure mandated by the U.S. Securities and Exchange Commission (SEC).[2] Our data set includes original contractual provisions, proxies for contract incompleteness and specific investments and decision rights to structure renegotiation. When a publicly filed contract is renegotiated, parties are required to file the amendments as an addendum. Similarly, contract terminations are disclosed either through press filings or financial statements. Thus, we observe both the incidence and outcome of renegotiation by tracking each contract from the start date to the date of completion or termination. We conduct a detailed analysis of the textual content of each renegotiation outcome to distinguish between Pareto improving amendments, defined as renegotiations that improve the welfare of one party without worsening the other (e.g., Guasch et al. 2007, 2008), from opportunistic repricing that represents rent shifting renegotiation (Guasch et al. 2008). Specifically, we consider as Pareto improving those amendments that enhance the value from outsourcing through hazard equilibration (Williamson 1985) and by incorporating learning (Mayer and Argyres 2004).

The central question we investigate is the role of decision rights delineated ex ante that enable Pareto improving amendments. We examine three important decision rights: (i) flexibility provisions that provide a structure for adjusting the terms of trade ex post,

(ii) termination for convenience rights[3] that confer bargaining power to a client during renegotiation, and (iii) redeployability rights that allow a vendor to redeploy knowledge to uses outside the contractual relationship. We find that such ex ante decision rights significantly enhance the likelihood of Pareto improving amendments against the default outcome of parties completing the contract without ex post renegotiation.

The identification challenge is that of distinguishing the role of contractual provisions that foster renegotiation design in enabling Pareto improving amendments from that of contractual breach. As an alternative to costly enumeration of contract contingencies, parties could exit the agreement rather than continue to renegotiate (e.g., Shavell 1984), which implies that factors that lead to Pareto improving amendments could also enhance the likelihood of contract breach. Data on contract terminations, where contracts were canceled before the term of the contract, serve as a robustness check in examining the potential simultaneity in the relationship between Pareto improving amendments and contract breach. We also conduct a multivariate probit to address the possibility that parties could first decide to exit the contract or not and then decide to engage in Pareto improving amendments.

Examining the relationship between ex ante decision rights and Pareto improving amendments is complicated by endogeneity if parties exhibit "feasible foresight" (e.g., Williamson 2005, p. 8) by designing contracts with provisions to allow for smooth adjustment to contingencies ex post. We use an instrumental variable to proxy for market conditions, which could make it likely that parties anticipate such ex post changes. The results are also robust to adverse selection whereby opportunistic agents may deliberately choose contracts that may be amended ex post.

This paper contributes to the literature by highlighting the importance of renegotiation design in enabling adaptation ex post. This paper is in the tradition of recent empirical literature in economics and finance, such as Benmelech and Bergman (2008), Lerner and Malmendier (2010), and Roberts and Sufi (2009), that considers the contractual allocation of rights across firm boundaries. One stream of prior research suggests that writing tightly defined contracts with comprehensive measures of performance (e.g., Lacity and Willcocks 1998) works best, characterizing ex post adjustments as evidence of governance problems (e.g., Anderson and Dekker 2005).

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[2] Item 601(b)(10) of SEC Regulation S-K describes a material contract as "any contract upon which the registrant's business is substanially dependent" (http://www.sec.gov/investor/pubs/edgarguide.htm).

[3] Contracts could incorporate clauses to terminate agreements in the event of circumstances such as merger or acquisition or termination for reasons of contract breach, which are not considered termination for convenience rights. Such types of termination rights do not mitigate the hazards of maladaptation and underinvestment.

Another stream of prior literature on IT outsourcing has examined the problem of contractual adaptation through the lens of pricing mechanisms (e.g., Banerjee and Duflo 2000) and ignored the dangers of maladaptation and underinvestment engendered by renegotiation. We differ from these papers by adopting an incomplete contracts perspective whereby renegotiation enhances ex post welfare. Another contribution is to conceptualize rights to redeploy know-how and intellectual property, which is a feature of IT outsourcing where vendors undertake investments in human capital and process enhancements (e.g., Poppo and Zenger 1998) rather than the durable investments analyzed elsewhere (e.g., Joskow 1987).

The remainder of this paper is structured as follows. Section 2 presents the theory and hypotheses. Section 3 describes the data and measures. Section 4 presents the empirical approach, and §5 presents a discussion of results. Concluding remarks are provided in §6.

2. Theory and Hypotheses

2.1. Rent Seeking in IT Outsourcing

In IT outsourcing, the task environment is characterized by constant changes in underlying technologies and inputs such as hardware and network infrastructure (Gurbaxani 2007) and by constantly changing business requirements, technological specifications, and applications architecture as well as capabilities expected by users (e.g., Barthélemy 2001). The complexity in the task environment makes it difficult to detail what is to be covered in the contract (e.g., Banerjee and Duflo 2000) and to outline parameters upon which vendor performance can be assessed (e.g. Whang 1992). Consider a new system to support claims processing, where a vendor and a client might realize, only after development has begun, that business value will be greater if there is a change in the entire accounts receivable process. Thus, parties could begin the contract with an imperfect system specification, and only when the outsourcing initiative is underway do parties incorporate the complete responsibilities not envisaged in the original agreement (e.g., Huntley 2008).

Although contracts for IT outsourcing are inevitably incomplete, achieving adaptation is hampered by the threat of rent seeking. As explained earlier, we consider two sources of rents in the context of IT outsourcing. First, investments in learning about the client organization and in conceptualizing process redesign are highly specific to a client (Poppo and Zenger 1998), generating the most value within the relationship, consistent with the classic view of specific investments (Williamson 1985). For example, as the following quote from one of the contracts illustrates,

contract clauses could define the responsibility of the vendor in the following terms:

> …review the client environment with the goal of consolidating functions and machines, eliminating requirements, and modifying processes.

Specific investments are characterized as "valuable but vulnerable" (Ghosh and John 1999, p. 134) because either party can take advantage of the bilateral lock-in conditions to engage in rent seeking. Second, given the interlinkage between IT and organizational capital (Brynjolfsson and Hitt 2000), another source of rents and value creation by IT systems is because of management practices enabled by IT (Miozzo and Grimshaw 2003). Thus, the effort made by a vendor in process innovation and process improvements (e.g., Linder et al. 2003) that could generate economic rents when deployed in alternate settings.[4]

The threat of rent seeking by either party could lead to two types of ex post contractual hazards. First, when rent seeking deters parties from adapting to unfolding contingencies (Susarla et al. 2009), the result is maladaptation, whereby contracts are too rigid to incorporate changing business needs. For instance, vendors could exploit their lock-in position and engage in costly haggling, concessions extraction (Klein 1996), and inefficient bargaining over the division of surplus (Williamson 1985). Maladaptation erodes the value from contracting (Bajari and Tadelis 2001, Dahlstrom and Nygaard 1999) when needed modifications are prevented. Clients wary of switching a vendor because of termination penalties and the potential for business disruption (Forrester 2006) may then be locked into higher rates and diminished service. Alternately, clients could force price changes on vendors to exploit the sunk costs (in the form of specific investments), resulting in vendor inflexibility in adapting to new information revealed after the contract begins.

The second hazard is that of underinvestment in (noncontractible) specific investments (e.g., Hart and Moore 1990) when vendors expect that appropriable quasi-rents may be dissipated by ex post bargaining. Clients could exploit a vendor's concern for contract continuation by forcing repricing on the vendors, by imposing stricter standards, or by garnering returns from process improvements. Anticipating contentious bargaining ex post, the vendor could underinvest ex ante and deliver perfunctory performance. Vendors may also want to hide to protect future rents through performance shading and shirking of responsibilities,

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[4] Residual rights over know-how as a result of performing a contracted task are distinct from property rights over developed software, which could be held by the client.

Figure 1   Contracting Timeline
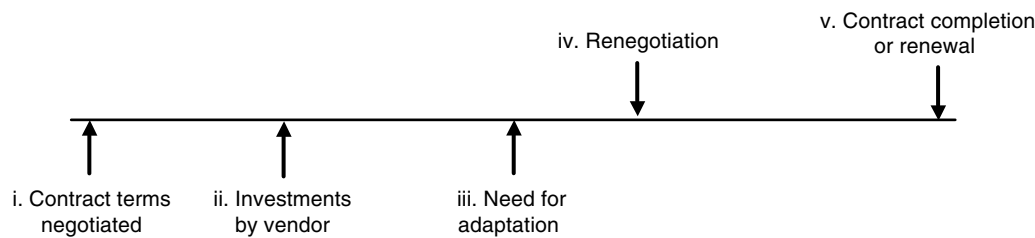
similar to the "ratchet effect" (e.g., Laffont and Tirole 1993, p. 375). These two hazards may cause parties to abandon contracting altogether (Dye 1994) or to move the transaction back in-house. Strategic behavior by either party could also force the other to prematurely terminate the contract.

