CAN OUTSOURCING OF INFORMATION TECHNOLOGY FOSTER INNOVATIONS IN CLIENT ORGANIZATIONS? AN EMPIRICAL ANALYSIS

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Appendix A

Coding of Variables

Table A1. Contract Excerpts for Clauses of Key Variables		
Variable and Definition	**Example Contract Clauses**	**Prior Literature**
Credible commitments by clients refer to a client's binding investments in the vendor	• The extent to which the client uses vendor's proprietary knowledge that provides them a defendable advantage over other vendors (e.g., Walker and Weber 1984), specifically mention of client investing in proprietary methods and intellectual property "developed and owned by Supplier" or "developed by a third party for, and owned by Supplier." • The extent to which parties set up specialized internal dispute resolution mechanisms that increase the binding nature of contracts, specifically actions that designate key individuals such as the "Vice President of Procurement Governance" and a "Outsourcing Relationship Executive" who would be involved in developing a "transition plan" as well as assuming "responsibility for managing the relationship" with the vendor.	Lumineau and Malhotra 2011; Walker and Weber 1984
Contingent control rights refer to the ability of the client to restrict the usage by the vendor	Elfenbein and Lerner (2009) denote contingent control rights as "provisions that give one of the contracting parties certain prerogatives in specific states of the world." Accordingly we consider the following: • State-contingent ownership. When the ownership over the developed software can be shifted between parties depending on the observed state of the world, such as a contract where the client could transfer control over derivative rights to the vendor, subject to conditions such as when "such grant would materially impair a competitive advantage to Client or grant a material competitive advantage to a competitor of Client." • Contingent performance measures. This denotes that parties incorporate benchmarks that are contingent upon realized performance. For example, in an innovative task, it could be difficult to set service level targets; however, parties could specify that in setting performance standards, both parties would review and "adjust Service Levels to reflect any improved performance capabilities associated with advances in the technology and methods used to perform the Services." • Incentives contingent upon actions. This denotes whether vendors face rewards or sanctions upon observed performance (which is not contractible or verifiable). For example, a contract	State contingent ownership: Lerner and Malmendier 2010 Contingent performance measures: Elfenbein and Lerner 2009 Incentives contingent upon actions: Kaplan and Strömberg 2003

	recognizes the vendor is performing services that do not have defined service levels; yet specifies that "Vendor should perform such Service or obligation with a level of accuracy, quality, completeness, timeliness and responsiveness," and that failure to meet the applicable standard (which is nonetheless, not a contractually specified standard) would result in fines that would be mutually decided upon by the parties.	
Transforma-tional intent (coded from press releases)	• Press release mentions transformational businesses objectives such as the ability of the client organization to "innovate business processes," or "design, develop and implement a new set of common business processes." • Sourcing intent from press release is enabling client to "optimize its IT investments and achieve an anticipated increase in productivity."	Lacity et al. 2003; Linder 2004; Susarla et al. 2010
Market orientation (coded from press releases)	Measured in terms of outsourcing objectives dedicated to improving new product development, speed to market of products, embedded software and innovations in production processes, specifically: • Press release mentions new product introductions, such as a new type of "mortgage processing functions, from loan origination to servicing" enabled by the outsourcing initiative. Similar language in the contract mentions "enabling resources … for new growth initiatives, including the development of new products." • Outsourcing enables speedy introduction of new products or product extensions in the client organization, such a press release that mentions that the outsourcing enables rapid expansion of customer delivery capabilities such as "creating customized products" or "enhanced customer engagement."	Bartel et al. 2007; Bresnahan et al. 2002; Konana and Ray 2007

Table A2. Instruments for Multivalued Treatment Effects	
Instruments	**Coded from Earlier Contracts between Client and Vendor**
Information disclosure terms in earlier contract	Coded from SEC filings of the contract preceding the contractual engagement (the unit of analysis). Drawing upon Lumineau and Malhotra's (2011) discussion of coordination focus and prior discus-sion of "coordination provisions" in Reuer and Arino (2007, p. 322), we conceptualized this measure to examine the extent to which parties codify expectations that there would be "written reports of all relevant transactions" and "written notice of any departures from the agreement" (Parkhe 1993, p. 829).
Contingency planning in earlier contract	Coded from SEC filings of the contract preceding the contractual engagement (the unit of analysis). Contingency planning in earlier contracts indicates the extent to which partners could anticipate and plan for potential exchange hazards (Argyres et al. 2007), specifying procedures and processes to be undertaken in case an anticipated contingency occurs.

