

# Revisiting Agency and Transaction Costs Theory Predictions on Vertical Financial Ownership and Contracting: Electronic Integration as an Organizational Form Choice

Kaouthar Lajili  
*University of Ottawa*

Joseph T. Mahoney  
*University of Illinois at Urbana–Champaign*

## *Abstract*

Following an efficiency perspective and a micro–analytic approach, this paper provides an organizational economics foundation to guide managers in matching the comparatively more efficient organizational mode with firm–level transactions possessing certain transactional characteristics. In particular, this paper focuses on the following transactional characteristics: (1) the degree of specificity of the assets involved in the transactions (including human capital asset specificity), (2) the degree of uncertainty surrounding the transaction, and (3) the number of trading partners (suppliers and buyers) in the vertical supply chain. The role of technology, and more specifically the e–business infrastructure and its effects on the choice of organizational modes, is highlighted. The main results from this transaction costs analysis suggest that changes in information technology are changing the nature of transaction costs leading to more efficient management through an electronic integration solution thus favoring contracting and outsourcing as the preferred organizational form choice than would have been possible when Williamson’s (1975) *Markets and Hierarchies* was published. It is emphasized that the transaction cost economics principles are durable but that the breathless advances in information technology, especially in the past decade, have comparatively favored lower transaction costs of markets over hierarchies.

**Revisiting Agency and Transaction Costs Theory Predictions on  
Vertical Financial Ownership and Contracting: Electronic  
Integration as an Organizational Form Choice**

**KAOUTHAR LAJILI**

School of Management  
University of Ottawa  
136 Jean-Jacques Lussier  
Ottawa, Ontario K1N 6N5  
Telephone: (613) 562-5800 ext. 4736  
Fax: (613) 562-5164  
[lajili@management.uottawa.ca](mailto:lajili@management.uottawa.ca)

and

**JOSEPH T. MAHONEY**

Department of Business Administration  
College of Business  
University of Illinois at Urbana-Champaign  
339 Wohlers Hall  
1206 South Sixth Street  
Champaign, IL 61820  
217-244-8257  
[josephm@uiuc.edu](mailto:josephm@uiuc.edu)

Kaouthar Lajili (Ph.D. Business Economics and Agribusiness Management, University of Illinois at Urbana-Champaign) and Joseph T. Mahoney (Ph.D. Business Economics, Wharton School, University of Pennsylvania) wish to thank the College of Agricultural and Consumer Economics at UIUC, for providing research funding, which supported the initial collaborations of the two authors. The usual disclaimer applies.

## Abstract

Following an efficiency perspective and a micro-analytic approach, this paper provides an organizational economics foundation to guide managers in matching the comparatively more efficient organizational mode with firm-level transactions possessing certain transactional characteristics. In particular, this paper focuses on the following transactional characteristics: (1) the degree of specificity of the assets involved in the transactions (including human capital asset specificity), (2) the degree of uncertainty surrounding the transaction, and (3) the number of trading partners (suppliers and buyers) in the vertical supply chain. The role of technology, and more specifically the e-business infrastructure and its effects on the choice of organizational modes, is highlighted. The main results from this transaction costs analysis suggest that changes in information technology are changing the nature of transaction costs leading to more efficient management through an **electronic integration** solution thus favoring contracting and outsourcing as the preferred organizational form choice than would have been possible when Williamson's (1975) *Markets and Hierarchies* was published. It is emphasized that the transaction cost economics principles are durable but that the breathless advances in information technology, especially in the past decade, have comparatively favored lower transaction costs of markets over hierarchies.

**Key words:** Organizational form choice, Electronic integration, and Organizational economics

## I. Introduction

In recent years there has been increased research attention devoted to the corporate strategy of vertical integration and especially business trends toward vertical de-integration via strategic outsourcing (e.g., Coles and Hesterly, 1998; Leiblein and Miller, 2003; Leiblein, Reuer and Dalsace, 2002; Sanchez and Mahoney, 1996). Internet information technology and e-business derivatives are transforming business practices, especially in the area of vertical coordination (Bakos and Brynjolfsson, 1993; Bharadwaj, 2000; Hitt, 1999; Orlikowski and Barley, 2001), which is the focus of the current paper. Although an increasing number of business enterprises are building and implementing e-business infrastructure in their current business models, little academic research has focused on the theoretical foundations and conditions of economic success for this new emerging form of business organization via **electronic integration**.