2.2. Contracting Environment and Pareto Improving Amendments

Figure 1 presents a stylized timeline of outsourcing. Contracting parameters chosen at (i) impact both the structure of the renegotiation process at (iv) as well as the actions of parties at (ii). Building upon incomplete contract theory (e.g., Hart and Moore 1990, Segal 1999), we distinguish between ex ante decision rights at stages (i) and actions at stage (ii) from ex post actions at (iv). Because a contract could commence with an incomplete specification at (i), an amendment at (iv) is Pareto improving when the welfare of one party is improved without making the other worse off (Guasch et al. 2008). As discussed earlier, the two ex post contracting hazards we consider are that of underinvestment at stage (ii) and maladaptation at stage (iv), both engendered by rent seeking when parties cannot commit not to renegotiate.[5]

We build upon prior literature to articulate two types of Pareto improvements in amendments: hazard equilibration and learning.[6] First, exchange partners need to develop "local and incremental" learning in how to draft contractual clauses (Mayer and Argyres 2004, p. 395), such as incorporating contingency planning and responsibilities not defined upfront (Mayer and Argyres 2004). For instance, an amendment requires the vendor to conduct a satisfaction survey of "(a) end-users of the Services and (b) senior management of end-users" to provide an indicator of vendor performance. Another amendment specifies additional responsibilities whereby "the client could

participate in early testing" and broadens the original agreement so that the completed system is compatible with a Web services initiative at the client organization. Second, "hazard equilibration" (Williamson 1985, p. 34) is the process of increasing responsibilities of both parties ex post and giving them a greater stake in order to prevent a breakdown of the contract, such as a "mutually agreed-upon milestone schedule" as specified in one of the amendments. Another amendment similarly outlines mutually agreed upon conditions on the level of expected performance. In both cases, each party's incentive to engage in postcontract bargaining is balanced through mutual adjustment (Williamson 1985). Such hazard equilibration keeps the costs of ex post adjustment low (Masten 2009) and ensures that renegotiation is equitable (Masten 1988).

Both types of amendments are Pareto improving because they allow ex post revision of terms when new information is revealed about the contracting environment (Roberts and Sufi 2009). As discussed in the appendix (Table A.1), Pareto improving outcomes such as hazard equilibration and learning allow parties to incorporate mutual adjustments to new information, to clarify the goals from outsourcing, and to incorporate changes in the external environment. Because parties cannot commit not to renegotiate (Aghion et al. 1994, Hart and Moore 1999, Segal 1999), the challenge in achieving contractual flexibility is to balance the need for adaptation with the twin distortions of maladaptation and underinvestment engendered by rent seeking. Given the complexity of IT services, a third party, such as a court, could find it difficult to distinguish between forced renegotiations and a genuine need for ex post adaptation. This distinction is important because otherwise contracts could incorporate contractual safeguards or benchmarks to enable adaptation.[7]

2.3. Renegotiation Design and Ex Ante Decision Rights

Property rights are defined as the "the residual rights of control of the asset, that is the right to control all aspects of the asset that have not been explicitly given

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[5] Although some papers assume that ex post rent seeking can be solved through renegotiation proof contracts, legal scholars have argued that law does not allow parties to write such a contract that cannot be later modified (Katz 2005).

[6] These two motives are not mutually exclusive because contracting parties can make both types of ex post adjustments within an amendment. Thus, we do not empirically distinguish between these two different motives.

[7] That is, known sources of variation in an outsourced project are distinct from unanticipated contingencies (e.g., Segal 1999).

Table 1 The Role of Renegotiation Design on Pareto Improving Amendments

Contracting hazards	Role of decision rights	Impact on Pareto improving amendments
Anticipation of rent seeking leads to maladaptation and underinvestment	*Flexibility provisions* specify a structure for adjusting terms ex post	Flexibility provisions reduce the likelihood of rent seeking by both parties, lowering maladaptation and underinvestment
Inadequate incentives for rent generating knowledge assets leads to maladaptation and underinvestment	*Redeployability rights* to vendors enable them to redeploy assets generated in a client engagement to uses outside the contract	Redeployability[a] enhances the value of the outside option for the vendor in case renegotiation breaks down, lowering maladaptation and underinvestment
Anticipated rent seeking leads to maladaptation and underinvestment	*Termination for convenience rights* specify a default option and assign bargaining power to one party	Termination for convenience rights provide unilateral control to clients, lowering maladaptation and underinvestment

[a]Investments that enhance the disagreement payoff or outside option are characterized as "self-investments" (Whinston 2001, p. 186).

away by contract" (Grossman and Hart 1986, p. 695), suggesting a broad interpretation of property rights as any decision right. We examine decision rights allocated ex ante that govern noncontractible actions of parties (e.g., Lerner and Merges 1998, Roberts and Sufi 2009). Table 1 summarizes the role of decision rights and serves as a roadmap for the hypotheses development.

2.3.1. Flexibility Provisions. Contractually specified ex ante decision rights, such as provisions to update contract terms (Masten and Crocker 1985) and price adjustments (Joskow 1988), which we refer to as flexibility provisions, enable smooth adaptation ex post. Flexibility provisions specify a framework for how to renegotiate contracts, reducing maladaptation by lowering the threat of costly bargaining ex post, facilitating "adaptive, sequential decision-making" (Williamson 1979, p. 237). A structured process of redetermination of contract terms (e.g., Crocker and Masten 1991) enables adaptation to changing circumstances without relying on detailed specification of contingencies (e.g., Masten and Crocker 1985). A client is less likely to force concessions because a vendor can always refuse to alter the terms of trade agreed upon at the outset. There is also a lower likelihood of underinvestment because a vendor is less concerned about rent seeking by a client. Thus, we hypothesize the following:

HYPOTHESIS 1. *Flexibility provisions are associated with greater likelihood of Pareto improving amendments.*

Although parties do not have perfect foresight, they may have "feasible foresight" in that "they have the capacity to look ahead, uncover possible hazards, and work out the ramifications" Williamson (2005, p. 8), such as flexibility provisions when there is a reasonable anticipation that contracts will be renegotiated later on. We therefore examine the possibility of endogeneity in the empirical estimation.

2.3.2. Termination for Convenience Rights. Prior literature posits that contracts should delineate decision rights whereby a default option is specified in case bargaining breaks down and assign all the bargaining power to one party (Aghion et al. 1994, Edlin and Reichelstein 1996), specifically to the party not making the investment. Termination for convenience rights grants unilateral control to the client, reducing the likelihood that a vendor can engage in opportunistic rent seeking. The threat of unilateral termination by the client correspondingly lowers the likelihood of underinvestment by the vendor. Such enhanced performance incentives for a vendor correspondingly lower incentives for a client to force concessions or strategic termination, lowering the likelihood of maladaptation and underinvestment, facilitating smooth adaptation to unfolding contingencies, and leading to Pareto improving amendments. Thus, we hypothesize the following:

HYPOTHESIS 2. *Termination for convenience rights are associated with greater likelihood of Pareto improving amendments.*

2.3.3. Redeployability Rights. Decision rights allow the owners not only to deploy an asset for profitable uses but also to allow the right to exclude others from access and charging for access (e.g., Rajan and Zingales 1998). Ex ante decision rights granted to vendors, whereby they can derive rents in redeploying assets generated in one client engagement to uses outside the contractual relationship, are termed redeployability rights in this paper. For instance, one of the contracts grants the vendor "all rights, title and interest in and to all development tools, know-how, methodologies, processes, technologies or algorithms used in performing the (contracted) services and providing the deliverables," whereby the vendor can redeploy skills, know-how, technological expertise, and process knowledge toward service

delivery in other outsourcing initiatives.[8] MacLeod and Malcomson (1993) posit that renegotiation is beneficial when specific investments made by a party strengthen its outside options in case contracting breaks off ex post. When vendors are granted such redeployability rights, there is a lower temptation to engage in underinvestment, and correspondingly lower likelihood of strategic concessions extractions by clients, thus strengthening incentives of both parties to behave cooperatively. By lowering the threat of maladaptation and underinvestment, decision rights granted to vendors facilitate smooth adaptation. Thus, we hypothesize the following:

HYPOTHESIS 3. *Redeployability rights are associated with a greater likelihood of Paretoimproving amendments.*

3. Data and Measure Development

As explained earlier, the data for this study are drawn from 10-Q, 10-K, and 8-K filings of firms. Although firms have considerable discretion in terms of which contract activity is disclosed, limiting the volume of outsourcing activity that is reported, the filings do provide a comprehensive source of contract data from both vendors and clients. The SEC filings also provide information about prior contracts, if any, between the vendor and client and data about contract amendments. The data collection was as follows. From the SEC's EDGAR database, all registrants were identified that were classified in the two-digit SIC category 73, which denotes that the contract is written for computer related services. In addition, details of large clients were identified based on data sets of press releases of outsourcing announcements compiled by a professional advisory firm and a trade journal that lists publicly announced outsourcing deals. The entire sample was then assembled over a 14-month period between 2006 and 2007 and includes filings from both vendors and clients. From an overall sample of roughly 3,800 contracts, the screening process resulted in 466 contracts. Based on intensive screening, the sample was further narrowed down to

[8] By contrast, some contracts restrict redeployability or specify strict limits as to the future rents, as the following quote from a contract illustrates:

[S]pecific code written by the vendor for use in connection with the [Client] system or for interfacing the system with the vendor developed software, and the specific algorithms associated therewith, may not be utilized by the vendor for a period of seven years after contract completion.

Contracts can also prohibit vendors from redeploying knowledge that is strategically important to the client:

Vendor specifically acknowledges that any information relating to the manufacturing learned by Personnel during the course of (and as a result of) providing Services is not Residual Subject Matter under this Section.