Table A3. Coding Template for Other Variables	
Task Characteristics	
Service Breadth	Sum of 14 individual dummy variables of outsourced IT tasks (Lee et al. 2004): systems planning, application analysis and design, application development, operation and maintenance, systems integration, data center, telecommunications management, software and data licensing, hardware products, IT facilities management, basic support, training and documentation, advanced support, e-marketing, and e-advertising.
Specific Investments	Adapted from Rokkan et al. (2003) and Poppo and Zenger (1998). Measure captures the extent to which vendor personnel need to acquire division-specific or company-specific knowledge of the client organization in order to perform the contracted task.
Contractual Contingencies	
Contract Extensiveness	Total number of contractual provisions included per contract (21 contingencies from Andersen and Dekker 2005): price determination mechanisms, price level, payment terms, sanctions on late payment, delivery time specified, liability – supplier, force majeure – supplier, warranties – supplier, quality (norms), intellectual property protection, piracy protection, limitations on product, nondisclosure, insurance – supplier, duration of service specified, reservation (spare parts), duration of maintenance specified, arbitration provisions, calculation of R&D costs, technical specifications, termination of transaction – terms of notice.
Input Monitoring	Coded as 1 when the contract and the statement of work (SOW) provide detailed descriptions for how to perform tasks (Heide et al. 2007), for example: "The Client will provide the vendor with the task steps, their descriptions, relevant factors concerning the task use and other resources that are necessary…"
Milestones	Coded as 1 when the contract contains clauses relating to performance milestones tied to specific outcomes, for example: demarcating particular milestones in a statement of work (SOW) as dependent upon completion of tasks and/or performance by the vendor.
Audit Rights	Coded as 1 when clauses denote audit rights whereby clients have the right to inspect and validate service delivery by the vendor.
Service Level Agreements	Coded as 1 when the contract details acceptable service levels. Example: Exhibit B establishes service levels for certain specified services and groupings of services to be provided by vendor from the effective date throughout the remainder of the term.
Instruments for Bivariate Probit	
Exclusivity	Exclusivity provisions place restrictions on outside activities that can be undertaken by a vendor (e.g., Susarla et al. 2010).
Restrictive Covenants	Following Gompers and Lerner (1996), we consider restrictions on the vendor's ability to reuse the client's trade secrets and confidential intellectual property.
Vendor and Client Characteristics	
Fortune 1000	Indicates that the client/vendor belongs to the list of Fortune 1000 companies.
Dominant Customer	Value of 1 assigned to this variable if client accounts for more than 10% of the vendor's business.
Prior Relationship	Coded as 1 when parties to a contract have prior contracting relations.
Ln(Client/Vendor Size)	Number of employees (log transformed).
Prior Market experience of vendor	Coded as 1 if the vendor had signed similar contracts with other clients in the same industry in a 5-year horizon prior to the date the contract was signed.

Table A4. Correlation Table of Key Variables		(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)	Credible Commitments	1.00						
(2)	Contingent Control Rights	0.18	1.00					
(3)	Transformational Intent	0.11	-0.03	1.00				
(4)	Market Orientation	-0.05	0.25***	-0.02	1.00			
(5)	Process Innovation	0.37***	-0.03	0.21	-0.11	1.00		
(6)	Service Innovation	0.02	0.19**	0.04	0.02	0.25***	1.00	
(7)	Non Appropriable Specific Investments	0.20**	0.04	0.07	0.13*	0.06	0.01	1.00

Notes: *$p < .10$, **$p < .05$, ***$p < .01$

Appendix B

Estimation of Complementarity

We categorize contract design choices in an ordinal scale. We recoded the data into four mutually exclusive categories: contracts with both credible commitments and contingent control rights defined, contracts with only credible commitments, contracts with only contingent control rights defined, and contracts where neither terms were present. Since there were very few observations with only one term present, we combined the two categories into one category, and coded the contracts as taking a value of 2 when both contract terms are present, 1 when either is present, and 0 when neither is present. The set of contracts where neither term is present serves as the control group. We conducted an ordered probit of the recoded data as the selection into a treatment regime, using instrumental variables. In other words, we distinguish between the case when clients and vendors understand that these two contract design variables are complementary and design them together, versus having either contractual design dimension.

$$CONTRACT \ for \ i = \begin{cases} 2 \ if \ both \\ 1 \ if \ either \\ 0 \ otherwise \end{cases}$$

The treatments can be considered independent of each other (Cattaneo 2010). Under this approach, estimation relies upon conditional mean independence rather than the stronger assumption of conditional independence (Cattaneo et al. 2013). That is, for a multivariate treatment effects estimation (unlike in the case of propensity score matching), it is not necessary to assume that there is a control group for every treatment group. While these contract design features (i.e., both credible commmitments and contingent control rights present or either of them present) are not randomly assigned across the contracts in our sample, we can control for the likelihood that contracts exhibit these terms without matching each contract with an equivalent contract that does not have these contractual contingencies. In other words, our approach still allows us to compare across these groups by taking into account they were not randomly assigned in the first place. The technical details of the identification conditions are provided in Cattaneo (2010). The innovation outcomes realized are as follows:

$$PERFORMANCE_i = Y_i \left(CONTRACT \right) \text{ for } CONTRACT = 0, 1, 2$$

The instruments used for estimation in the post-contract innovation value are the contract clauses from prior relationships between the vendor and client. From a proprietary dataset listing comprehensive details of very large outsourcing engagements in the United States, we collected data on prior IT outsourcing contracts entered into by each client for 3 years preceding the start of the current contracting engagement (i.e., the unit of analysis). Since we have temporally separated data with detailed contracting history between the parties, we use SEC filings to code the contractual clauses in a previous contract between the parties. We use the presence of information disclosure terms (Elfenbein and Lerner 2009) and contingency planning in earlier contracts (Lumineau 2017) as instruments for the presence of complementary contractual provisions in the current contract. Since there is learning (Argyres and Mayer 2007; Mayer and Argyres 2004) and path dependence (Argyres and Liebeskind 1999) in contracts, the presence of these variables indicates parties' ability to learn from their past and thus their willingness to draft complementary contractual clauses. While previous contract design could plausibly influence design of current contracts due to learning, it

is difficult to ascribe performance resulting in a current contractual engagement from the contract clauses employed in a previous contract, making these good instrumental variables from a causal identification perspective.

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