This paper attempts to fill this research gap and to provide additional theoretical insights concerning vertical supply chain management and business options for input procurement from economic efficiency and business-level strategy perspectives. Firms' efficient organizational form choice in the area of supply chain management, and more specifically the "make-or-buy decision," is increasingly becoming an important economic value-driver, and firms in different industries are increasingly competing --- perhaps a better description is experimenting --- with alternative supply chains for achieving vertical coordination in an attempt to minimize their operating and transactions costs and to enhance the economic value of their product offerings and services.

The current paper provides a conceptual framework based on the integration of constructs derived from transaction costs theory and agency theory to help explain and predict the use of

alternative supply chain management options and firm-level organizational modes for achieving an economic cost-minimizing vertical coordination solution. Based on a transaction costs economics analysis, we explain and predict why relational contracting (via electronic integration) is becoming increasingly favored over both the spot market (price mechanism) and vertical integration (hierarchical) solutions (Shapiro and Varian, 1999). This organizational economics outcome is mainly due to the increased efficiency gains and substantive economic cost savings that often result from streamlining supply chain operations, which typically translates into increased firm-level economic profitability. Such economic costs savings are now possible because information technology has reduced the transaction costs of using electronic integration as a *substitute* for vertical financial ownership.

More specifically, this paper maintains that Internet technology and e-commerce software development continue to dramatically change the way post-industrial businesses are governed, managed, and valued economically in the capital markets. By altering the traditional organizational model of the firm (i.e., hierarchy) and facilitating a faster, more flexible and efficient exchange of goods and services, as well as ideas and information flows between different firm's stakeholders (e.g., managers, suppliers, employees, customers, capital providers and regulators), the IT infrastructure, when used in a cost-efficient way, can economize on significant (pre- and post-contractual) transactions costs (Williamson, 1996), while potentially accumulating economic (quasi-) rents and internalizing and protecting valuable intellectual assets such as supplier relationships, specific human capital investments, and customer relationships (Shapiro and Varian, 1999).

The paper proceeds as follows: First, the micro-analytic theoretical framework for analyzing make-or-buy decisions is presented. Second, the conditions and hypotheses for selecting each

alternative organizational form option in input procurement methods are developed. The paper concludes with some implications for business practices and suggestions for future research in this organizational economics area.

## **II. A Micro-analytic Approach to Organizational Form Choice**

Coordination and cost minimization (of both production and transactions costs) have usually been a strategic objective of managerial decision-making inside the business firm. How managers achieve economic cost minimization via the choice of organizational form (that can contribute to sustainable competitive advantage) is a core concern of the current paper.

In deciding on a particular organizational form along the continuum from short-term contracts to complete financial ownership for the purpose of economically achieving an efficient vertical coordination solution, a manager needs to evaluate the following contributions to economic value (Mahoney, 1992b; Mahoney, Crank and Lajili, 1995):

1. **Increasing Revenues** (e.g., increasing market power [while respecting anti-trust law]) (Bain, 1968; Scherer and Ross, 1990);
2. **Reducing Costs** (e.g., improving cost efficiency), for example by lowering production costs via economies of scope and by reducing transactions costs (D'Aveni and Ravenscraft, 1994; Teece, 1980, 1982); and
3. **Reducing Risks** in ways that cannot be replicated by the shareholders (see e.g., Chatterjee, Lubatkin and Schoenecker (1992); Helfat and Teece, 1987; Spiller, 1985).

Production costs are typically easier to define and measure than economic transaction costs. Nevertheless, transaction costs are often acknowledged to be important and critical components of the total economic costs for a particular firm in a given industry. Transactions costs include the ex-ante economic costs of (1) search and information costs, (2) drafting, bargaining and decision costs, and (3) costs of safeguarding an agreement. Ex-post economic costs include (1) costs of measuring input, (2) costs of measuring output, (3) monitoring and enforcement costs, and (4) adaptation and haggling costs (Williamson, 1985).

The generalizable thesis of transaction costs theory is that the particular organizational form chosen to implement the strategy of vertical integration serves mainly economic efficiency purposes (Coase, 1937). Williamson (1996) develops a well-grounded theoretical framework for explaining and predicting severe market frictions. The fundamental idea is that contractual difficulties might be anticipated when some opportunistic agents (Anderson, 1988; Williamson, 1975) engage in frequent transactions in an environment of sufficient uncertainty and/or complexity to surpass bounded rationality capabilities (Simon, 1982). The contractual risk of some opportunistic agents utilizing asymmetric information to their advantage --- and thus potentially leading to adverse selection, moral hazard, and economic hold-up problems --- is high in such business environments and vertical financial ownership is one adaptive response to this inadequacy of classical market contracting.