161 contracts between 232 clients and vendors after removing filings that pertain to arrangements such as mergers, strategic alliances, joint ventures, partnerships, asset purchases, or acquisition related agreements, which pose substantially different contracting challenges. The sample was also screened to ensure that a complete history of transactions pre and post contract was available and based on the criteria that the contracts included detailed descriptions of contract deliverables and responsibilities of parties. The final sample was 141 contracts. The sample construction and validation are available upon request. The SEC data were supplemented with data from a number of publicly available databases that aggregate news and press releases, such as Dow Jones Interactive and Factiva, as well as trade and business press that reports on outsourcing deals. Firm and vendor information for each contract was matched with data from the One Source Online Business Information database and Hoovers database. Press releases from clients and vendors also provide a data source to examine the relationship history between parties.

Although prior literature in management and economics offers normative guidelines on coding contracts (e.g., Anderson and Dekker 2005, Lerner and Malmendier 2010, Ryall and Sampson 2009), there is limited guidance to measure some of the variables of interest, such as redeployability rights. Therefore, an in-depth analysis was conducted for an initial set of 10 exhaustively detailed contracts (each more than 60 pages long) to develop guidelines for measure development. To minimize discrepancies, the initial sample was obtained from a proprietary database compiled by a firm specializing in advisory services for contract negotiations. The contracts used for measure development were excluded from the subsequent data analysis. Table A.1 in the appendix provides the coding guidelines for key variables along with excerpts from contract documents.

3.1. Dependent Variables

Pareto Improving Amendments. This variable was coded as a binary variable based on detailed textual analysis of the amendments by analyzing whether (i) parties exhibit learning (e.g., Mayer and Argyres 2004) and (ii) hazard equilibration (Masten 1988, 2009) ex post. Pareto improving amendments can result in substantial changes to the terms of the initial contract, allowing parties to incorporate contingencies revealed ex post, thereby expanding the set of contracting opportunities (e.g., Segal 1999). By contrast, contractual enforcement failures could result in rent shifting renegotiations (Guasch et al. 2008).

Terminations. Clients (and usually vendors) disclose contracts that are terminated early in their press filings and investor briefings, which provided the data to code contract cancellations. Terminations followed

by litigation of a contract that is deemed material are also disclosed in annual filings. Gathering data from press releases allows us to obtain data on contract terminations because of vertical integration. For terminations of convenience, parties sign separation agreements and disclose such terminations in investor briefings. Therefore, we also gathered additional data sources such as separation agreements and annual financial reports. We investigate alternate causal explanations whereby terminations could represent contractual breach.

3.2. Independent Variables

Flexibility Provisions. Parties to a contract may build in provisions that enhance flexibility in dealing with changed circumstances. We coded this measure as a binary scale depending on the presence of two clauses that specify updating of service terms and enabling price changes. The measure is coded as 1 if either or both of the clauses are present. First, contracts contain provisions for updating service terms (Goldberg and Erickson 1987, Masten and Crocker 1985), as illustrated in a quote from one of the contracts: "fees and charges under an agreement with consent of parties by an amount that reflects the increased cost to the [Vendor]." Second, contracts could contain provisions enabling price changes (Joskow 1988), as evidenced by a quote from one of the contracts that mentions that "prices may be updated by parties." For sensitivity, the binary measure was checked against an ordered scale. The binary coding scheme was more robust since the two flexibility provisions tended to be highly correlated.

Redeployability Rights. This variable was assessed by examining the vendor's residual rights of control to redeploy (e.g., Benmelech and Bergman 2008) knowledge and intellectual property generated in performing the contracted task to uses outside the contractual relationship. This measure is coded as a binary variable when the contract specifies that vendors could either (i) employ the know-how resulting from performing contract obligations elsewhere (e.g., Mayer 2006) or (ii) patent any technology, tools, processes, etc., generated from performing the contractually specified service. Redeploying know-how and process knowledge implies not that such knowledge is generic but that the vendor has residual rights over future rents[9] and the right to exclude others and restrict access to the asset (e.g., Rajan and Zingales 1998). Redeployability is relevant when the vendor can generate improvements and inventions that arise during the course of performing the contracted task.

Although vendors may have a stock of preexisting knowledge, there could be enhancements in performing the contracted services (sometimes known as a "derivative" work). Therefore, we distinguish redeployablity from cases where the client has a de facto ownership of rights to all derivative works or when new inventions are considered the property of the client under a made for hire contract clause.

Termination for Convenience Rights. This variable assigns a default bargaining power to one of the parties in case renegotiation breaks down (e.g., Aghion et al. 1994). This variable was coded as 1 if clauses indicate that the client has an option to terminate the agreement prematurely without cause (e.g. Gurbaxani 2007), similar to the *right to terminate without cause* measure in Lerner and Merges (1998).

3.3. Task Characteristics

Complexity. Complexity refers to contingencies that are difficult to anticipate ex ante and to enforce ex post (Segal 1999). Creating a new information system involves changes in the way a client conducts business, limiting the extent to which parties can envisage the scale and scope of the outsourcing initiative ex ante[10] and increasing the difficulty in measuring vendor performance ex post. *Complexity* was measured as a binary variable coded as 1 if either of the following factors were observed in the contract: (i) the service description suggests that product specifications are incomplete upfront (Banerjee and Duflo 2000), similar to applications volatility in the IS literature (Banker and Slaughter 2000), or (ii) the objectives are transformational, such as strategic goals or improvements in effectiveness that are difficult to specify and enforce (Susarla et al. 2010). For robustness, this variable was recoded using a three-point scale. Most contracts tended to cluster either on a scale of either low complexity (=1) or high complexity (=3); thus, coding on a binary scale is appropriate.

Specific Investments. Specific investments are investments "tailored to meet the requirements of dealing with (the exchange partner)" (Rokkan et al. 2003, p. 215), defined in the IT context as the extent to which vendors need to acquire "company-specific or division-specific knowledge to adequately perform the IS [information systems] function" and "custom tailor" their services to the client (Poppo and Zenger 1998, p. 866). This measure is coded as a binary variable when the task is (i) customized to client-specific processes, e.g., a contract calls for "consolidating functions and modifying processes" highly

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[9] This definition excludes technology and tools that are patented to the vendor prior to the contract.

[10] This definition excludes situations where the vendor is obligated to keep up with technological advances, because contracts are not incomplete when parties can agree upon an external index or benchmark (e.g., Tirole 1999).

specific to a client, and when (ii) the vendor needs to acquire specialized knowledge or skills unique to the relationship (e.g., Chen and Bharadwaj 2009), as stated in one of the contracts.

3.4. Contract Characteristics

Fixed Price. This variable denotes that the contract specifies a defined payment schedule for services rendered.

Breadth of Service. Services performed by the vendor were classified along a typology of 14 subservices (Lee et al. 2004). The breadth of services is a summation of the above set of activities (Susarla et al. 2010).

Input Monitoring was coded as 1 if clauses in the contract provided detailed descriptions for task performance, delineating strict guidelines as to which activities are to be performed and how they should be performed (Heide et al. 2007).

Output Monitoring. The extent to which a client can monitor outcomes is measured by the following three variables: (i) *Performance Milestones* tied to specific outcomes (e.g., Lichtenstein 2004), (ii) *Audit Rights* to inspect and validate service delivery by the vendor (e.g., Watts and Zimmerman 1983), and (iii) *Service Level Agreements* that specify a threshold acceptable quality level (Goo et al. 2009) for services to be provided by the vendor.

Source Code Escrow Account. This measure was coded as 1 when contracts designate an escrow party that holds the source code until (and releases it after) the client makes a payment (Bahli and Rivard 2001).

Contractual Coordination Mechanisms. This variable was coded as 1 when the contract mandated roles and mechanisms to ease the challenges of communication across clients and vendor (Willcocks and Feeny 2006).

Contract Length. This variable denotes the duration for which the vendor is contracted to deliver services, similar to the expected duration measure of Barry et al. (2002). Because contract length tends to be fine grained for shorter-duration contracts (Masten and Saussier 2002),[11] this was coded as a binary variable if the length is greater than three years following Susarla et al. (2010).

Prior Relationships. This is a binary variable that assesses whether parties transacted with each other in the past (e.g., Banerjee and Duflo 2000) and that was obtained from contract documents as well as public databases.

Contract Value. This variable is obtained from the contract and verified from public databases, measured in log (millions of dollars).

Force majeure. This variable was coded as 1 if the contract clauses provide for easy exit when it may

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[11] Masten and Saussier (2002) argue that duration is "finely tuned" for short-term agreements, whereas long-term contract duration clusters at discrete intervals, making a binary coding scheme appropriate.

be prohibitively expensive to address contingencies revealed ex post (e.g., Crocker and Masten 1991).

3.5. Vendor and Client Characteristics

Vendor Reputation. This variable was coded as 1 following Susarla et al. (2010) if the vendor was listed among any of the following: (i) the Fortune 1,000 technology firms, (ii) IT providers listing in the *Information Week* list of 500 technology companies, or (iii) the Business 2.0 list of 100 fastest growing technology companies and validated against quality assessments from firms such as Gartner and Forrester that publish vendor ratings.

Dominant Customer. This variable is obtained from financial statements and coded as 1 if the client firm accounted for 10% or more of the vendor's annual revenues (Susarla et al. 2010), which is mandated by SEC guidelines. *Client Size* and *Vendor Size* are measured as the log transformed number of employees, to take scale effects into account. A vendor's access to capital markets is measured through a variable called *Publicly Traded* company. The descriptive statistics of all measures are presented in the appendix (Table A.2).