Contractual problems can become acute when there is a small-numbers bargaining condition, which is a situation that often occurs when transactions involve human, physical or site "asset specificity" (Choate and Maser, 1992; Whyte, 1994; Williamson, 1979). Human asset specificity involves uniquely related learning processes and often involves teamwork as well (Masten, Meehan and Snyder, 1989). Physical asset specificity includes requirements for specialized machine tools and equipment (Caves and Bradburd, 1988). Site specificity occurs when unique locational

advantages exist, as, for example, when a power plant is located near a coal mining area to save on transportation costs (Joskow, 1985).

A parsimonious organizational economics model that may explain and predict the choice of organizational form for achieving an economically efficient vertical coordination solution is an important task that is developed below. We analyze positive agency and transaction costs to predict and prescribe organizational form from an economic efficiency perspective. While the principal-agent model typically emphasizes the moral hazard problem (Holmstrom, 1979; Levinthal, 1988), the positive agency theory research literature (e.g., Alchian and Demsetz, 1972; Jensen and Meckling, 1976) typically emphasizes the critical role of measurement uncertainty in determining organizational form. The choice of organizational form that will be economically cost minimizing is influenced by uncertainty (demand and technological) and asset specificity (physical, human, site) in transaction costs theory.

Transaction costs theory (Williamson, 1985) provides insight into the key role of asset specificity, but typically neglects the interactive effects of measurement problems (e.g., Barzel, 1982; Eisenhardt, 1985) that have been highlighted by agency theory. On the other hand, positive agency theory emphasizes measurement costs but neglects asset specificity (Joskow, 1985; Mahoney, 1992b). The current paper maintains that combining these two economic efficiency perspectives enables us to make better explanations and predictions and to offer better economic cost-minimizing prescriptions on the make-or-buy decision.

The agency perspective emphasizes information asymmetry issues. A significant aspect of information asymmetry in organizations is the economic problem of ascertaining and rewarding individual effort in team production (Jones, 1987; Poppo and Zenger, 1998). Asymmetric information (between principals and agents) due to team production leads to the so-called

"nonseparability problem" (Alchian and Demsetz, 1972). If the economic reward cannot be effectively made contingent on output, it may be necessary to have a manager to monitor behavior or effort (Barzel, 1982; Ouchi, 1979). A second important agency theory variable concerns knowledge of the transformation process or "task programmability" (Eisenhardt, 1985; Ouchi, 1979). Low task programmability reduces the effectiveness of monitoring effort.

The transaction costs approach emphasizes asset specificity as the fundamental variable in determining the economic cost-reducing organizational form to achieve efficient vertical coordination (Krickx, 1995; Williamson, 1985). When assets are not closely tied to a specific strategy, transaction costs theory suggests that market and informal means of coordination will be the preferable economic cost-minimizing organizational choice. Vertical financial ownership (Dow, 1987) --- which entails a hierarchical authority relationship and residual rights of control from an incomplete contracting perspective (Brynjolfsson, 1994; Grossman and Hart, 1986) --- is more likely to reduce economic costs when (physical, site, and human) assets are idiosyncratic and closely tied to a specific strategy.

A partial integration of transaction costs theory and agency theory yields task programmability, nonseparability, demand uncertainty, technological uncertainty, and asset specificity as five key transactional characteristics that influence the economic cost-minimizing choice of organizational form (Mahoney, 1992a, 1992b). Although each of these variables has been operationalized in the extant organizational economics research literature, no single empirical study has considered all five variables simultaneously. In the current paper, we revise and extend the conceptual table in Mahoney (1992b) to include **electronic integration** via Internet technology and the competitive environment as additional crucial elements in the decision process for the economic cost-minimizing organizational form choice.

**Table 1**, adapted from Mahoney (1992b), suggests an integrative organizational economics theory of corporate vertical coordination and organizational form choice under conditions of agency costs, transaction costs (mainly the degree of asset specificity), and relationship-specific Internet technology availability and investment. Drawing together empirical evidence from two fields of inquiry --- strategy and organizational economics --- and applying insights from two theoretical perspectives --- transaction costs theory and agency theory --- while incorporating technology breakthroughs such as Internet platform and interfaces, it offers a more integrative organizational economics (efficiency) approach to the choice of organizational form than previously available.

-----  
**Insert Table 1 about here**  
-----

In its simplified form, Mahoney (1992b) provides a combined agency and transaction costs framework, which is expressed in eight different transactional characteristic scenarios that the business enterprise might encounter. The current paper hopefully contributes to the organizational economics research literature by providing an extension of the theory to include electronic integration via the IT system, which represents another eight scenarios and emphasizes the critical agency variable of output nonseparability. We consider these scenarios below.

When the output of the individual is easily measured (a low nonseparability problem) and asset specificity is low (cases 1 and 5), the ease of input measurement (task programmability) is inconsequential for achieving economic efficiency because in either case compensation can be based on the output. Consequently, in both business cases, the market mechanism (spot market prices) predictably works smoothly. Vertical financial ownership can add very little to these transactional characteristic scenarios; it is unlikely to be considered, and is highly unlikely to be the efficient

economic cost-minimizing organizational form choice. Since asset specificity is low, the process of competition provides few degrees of freedom for agents to behave opportunistically. Since there is a low nonseparability problem, there is little need to monitor input. Economic reward that is based on output, such as a piece rate system, is expected to work well. Thus, the price system is the predicted organizational form choice for economically achieving vertical coordination.

In this business case, an economic investment in a relationship-specific IT system to coordinate the vertical supply chain might not be needed since the market mechanism is expected to function well (cases 1a and 5a). Furthermore, a generic, unsophisticated form of an IT system would be sufficient to support production and business-level activities under these transactional conditions.

When the output of the individual is easily measured (a low nonseparability problem) and asset specificity is high (cases 2 and 6) a long-term relationship is required in order for the contractual parties to be willing to invest in high sunk cost investments (high asset specificity). Although high asset specificity is present, a low nonseparability problem suggests that hierarchy is less essential than is maintaining a long-term economic relationship of some kind (Alchian and Demsetz, 1972). The *type* of long-term relationship chosen will be influenced by the ability to measure input behavior (Ouchi, 1979; Eisenhardt, 1985). If task programmability is high (case 6), an equity joint venture allows a more refined monitoring system to develop and is predicted to be an effective economic cost-minimizing organizational form. If task programmability is low (case 2), a long-term contract that stipulates output performance and is enforced by courts is the predicted organizational form choice because monitoring the effort (inputs) is not effective due to low task programmability.

When the firm invests in an IT system under conditions of high asset specificity, a low nonseparability problem, and high/low task programmability (cases 2a and 6a), the predicted

organizational form choices for achieving an economically efficient vertical coordination solution would result in electronic contracts --- rather than a standard long-term contract --- in the low task programmability transactional condition, and in strategic alliances (Gulati and Singh, 1998) --- rather than equity joint ventures --- in the high task programmability transactional case. These changes in predictions (in comparison to the pre-information technology era) are warranted theoretically on the basis that an economically cost-effective IT system would offer the added flexibility to formalize tasks and thus facilitate input monitoring and verifications thus potentially eliminating the need to write and enforce costly and risky long-term contracts (Bensaou, 1997; Clemons, Reddi and Row, 1993; Gurbaxani and Whang, 1991). Moreover, when task programmability is already high (case 6a), and given the availability of a relationship-specific IT system to support exchange in the presence of high asset specificity, contracting firms or partners may not need an equity joint venture, but could rather benefit from their mutual synergies and economies of scope through (non-equity) strategic alliance arrangements.

When the output of the individual is difficult to measure (a high nonseparability problem) and asset specificity is low (cases 3 and 7) a long-term relationship is not required due to low switching costs (low asset specificity). When task programmability is low (case 3), some type of relational contract (Eccles, 1981; Macneil, 1980; Williamson, 1979) that inculcates cooperative attitudes is required since both output control and behavioral control are ineffective as a consequence of a high nonseparability problem and low task programmability. Cooperation must be achieved by a “self-enforcing agreement” (Klein, 1985) or "private ordering" (Williamson, 1985) rather than by reliance on third-party enforcement.

A business situation in which there is low asset specificity (e.g., near perfect labor markets), a high nonseparability problem, and there is high task programmability (case 7) precisely describes the conditions posited by Alchian and Demsetz (1972). Williamson (1975: 95-98) argues that the "inside-contracting" system (Buttrick, 1952) is the real world organizational form that most resembles the Alchian and Demsetz (1972) "manager as monitor" model. Departments in the inside- contracting system are paid by a piece-rate, however, team production may exist within a department and thus a manager is required to mitigate potential opportunistic behavior (e.g., reducing quality).

By investing in a relation-specific IT system, the firm could increase the effectiveness to monitor input and to measure output by incorporating product and/or service performance measurements and by clearly formulating expectations while highlighting specific tasks and decision rights to different layers of management and employees within the organization. These transactional characteristics seems to be well-served by a B2E (or Business-to-Employees) interface where the relevant information about the firm’s regular business activities would be available for key employees to act on and to use in their decision-making processes. Such an interface would not only

avoid the costs of social conditioning in relational and inside contracts in the base case (where no IT system option was available) but would also promote more responsibility and creativity from employees while effectively reducing managerial and bureaucratic layers in management and project implementation.