4. Econometric Approach

4.1. Descriptive Overview

Contracts in our sample were written during the period 1998–2003 and exhibit considerable heterogeneity in contract structure such as vendor responsibilities, governance terms, processes for managerial evaluation, and procedures for interorganizational communication. Clients typically initiate amendments as well as terminations. The types of amendments and terminations observed in the data are listed below in Table 2. As explained in Figure 1, clients and vendors can terminate contracts, continue with the original contract, or engage in either rent shifting or Pareto improving amendments to a contract. The contracts that were not amended or terminated were executed per the original contract specification.

Table 3 presents the cross tabulations of the raw data showing Pareto improving amendments and terminations depending on contract characteristics. The appendix (Table A.1) provides detailed examples of amendments and terminations as disclosed in annual reports and through filings by vendors and clients such as separation agreements, transition agreements, asset purchase agreements, and other legal agreements. Pareto improving amendments can broaden the scope of the initial agreement and increase the extent of monitoring and managerial control by the client as well as incorporate additional vendor responsibilities such as performance analysis, testing, migration plans, and interface specification. Preliminary evidence suggests that the theoretical arguments

Table 2 Descriptive Statistics of Contract Renegotiations ($N = 141$)

Outcome event	Total	Long-term contracts	Specific investments	Service breadth	Complex services
Pareto improving amendments					
Hazard equilibration	10	8	7	2	6
Learning to contract	19	17	13	4	10
Amendments with both hazard equilibration and learning	16	16	4	11	12
Total Pareto improving amendments	45	26	24	17	28
Rent seeking or rent shifting amendments	2	1	1	—	1
Terminations					
Terminations followed by litigation	6	3	2	1	2
Termination followed by vertical integration	7	4	5	1	—
Contracts that were terminated without cause	12	4	7	4	6
Total terminations	25	7	14	6	8
Number of contracts	141	141	141	141	141

about renegotiation design are borne out by the data. On average, Pareto improving amendments are 20% more likely with complexity of services, 27% more likely for contracts longer than three years, 20% more likely with an increase of 10 million dollars in contract value, and 32% greater when the client is a dominant customer. Flexibility provisions increase the likelihood of Pareto improving amendments by 20%, termination for convenience rights by 18%, and redeployability rights by 21%.

4.2. Baseline Estimation

We first conduct a probit model where the incidence of Pareto improving amendments is compared against the alternative that the contract is executed without ex post renegotiation. In the econometric model, i refers to the client and j to the vendor; $A_{ij} = 1$ when there is a Pareto improving amendment of a contract between the client i and the vendor j, and $A_{ij} = 0$ when the parties continue with the original contract without renegotiation; O_{ij} refers to decision rights delineated ex ante; X_{ij} to the characteristics of the task contracted upon; C_{ij} refers to a vector of contractual provisions; V_j is a vector

of vendor specific characteristics; and F_i is a vector of client characteristics. We control for factors that improve parties' understanding of exchange needs, such as contractual provisions governing monitoring and performance that may lower potential opportunism (Wathne and Heide 2000), prior relationships between parties that may lead to smoother adaptation (e.g., Banerjee and Duflo 2000), and contractual coordination mechanisms that could minimize postcontractual frictions by enabling communication between organizations (Willcocks and Feeny 2006). We also control for several client and vendor characteristics that affect bargaining power, such as a client being a dominant customer and the vendor being a publicly traded company. The reputation of the vendor may assuage concerns about rent seeking and enable smooth adaptation (e.g., Klein 1996). We excluded from the analysis the two contracts where we observed rent shifting renegotiations. The econometric specification is of the form

$$\Pr(A_{ij} = 1) = \alpha O_{ij} + \beta X_{ij} + \chi C_{ij} + \lambda V_j + \mu F_i + \varepsilon_{ij}. \quad (1)$$

Because there are a few vendors and clients repeated across the sample, we also employed a multiway clustered robust (MWCR) probit specification to address the possibility that error terms are correlated across clients and vendors. We employ a statistical approach developed by Petersen (2009) that builds upon prior work by Cameron et al. (2011).[12] The MWCR specification provides an unbiased method of accounting for the firm level residual effects correlated across observations (Petersen 2009) by generalizing the independent heteroskedastic errors of White (1980). The results are presented in Table 4.

Table 3 Cross-Tabulations of Amendments and Decision Rights ($N = 141$)

Likelihood of Pareto improving amendments		Test of difference: *t*-statistic (*p*-value)	
Contract characteristics			
Contracted task is more complex	0.44	Otherwise 0.22	2.75 (0.003)
Contract length greater than three years	0.44	Otherwise 0.23	2.62 (0.004)
Contract breadth greater than median	0.46	Below median 0.18	3.21 (0.001)
Structure of decision rights			
Flexibility provisions	0.47	Otherwise 0.25	2.53 (0.012)
Termination for convenience rights	0.44	Otherwise 0.26	2.09 (0.018)
Redeployability rights	0.40	Otherwise 0.17	2.89 (0.002)

[12] We used a modified version of the Stata code provided on the author's website to conduct a cluster robust probit: http://www.kellogg.northwestern.edu/faculty/petersen/htm/papers/se/se_programming.htm.

Table 4 Probit Estimation of Pareto Improving Amendments ($N = 139$)

| Variables	(1) Baseline	(2) Contactual provisions	(3) Task characteristics	(4) Decision rights	(5) Multiway clustered robust specifications
Constant	−1.48 (0.263)***	−1.568 (0.404)***	−2.42 (0.57)***	−3.202 (0.636)***	−2.718 (0.532)***
Decision rights					
Flexibility Provisions				0.359 (0.162)**	0.459 (0.223)**
Redeployability				0.655 (0.330)**	0.642 (0.335)**
Termination for Convenience				0.471 (0.162)**	0.512 (0.244)**
Task characteristics					
Complexity			0.515 (0.230)**	0.525 (0.228)**	0.530 (0.225)**
Specific Investments			−0.316 (0.218)	−0.328 (0.196)*	−0.293 (0.200)
Contract Length (>3 years)			0.853 (0.299)***	0.929 (0.301)***	0.916 (0.288)***
Breadth of Service			0.102 (0.061)*	0.114 (0.069)**	0.102 (0.063)*
Contractual provisions					
Fixed Price Contract		−0.099 (0.219)	0.252 (0.319)	0.172 (0.325)	0.270 (0.311)
Service Level Agreements		0.707 (0.281)***	0.473 (0.218)**	0.821 (0.320)***	0.730 (0.308)**
Milestones		−0.403 (0.310)	−0.299 (0.212)	−0.558 (0.276)*	−0.689 (0.404)*
Audit Rights		0.372 (0.285)*	0.422 (0.306)*	0.095 (0.339)	0.129 (0.340)
Contractual Coordination		−0.495 (0.254)**	−0.510 (0.255)*	−0.605 (0.305)**	−0.689 (0.434)**
Input Monitoring		−0.327 (0.300)	−0.112 (0.333)	−0.285 (0.364)	−0.067 (0.070)
Vendor and client characteristics					
Public Vendor	0.808 (0.244)***	0.893 (0.291)***	0.688 (0.322)**	0.493 (0336)*	0.299 (0.321)
Dominant Customer	0.592 (0.268)**	0.757 (0.296)***	1.136 (0.336)***	1.04 (0.342)***	1.142 (0.326)***
Prior Relationships	0.679 (0.247)***	0.693 (0.266)***	0.661 (0.298)**	0.660 (0.314)**	0.709 (0.345)**
Vendor Reputation	0.656 (0.267)***	0.796 (0.294)***	0.686 (0.320)**	0.789 (0.337)***	0.789 (0.355)**
Adjusted R^2	0.15	0.24	0.32	0.38	—

*Significance at the 10% level; **significance at the 5% level; ***significance at the 1% level (all values based on two-tailed t-tests).

4.3. Contractual Breach and Pareto Improving Amendments

Given the contract timeline as outlined in Figure 1, vendors and clients face several choices after initiating a contract: (i) they can choose to continue with the initial contract without renegotiation, (ii) they can terminate the contract, or (iii) they can amend the contract. Because we do not observe significant cases of rent seeking in amendments, we excluded them from the analysis. Figure 2 depicts how amendments, contract continuation without renegotiations, and terminations could be contingent upon the same information.

To address the possibility that vendors and clients face multiple choices, rather than a single choice of amending the contract or not, we conduct a multivariate probit estimation. The multivariate probit has a structure similar to seemingly unrelated regression (SUR) models where different outcomes could be dependent on a common set of explanatory variables. We conduct a simulated maximum likelihood estimation using a Stata module developed by Cappellari and Jenkins (2006), who employ the Geweke–Hajivassilou–Keane multivariate normal simulator (Geweke 1989, Hajivassilou and McFadden

Figure 2 Simultaneity in Amendments and Terminations
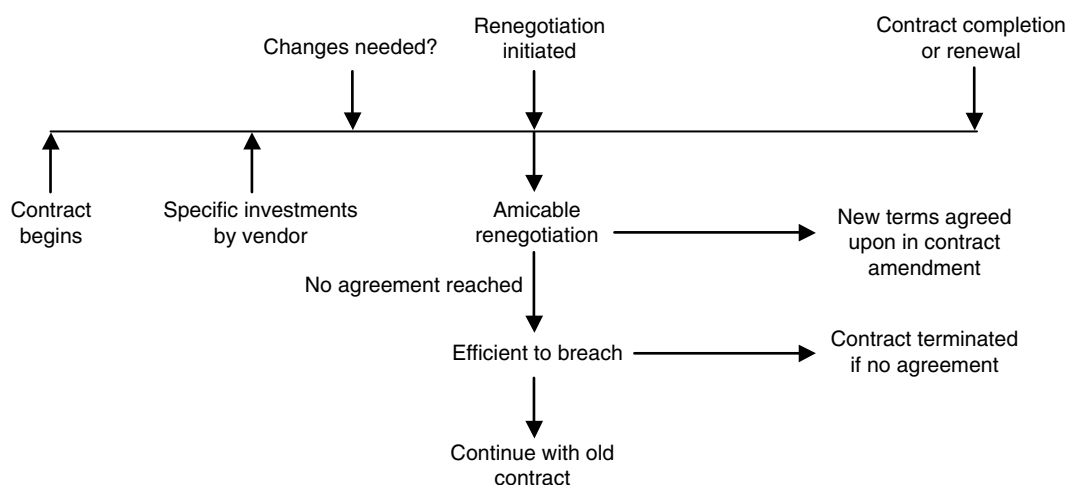
1998, Keane 1994). The Cappellari and Jenkins (2006) method exploits the fact that a multivariate normal distribution can be expressed as a product of sequentially conditioned univariate normal distribution functions.

The three choices, i.e., continue a contract without renegotiation, termination, and Pareto improving amendments, are linearly dependent because contracts fall into any of these categories. Therefore, we do not conduct a trivariate probit but conduct a multivariate probit estimation to address the two simultaneous choices: (i) a contract could be continued without renegotiation against the alternative that a contract is terminated, and (ii) contracts are renegotiated through a Pareto improving amendment against the alternative that contracts are executed without renegotiation (i.e., those contracts that were not terminated). In other words, the multivariate probit allows us to simultaneously estimate the probability of a contract not being terminated and, conditional on contract continuation, the probability of a Pareto improving amendment. Table 5 presents the results. As an exclusion restriction for identification, we included the presence of terms and clauses specifying termination planning (Huntley 2008) in predicting contract continuation.

An important alternate explanation in examining the role of ex ante decision rights is that of contractual breach. Prior literature posits that it may be better to discontinue a contract when the information revealed ex post makes the initial contract inefficient (e.g., Edlin and Reichelstein 1996). Thus, termination serves as a substitute for specifying contingent terms (e.g., Edlin and Reichelstein 1996, Rogerson 1984, Shavell 1984), acting as a holdup tax by reducing the incentives for rent seeking during renegotiation. This leads to an identification challenge in the empirical analysis. Factors that increase contract incompleteness, therefore, may explain both amendments and termination; thus, renegotiation and contract termination decisions that appear to be apparently independent decisions may be a result of the same underlying decision-making process and dependent upon a common set of exogenous factors. The bivariate probit estimation is presented in Table 6. We control for force majeure clauses that make it easy to terminate agreements when contingencies arise that are extremely costly to address. The parameter rho (ρ) denotes the correlation of residuals from the two models (Greene 2000, p. 708).

Another possibility we need to consider is whether contracts could be eventually terminated before the contractual duration, even though they may have

Table 5   Multivariate Probit Estimation ($N = 139$)

Variables	Continue contract without termination	Pareto improving amendment conditional on continuation
Constant	0.751 (0.465)*	−2.866 (0.638)***
Decision rights		
Flexibility Provisions	0.067 (0.030)**	0.447 (0.208)**
Redeployability Rights	0.192 (0.063)**	0.815 (0.259)***
Termination for Convenience	0.009 (0.003)**	0.512 (0.223)**
Task characteristics		
Complexity	0.290 (0.235)	0.421 (0.345)*
Specific Investments	−0.328 (0.334)	−0.191 (0.106)*
Contract Length (>3 *years*)	−0.043 (0.025)*	0.786 (0.317)***
Breadth of Service	0.083 (0.080)	0.098 (0.064)*
Contractual provisions		
Fixed Price Contract	0.373 (0.346)	0.106 (0.336)
Service Level Agreements	1.083 (0.412)***	0.788 (0.347)**
Milestones	−0.418 (0.397)	−0.643 (0.276)**
Audit Rights	−0.327 (0.372)	0.037 (0.336)
Contractual Coordination	0.247 (0.339)	−0.575 (0.212)**
Input Monitoring	−0.341 (0.423)	−0.258 (0.398)
Vendor and client characteristics		
Public Vendor	−0.317 (0.368)	0.261 (0.335)
Dominant Customer	0.412 (0.304)*	1.058 (0.346)***
Prior Relationships	−0.121 (0.335)	0.677 (0.322)**
Vendor Reputation	0.674 (0.388)*	0.686 (0.321)**
Instrument		
Termination Planning	−0.381 (0.201)**	
Likelihood-ratio test of $\rho = 0$: $\chi^2(1) = 10.199$***		

*Significance at the 10% level; **significance at the 5% level; ***significance at the 1% level (all values based on two-tailed *t*-tests).

Table 6   Bivariate Probit of Pareto Improving Amendments and Terminations ($N = 139$)

	Pareto improving amendment	Termination
Constant	−2.635 (0.630)***	−0.632 (0.561)
Decision rights		
Flexibility Provisions	0.354 (0.172)**	−0.048 (0.409)
Termination for Convience	0.423 (0.210)**	−0.204 (0.205)
Redeployability Rights	0.657 (0.389)*	−0.117 (0.056)**
Task characteristics		
Complexity	0.705 (0.340)***	−0.173 (0.096)*
Specific Investments	−0.332 (0.302)	0.225 (0.148)*
Contract Length (>3 *years*)	0.868 (0.332)***	−0.065 (0.253)
Breadth of Service	0.098 (0.060)*	−0.065 (0.081)
Contract provisions		
Coordination	−0.697 (0.310)**	−0.143 (0.346)
Input Monitoring	−0.213 (0.410)	0.271 (0.421)
Fixed Price	0.275 (0.328)	−0.208 (0.343)
Service Level Agreements	0.351 (0.338)	−0.886 (0.383)***
Audit Rights	0.315 (0.341)	0.512 (0.307)**
Milestones	−0.717 (0.371)**	0.319 (0.429)
Provisions to smooth exit		
Force majeure clauses	0.414 (0.281)*	−0.343 (0.222)*
Vendor and client controls		
Dominant Customer	1.413 (0.360)***	−0.345 (0.374)
Public Vendor	0.241 (0.350)	0.198 (0.343)
Prior Relationships	0.745 (0.329)**	0.019 (0.328)
Vendor Reputation	0.676 (0.331)**	−0.572 (0.220)**
Likelihood-ratio test of $\rho = 0$: $\chi^2(1) = 19.58$***		

*Significance at the 10% level; **significance at the 5% level; ***significance at the 1% level (all values based on two-tailed *t*-tests).

progressed through a series of amendments, possibly because of the information revealed in the negotiations leading up to termination. To test for endogeneity, Wooldridge (2002, pp. 472–477) recommends a variant of the two-stage procedure outlined in Rivers and Vuong (1988) for discrete choice models with endogenous regressors. Following this method, in the first stage a probit estimation of amendments using the full set of exogenous regressors is conducted. In the second stage a probit estimation of terminations was conducted with the residuals from the first stage, Pareto improving amendments, and a partial set of exogenous regressors. The coefficient of the residual is not significant; thus, the two-stage estimation fails to reject the null hypothesis of exogeneity.

As a robustness check to examine the association between amendments and terminations and the dependence of terminations on amendments, we conducted a recursive simultaneous bivariate probit model that considers the simultaneity between the two choices as well as the interdependence of one choice on another (Greene 2000, pp. 852–855). Following Bajari et al. (2011), a variable known at the time the contract is signed can be reasonably expected to be uncorrelated with the error term of ex post outcome realization. The use of escrow accounts was used as an instrument to predict Pareto improving amendments. A Hausman test (Wooldridge 2002) and a Wald F-test (Angrist and Krueger 1991) established the suitability of the instrument used. The bivariate probit model fails to reject the exogeneity of terminations. Results are omitted for brevity.

4.4. Feasible Foresight and Endogeneity of Flexibility Provisions

An important concern with the empirical estimation is the potential endogeneity between flexibility provisions in the contract and observed Pareto improving amendments. According to arguments of feasible foresight (Williamson 2005), parties to a contract, even when they lack exact knowledge of the possible contingencies to be resolved in exchange, can still anticipate contracting hazards and design contracts that allow smooth adaptation at a later date. The presence of contractual provisions that permit smooth renegotiation may be endogenous to observed renegotiations. The problem in inference can be resolved when there are external factors that affect the incidence of flexibility provisions. We conducted a recursive simultaneous bivariate probit (Greene 2000) where a dummy variable denoting the contract date is used to instrument for flexibility provisions. A contract date prior to 2000 (coded as a binary variable) is employed as an instrumental variable that affects the presence of flexibility provisions. The Internet boom as well as the demand for IT services related to the year

Table 7 Endogeneity of Pareto Improving Amendments and Flexibility Provisions ($N = 139$)

	Pareto improving amendments	Flexibility provisions
Constant	−1.924 (0.527)***	−1.248 (0.443)***
Decision rights		
Flexibility Provisions	−1.369 (0.197)***	—
Redeployability	0.462 (0.166)**	—
Termination for Convenience	0.368 (0.191)**	—
Task characteristics		
Complexity	0.472 (0.284)*	0.147 (0.106)*
Specific Investments	0.086 (0.251)	0.508 (0.172)***
Long Term	0.821 (0.263)***	0.532 (0.252)**
Breadth of Service	0.069 (0.045)*	0.026 (0.054)
Contractual provisions		
Coordination	−0.638 (0.257)***	−0.199 (0.264)
Input Monitoring	0.192 (0.314)	0.520 (0.205)**
Fixed Price	0.069 (0.273)	−0.221 (0.160)*
Service Level Agreements	0.602 (0.279)**	−0.029 (0.250)
Audit Rights	0.795 (0.252)***	0.751 (0.250)***
Milestones	−0.423 (0.283)*	0.362 (0.311)
Instrument		
Contract Date		0.106 (0.037)***
Vendor and client controls		
Public Vendor	0.409 (0.270)*	0.379 (0.273)
Dominant Customer	0.874 (0.282)***	0.217 (0.275)
Prior Relationships	0.481 (0.238)**	−0.219 (0.263)
Vendor Reputation	0.476 (0.270)*	−0.146 (0.265)
LR test of $\rho = 0$: $\chi^2(1) = 9.879$***		

*Significance at the 10% level; **significance at the 5% level; ***significance at the 1% level (all values based on two-tailed tests).

2000 affected both the price and the availability of personnel and skills, and likely influenced parties' expectations about future changes in input prices, which makes it an appropriate instrumental variable. A Hausman test (Wooldridge 2002, pp. 118–122) and Wald F-test (Angrist and Krueger 1991) established that the instrument predicts flexibility provisions but does not directly predict amendments. The results are presented in Table 7.

4.5. Robustness Checks

One possible concern with the empirical estimation is that of adverse selection, when the presence of uncertainty may cause parties to behave opportunistically and exploit the contract form to trigger the need for contract amendments (which increases gains from rent seeking). Following the literature that tests adverse selection (e.g., Chiappori and Salanie 2003), we conducted a bivariate probit estimation of contract choice and observed amendments. If the pricing structure adopted is that of time and materials contracts, adverse selection could cause contract choice and the probability of Pareto improving amendments to be affiliated, resulting in positive correlation between the two error terms. A two-tailed chi square test failed to reject the null hypotheses of no correlation between the probability of cost plus contracting and observed renegotiation.

Another type of estimation bias can result from adverse selection in quality if vendors deliberately seek out contracts with less stringent monitoring clauses. Conversely, clients could force tight quality and performance specifications on vendors to force the latter to give up rents during renegotiations. We conducted a bivariate probit of Pareto improving amendments and service level agreements, that proxy for tight enforcement of quality norms in a contract. The estimation fails to reject the null hypothesis of no correlation. The results support the view of incomplete contracting theories that renegotiation enables ex post welfare enhancement beyond absorbing of cost overruns alone. The results are available upon request.

Another concern with the empirical estimation is whether termination for convenience rights and redeployability rights could occur together in contracts. We followed the approach of Novak and Stern (2009) in examining the conditional correlation between these two contractual provisions. We first conducted a probit of redeployability rights using contractual restrictions on appropriation as an instrument and then conducted a probit of termination for convenience rights by including redeployability rights as an explanatory variable. The correlation between the residuals allows us to estimate complementarity. The estimation failed to reject the null hypotheses of no correlation between residuals. Thus, we did not find any evidence of codesign of contractual provisions. Results are available upon request.

5. Results and Discussion

5.1. Decision Rights and Pareto Improving Amendments

Figure 3 depicts that Pareto improving amendments are more likely with factors that increase incompleteness in initial contract specification. Column (3) of Table 4 highlights that Pareto improving amendments are more likely with greater breadth of services, longer-term contracts, and complexity and less likely with specific investments when assets have

limited value outside the relationship. Prior literature posits that elaborate contractual safeguards protect against ex post expropriation. However, contractual safeguards against rent appropriation might actually lead to other types of rent seeking (e.g., Gibbons 2005). Indeed, as the estimations of column (2) in Table 4 indicate, we find only two of the contractual provisions, service level agreements and milestones, increase the likelihood of Pareto improving amendments, suggesting that contract contingencies may have limited power to protect against ex post hazards.

Column (4) of Table 4 indicates that flexibility provisions that enable adaptation are significantly associated with Pareto improving amendments, suggesting that provisions that smooth postcontractual frictions in renegotiation enhance welfare of parties, supporting Hypothesis 1. Ex post welfare of exchange partners can be improved through better articulation of contracting contingencies and by incorporating lessons learned in outsourcing, consistent with both the hazard equilibration arguments from Williamson (1985) and arguments of learning to contract from Mayer and Argyres (2004). Pareto improving amendments imply that vendors and clients can engage in a process of rich exchange of information and harmonious resolution of contingencies revealed ex post terms. Because complex IT services carry with them substantial reengineering of business functions, it can be difficult to define the vendor's responsibilities upfront. Flexibility provisions are an important aspect of designing adaptive sourcing arrangements whereby exchange partners can incorporate changing business priorities and regulatory requirements.

Column (4) of Table 4 indicates that unilateral termination for convenience by clients significantly increases the likelihood of Pareto improving amendments, validating Hypothesis 2. Given contract incompleteness in conjunction with asset specific investments made by the vendor, the greater bargaining power contractually assigned to clients through unilateral decision rights deters vendors from underinvestment. The association between termination for convenience rights and Pareto

Figure 3   Probability of Pareto Improving Amendments and Task Characteristics
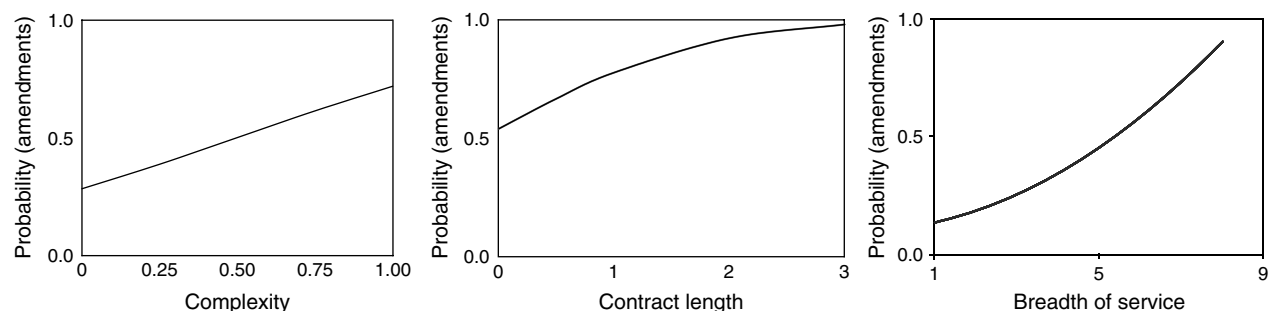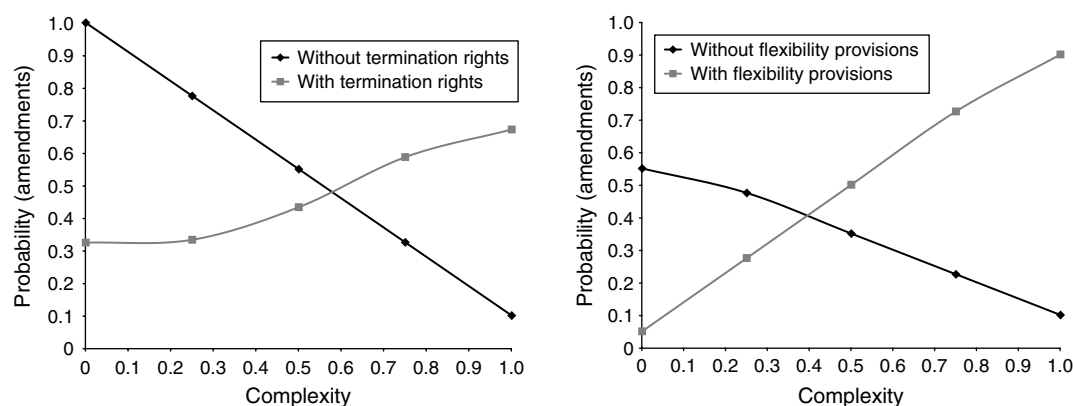
Figure 4   Pareto Improving Amendments and Complexity with Ex Ante Decision Rights

improving amendments also suggests that such rights deter clients from engaging in strategic termination, disciplining both parties from excessive rent seeking because each could benefit from the bilateral lock-in.

When the vendor has the right to patent or license the know-how acquired in performing the contracted task, there is a greater likelihood of Pareto improving amendments, validating Hypothesis 3. Redeployability acts as an outside option, whereby the vendor's value in redeploying process knowledge and technology strengthens investment incentives and reduces friction in renegotiation. Vendors are less likely to engage in rent seeking when the investments they make will provide value in the future and greater incentives to invest in relationship continuity. Clients have correspondingly lower gains from breaking off the contract. Figure 4 presents the role of decision rights. The *y*-axis depicts the probability of Pareto improving amendments, and the *x*-axis depicts the complexity of the contract.

We find that decision rights matter even after including a full set of controls for vendors and client and controlling for clustering across vendors and clients, as indicated by column (5) of Table 4, indicating that it may not be the magnitude of appropriable rents but the structure of decision rights that enables Pareto improving amendments. The probit estimates on Table 4 are consistent with the multivariate probit estimates in Table 5. The role of redeployability and termination for convenience is in the tradition of theories of the firm that emphasize ownership, whereby what matters is not who has the residual rights of control but that such control rights are clearly defined. Table 6 provides evidence of simultaneity in Pareto improving amendments and terminations, supporting arguments from theories of contract breach as well as incomplete contracts. An IT outsourcing initiative can begin with only an imperfect understanding of what needs to be accomplished by the contract and the amendment could help codify a clearer set of objectives. By not overcommitting to the contracted

relationship upfront, parties have sufficient flexibility to either modify the contract or exit the contract depending upon the progress made.

We find evidence of endogeneity in designing contracts with flexibility provisions. When parties anticipate that contracts need to be renegotiated, flexibility provisions in fact lower the likelihood of Pareto improving amendments as shown in Table 7. Fehr et al. (2011) provide evidence that formal contracts serve as reference points to a trading relationship. Flexibility provisions may provide an informal framework to enable mutual adjustments ex post, obviating the need for formal contract renegotiation accomplished in a contract amendment. Feasible foresight implies that parties can anticipate transaction hazards and craft contracts to mitigate these hazards (Williamson 2005). Accordingly, flexibility provisions may provide adaptation to unfolding contingencies without the associated hazards of underinvestment or maladaptation that accompany formal contract renegotiation. The design of in-built flexibility suggests that parties could design contracts explicitly taking into account the trade-off between the cost of writing contracts and the cost of renegotiating contracts (e.g., Schwartz and Watson 2004).

Another explanation we need to consider is that relationships act as an alternate mechanism in allowing parties to understand each other and draft contracts that enable adaptation (e.g., Banerjee and Duflo 2000). Although the results show that prior relationships do in fact increase the likelihood of Pareto improving amendments, the coefficients of the three decision rights remain highly significant after controlling for prior relationships. Because the source of complexity is business transformations, prior contracting experience might help in smoothing interfirm interactions but not be completely effective in enabling adaptation.

5.2. Implications for Literature and Practice
Although IT outsourcing is increasing in importance, the rigidity and inflexibility of long-term outsourcing

arrangements have frustrated companies who seek sustainable value from outsourcing. A focus on post-contract governance and examining the way firms manage adaptation within a contract is an important question to researchers and practitioners alike. This paper takes a first step in that direction by highlighting the role of renegotiation design to achieve flexibility in outsourcing. Pareto improving amendments redefine the structure of outsourcing to incorporate provisions not included in the original contract, such as enforcement and monitoring provisions, as well as management control systems that enhance the value from exchange. Given the difficulties in verification and the difficulty in foreseeing ex ante and describing all the contingencies (e.g., Segal 1999), ex ante decision rights lead to Pareto improving amendments. We consider the role of flexibility provisions that structure the terms of ex post adaptation, termination for convenience that confer unilateral bargaining power to the client, and redeployability rights that confer rights over residual rents to vendors. Our paper suggests that deliberate design decision rights delineated ex ante solve the threats of maladaptation and underinvestment engendered by rent seeking.

Given the pace of technological innovation and changes in business and regulatory environment, renegotiation design is critical to enabling flexible sourcing arrangements. We take a first step in that direction. We highlight the role of three types of decision rights that can achieve Pareto improving adaptation while minimizing the sources of rent seeking. Given that parties' intentions from outsourcing evolve over the course of the contract, we highlight the importance of contracting for flexibility. The Pareto improving role of adaptations highlighted here contrasts with literature that considers ex post renegotiations as the result of inefficient governance choices (Anderson and Dekker 2005) as well as prior work that posits that detailed clauses for service scope and comprehensive measures of performance are key to achieving success in IT outsourcing (e.g., Lacity and Willcocks 1998).

When clients and vendors engage in postcontract jockeying and bargaining, there can be several maladaptation costs to clients such as disruptions to project schedules, productivity losses, and the risk of interruption to business. Underinvestment by vendors also lowers the gains from outsourcing and leads to client dissatisfaction. Thus, when parties cannot commit not to renegotiate, the anticipation of contentious bargaining results in inefficient investments ex ante that lower gains from exchange (e.g., Hart and Moore 1999), which reduces the value from writing detailed contracts. When parties have limited knowledge about the future, drafting detailed contract provisions upfront may be inefficient ex post

(Segal 1999). Gibbons (2005) posits that writing costly contingent contracts could actually exacerbate ex post opportunism. The costs of enforcing contracts and the difficulty in precisely detailing obligations of a vendor may result in incompleteness even with detailed contracts (e.g., Susarla et al. 2010). With the rapid pace of change of technology and evolving business needs, contracts with stringent penalties and detailed service specifications could become too rigid. The importance of planning for termination illustrates that governance structures need to incorporate detailed clauses for transition planning along with provisions that smooth exit.

Whereas literature has examined vendors' capabilities on the dimensions of software development metrics (Harter et al. 2000), future work can examine processes in the vendor organization (and parallel processes in the client organization) that facilitate Pareto improving adaptation. For instance, vendor reputation has been identified as a critical determinant of postcontract negotiations and enforcement in IT outsourcing (e.g., Banerjee and Duflo 2000). Parties in collaborative contracting relationships could also develop adaptive capacity (Gulati et al. 2005) that enables greater responsiveness to ex post situations. Vendors should develop expertise in inter-firm communication and governance structures to deal with ex post adaptation, whereas clients need to develop sophistication in building collaborative processes. Further, clients and vendors should develop complementary competencies (e.g., Levina and Ross 2003) in realizing collaborative value through ex post adaptation.

Rights to redeploy valuable skills and know-how gained from an outsourcing initiative, specified ex ante, are important for two reasons. First, the ability to redeploy knowledge and learning from one outsourcing initiative to another may be a source of competitive advantage to vendors (e.g., Mayer 2006). Indeed one of the motives for outsourcing may be that firms have access to capabilities of suppliers, and the judicious allocation of decision rights protects the market position of vendors. Redeployability rights may also ensure that the efficiency gains from process improvements made by vendors can be passed on to other buyers. Second, the role of knowledge and learning by vendors can be very complicated given the importance of human capital in the IT services industry. Even when the client has the complete residual rights over the software developed, vendors could benefit from knowledge spillovers serving a particular customer from an industry. Similarly, vendors might gain knowledge of complex process transformations or industry knowledge that can be deployed elsewhere. Mayer (2006) posits that vendors increase the extent of task detail when they anticipate knowledge

could be reused.[13] However, the danger is that vendors might transfer resources to only those tasks that could potentially generate knowledge spillovers. Furthermore, in order for there to be a difference to the structure of renegotiation, parties should have outside options that affect the value from renegotiation (MacLeod and Malcomson 1993). Although there can be some strengthening of a vendor's market position because of knowledge spillovers, redeployability serves as a contractually specified outside option that enables efficient adaptation ex post. In other words, it is not the type of value created through knowledge spillovers or patentable know-how that matters but the structure of bargaining power.

5.3. Limitations
Recent literature in law (e.g., Eggleston et al. 2000, Katz 2005) and economics (Schwartz and Watson 2004) suggests that the need for renegotiation in the presence of contracting costs makes it optimal to write simpler contracts. This poses two problems for estimation. First, it is possible that the structure of ex post renegotiation is impacted by noncontractual mechanisms of enforcement. We cannot completely rule out whether Pareto improving amendments result from alternate mechanisms other than the role of decision rights. Second, we also do not examine whether there is a ratchet effect that is manifest by clients' increasing standards during renegotiations in light of past performance. In other words, it is possible that firms' past familiarity with contracting may only increase negative outcomes such as underinvestment and maladaptation. Renegotiation design could be impacted by the stock of tacit knowledge accumulated by the vendor that can benefit other engagements with clients in the same industry. We do not explore whether longer-term knowledge spillovers are generated through redeployability. It is also possibility that redeployability rights could lower a vendor's incentive to misappropriate client's intellectual property or valuable intangible assets such as process knowledge.[14] Combining patent citation databases with longitudinal data on contracts could yield greater insight into the role of redeployability, appropriation, and knowledge generation.

Although we consider termination as an alternative explanation, we do not distinguish between different breach outcomes. Future work could consider the breach provisions such as expectation damages or specific performance (e.g., Shavell 1984) and whether

these provisions act in conjunction with ex ante decision rights. Another type of contracting hazard not explored is that vendors may deliberately increase the extent of proprietary technologies or processes that increase switching costs to clients and then opportunistically raise service charges that exploit a client's dependence.

6. Conclusions and Future Work
Firms increasingly outsource for strategic objectives rather than cost savings alone (e.g., Linder 2004). Paradoxically, the growth in outsourcing has been accompanied by increasing dissatisfaction with IT outsourcing initiatives. The spate of contract restructuring and cancellations makes the question of renegotiation design important to practitioners and researchers alike, yet relatively little academic research has addressed this issue. The tremendous variation in success or failure rates of IT outsourcing suggests that the way firms manage adaptation within an outsourcing contract is an important question to researchers and practitioners alike. A focus on postcontracting outcomes yields insight into the factors that are important in managing the interaction between clients and vendors and ultimately provides more understanding into factors that lead to sustainable value from IT outsourcing.

One of the contributions of this paper is to investigate the role of renegotiation design in fostering flexibility in IT outsourcing. Postcontract restructuring enables vendors and clients to learn from their experiences and to realize hazard equilibration. Another contribution of this paper is to highlight the nature of investments in the IT context and the implications for renegotiation design. A complementary approach is to examine the role of relational contracting that enables joint governance and resolution procedures. Future work can examine how relational capital between organizations could lead to the development of capabilities that foster mutual adaptation and flexibility in contracting.

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[13] To examine whether there are knowledge spillovers other than redeployable knowledge, we coded a variable for task detail following Mayer (2006). The coefficients and significance level of the main variables are unchanged when we reestimated the results including this variable.

[14] We thank an anonymous reviewer for this observation.

Appendix

Tables A.1 and A.2 provide a summary of contract clauses and descriptive statistics.

Table A.1. Summary of Contract Clauses

Variable	Coding procedure and data sources	Extracts from contracts (in bold) and information supplemented from press releases
Pareto improving amendments This measure is adapted from Guasch et al. (2008) as well as Masten and Crocker (1985). This measure assesses ex post revision of terms when new information is revealed about the contracting environment (Roberts and Sufi 2009), such as business requirements and technological demands. Therefore, we do not consider amendments that are intended only for repricing as Pareto improving amendments.	(i) Learning to contract was operationalized consistent with Mayer and Argyres (2004), who suggest that such learning takes the form of (i) enhanced communication, (ii) clarification of responsibilities, (iii) contingency planning, (iv) documentation of processes such as problem reporting, and (v) statement of work format changes. Rent shifting through opportunistic repricing alone is not Pareto improving. (ii) Hazard equilibration (Williamson 1985, p. 34) refers to increasing responsibilities of both parties in order to prevent a breakdown of the contract, whereby parties have an incentive to ensure equitable renegotiation outcomes (Masten 1988) and minimize the ex post costs of adjustment of terms (Masten 2009). Thus, amendments indicating mutual adjustments between parties are considered evidence of hazard equilibration. (iii) Both hazard equilibration and learning can be observed in amendments that incorporate learning as well as broaden the stake of both parties. The measure distinguishes between (i) revision of the agreement vs. price changes and (ii) rent shifting vs. evidence of learning.	• Contracts detail additional services to be performed as well as procedures to assess execution of such additional services. For instance, a contract states, "**The contractor shall have mechanisms in place to ensure consistent application of review criteria for authorization decisions**." • Amendments can specify a point of contact at the client organization to handle the administrative aspects of contract governance such as "**day-to-day management control over its receipt of the services and its implementation of systems**." • One amendment specifies that parties agree to "**acceptance of deliverable at a (mutually determined) milestone**." • The amendment outlines additional customer responsibilities such as providing the vendor all information regarding the outsourced process and additional vendor responsibilities such as "**on a mutually agreeable schedule, vendor will provide those services and instructions ("conversion services") reasonably required for customer to convert to and use**" the new systems. • Contracts could specify enhanced benchmarking and monitoring clauses, "**vendor shall measure and report to client** (*specifications detailed in SOW*) **performance of the services against the applicable service levels**," that are mutually agreed upon and accompanied by changes in responsibilities of both parties.
Early terminations This measure was conceptualized following Masten and Crocker (1985)	*The data sources used for this measure are the annual reports, press releases, litigations as disclosed in public databases as well as reports of legal filings. In some cases the terminations are recorded in separation agreements recorded with the SEC or in transition agreements between vendors and clients that are disclosed through press releases.*	• Press releases disclose that a contract was terminated and a new vendor was reassigned the responsibilities of the original vendor. The excerpt reads, "To enable this function (application development) to be more responsive to the business, (the project) has been transferred to support high-level design activities." • The parties signed a separation agreement that mentions that parties terminated a services agreement and specifies that "[Client] to pay . . . (confidential information)" to settle the outstanding liabilities. The contract termination charges were listed in the 10-Q statement. • After terminated without cause, the client disclosed the aggregate costs from contract cancellations in SEC filings. • The quarterly statement mentioned that vendor filed breach of contract claims and both parties would undergo arbitration to resolve this issue.

Table A.2. Descriptive Statistics (N = 141)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mean	0.31	0.32	0.18	0.32	0.52	0.56	0.48	6.38	0.42	3.92	0.58	0.35	0.30	6.47	5.53	0.27	0.54	0.34	0.36	0.61	0.24	0.52	0.53	0.20	0.63
Standard deviation	0.46	0.47	0.38	0.46	0.48	0.50	0.57	1.08	0.49	2.40	0.49	0.39	0.45	2.8	3.31	0.45	0.43	0.47	0.48	0.49	0.43	0.49	0.49	0.41	0.22
Minimum	0	0	0	0	0	0	0	3	0	0	0	0	0	3.21	3.47	0	0	0	0	0	0	0	0	0	0
Maximum	1	1	1	1	1	1	1	9.18	1	12	1	1	1	13.1	12.7	1	1	1	1	1	1	1	1	1	1
(1) *Prior Rel.*	1																								
(2) *Amend.*	0.19	1																							
(3) *Early Term.*	0.03	−0.3	1																						
(4) *Flex. Prov.*	−0.06	0.18	−0.02	1																					
(5) *Redeploy.*	0.07	0.25	0.03	0.15	1																				
(6) *Spec. Inv.*	0.13	−0.11	0.07	0.25	−0.12	1																			
(7) *Fixed Price*	−0.26	−0.02	−0.09	−0.06	0.04	−0.08	1																		
(8) *Ln(Cont. Val.)* [a]	0.13	0.36	−0.01	0.18	0.29	0.09	−0.21	1																	
(9) *Long-Term Contract (Binary)*	0.14	0.20	0.03	0.10	0.29	0.09	−0.3	0.34	1																
(10) *Breadth of Service*	0.11	0.24	−0.17	0.08	0.05	0.06	−0.08	0.26	0.21	1															
(11) *Coordination*	0.04	−0.13	−0.09	0.16	−0.0	0.34	−0.26	0.11	0.10	0.18	1														
(12) *Complex.*	0.20	0.22	−0.16	0.10	0.15	0.19	−0.28	0.32	0.15	0.30	0.25	1													
(13) *Vendor Rep.*	0.02	0.25	−0.15	0.03	0.04	0.00	−0.15	0.33	0.14	0.26	0.11	0.19	1												
(14) *Ln(Cl. Size)*	0.01	0.23	−0.09	0.07	0.07	0.01	0.14	0.35	0.06	0.27	−0.09	0.22	0.14	1											
(15) *Ln(Ven. Size)*	0.08	0.32	−0.03	−0.01	0.18	−0.11	−0.08	0.38	0.27	0.35	−0.0	0.18	0.39	0.25	1										
(16) *Milestones*	0.13	0.02	0.03	0.14	0.07	0.05	−0.3	0.28	0.20	0.22	0.13	0.11	0.19	0.08	0.25	1									
(17) *Input Monit.*	−0.05	−0.01	0.08	0.17	0.29	−0.12	0.21	−0.07	0.09	−0.06	−0.06	−0.28	−0.07	0.03	−0.04	−0.04	1								
(18) *Term. Rights*	0.05	0.17	−0.03	0.24	0.11	0.06	−0.15	0.30	0.09	0.10	0.12	0.09	0.08	0.21	0.12	0.30	−0.16	1							
(19) *Serv. L. Agr.*	0.09	0.21	−0.17	0.19	−0.08	0.16	−0.04	0.24	0.09	0.29	0.10	0.02	0.09	0.20	0.31	0.26	0.08	0.07	1						
(20) *Audit Rights*	0.12	0.20	0.08	0.35	0.29	−0.06	−0.29	0.32	0.33	0.11	0.04	0.05	0.10	0.09	0.28	0.29	0.03	0.27	0.25	1					
(21) *Dom. Cust.*	−0.14	0.17	−0.08	0.04	0.02	−0.08	−0.02	0.04	0.35	−0.14	−0.05	−0.01	−0.04	0.02	−0.25	−0.20	−0.06	0.13	−0.27	−0.09	1				
(22) *Public Ven.*	−0.07	0.29	−0.00	0.31	0.32	−0.08	−0.01	0.37	0.13	0.23	0.01	0.18	0.31	0.17	0.40	0.30	0.22	0.10	0.20	0.21	−0.03	1			
(23) *Force maj.*	−0.00	0.16	−0.15	0.26	0.13	−0.00	−0.17	0.34	0.20	0.35	0.05	0.10	0.28	0.27	0.25	0.33	0.04	0.23	0.29	0.27	−0.16	0.22	1		
(24) *Escrow*	−0.07	0.07	0.01	−0.00	0.10	−0.09	−0.19	0.22	0.28	0.18	0.06	0.11	0.01	0.12	0.16	0.25	−0.11	0.08	0.17	0.01	0.01	0.10	0.18	1	
(25) *Term. Planning*	0.01	0.08	0.10	0.09	0.04	−0.13	−0.17	−0.01	0.13	0.10	−0.06	−0.18	0.07	−0.11	0.11	0.06	0.08	0.16	0.03	0.22	−0.03	−0.06	0.13	0.12	1

Notes. Correlation coefficient and *p*-values are as follows: $\rho > 0.12$ denotes *p*-value < 0.10 or significance at the 10% level; $\rho > 0.17$ denotes *p*-value < 0.05; $\rho > 0.20$ denotes *p*-value < 0.01; *Contract Value, Contract Length, Client Size,* and *Vendor Size* are log transformed to adjust for scale effect.

[a] Log transformed value of contract scaled to one million.

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