When individual output is difficult to measure (a high nonseparability problem) and asset specificity is high (cases 4 and 8), contractual problems become acute. The transaction characteristics combination of high task programmability, high asset specificity, and high nonseparability (case 8) contains the classical transactional conditions for when vertical financial ownership (hierarchy) is the preferred economic cost-minimizing organizational form choice (Williamson, 1985). With an investment in a specialized IT system to facilitate transactions and information processing and exchange (case 8a), hierarchy may still be the preferred cost-minimizing organizational model since information and management could be centralized and important coordination costs (both internal and external) could be saved while synergies such as economies of scope are realized. We hasten to add, however, that in some cases, mutual sunk costs commitments in a relationship-specific IT system may *substitute* for hierarchy, since the mutual sunk costs commitments can support exchange and reduce the possibility of economic hold-up (Blankenburg, Eriksson and Johanson, 1999; Subramani and Venkatraman, 2003; Williamson, 1983) without necessarily resorting to hierarchy (e.g., the system shared by P&G and Wal-mart). How often such vertical de-integration is the economic cost-minimizing organizational form choice over hierarchy is an empirical question. However, the current paper highlights the existence of this alternative organization form that was not available in the past for attenuating economic hold-up problems (Shapiro and Varian, 1999).

When there is a high nonseparability problem, when asset specificity is high and when task programmability is low (case 4) we have the worst-case transactional characteristics for achieving efficiency in which asset specificity is high and both input and output measurements are ineffective. Ouchi (1980) prescribes a clan relationship in which (personal) trust and human dignity are emphasized and opportunistic attitudes are transformed in favor of human solidarity. The inculcation of moral values (such as Adam Smith's concept of "sympathy") and cooperative attitudes are considered a viable solution to an otherwise intractable economic dilemma.

Finally, in the case of low task programmability, high nonseparability, and high asset specificity (case 4a), a relationship-specific IT system is predicted to minimize the agency costs of monitoring, economic bonding and the residual agency loss in this transactional case. Furthermore, third-party enforcement would be more effective if transactions are electronically accessed, processed and management decisions made more observable (Brynjolfsson, Malone, Gurbaxani and Kambil, 1994).

## A Conceptual Framework for Efficient Organizational Mode Choice

In this section of the paper, we revisit the research hypotheses provided in Mahoney and Lajili (1997) and focus on the organizational form choice of outsourcing via contracting and spot transactions using the internet and e-business platforms rather than the vertical financial ownership solution (Ang and Straub, 1998; Crowston, Sawyer and Wigand, 2001; Lam and Tan, 2001; Macher, Mowery and Simcoe, 2002). The transactional characteristics under which contracting via electronic integration is comparatively more efficient than vertical financial ownership are thus the core and basic structure for this new and revised organizational economics framework. The objective is to explain and predict the matching of transactional characteristics and cost-minimizing organizational form choice under a new competitive landscape where the option of *substituting* (a relationship-specific mutual sunk cost IT system) for a vertically integrated hierarchy is an available organizational option that had previously not been available.

We now focus on transaction costs economics logic to explain and predict the choice of organizational form. Transactions costs theory suggests that increased frequency will increase the likelihood of vertical financial ownership (Williamson, 1985) and empirical evidence has been corroborative (e.g., Anderson and Schmittlein 1984; Heide and Miner, 1992; Klein, 1989). The economic logic supporting this prediction is that the transaction costs economic savings from owning the upstream segment of the business will be sufficiently high to support vertical financial ownership when exchanges are recurrent and frequent. This economic outcome was the case, for example, for the auto manufacturing industry in the 1970s (Monteverde and Teece, 1982). However, the business solutions for minimizing transaction costs are changing in recent years because these economic costs savings can now be realized without having to resort to vertical financial ownership

of the upstream segment. An alternative organizational form option today that simply was not available three decades ago is to have an adequate B2B information infrastructure in place to achieve needed vertical coordination and adaptation (Dewan, Michael and Min, 1998; Malone, Yates and Benjamin, 1987; Powell and Dent-Micallef, 1997; Sambamurthy, Bharadwaj and Gover, 2003). This organizational form choice of *electronic integration* frequently facilitates and supports recurrent exchange and reduces transaction costs in comparison to the vertical financial ownership solution (Baldwin and Clark, 2000; Garud, Kumaraswamy and Langlois 2003; Langlois, 2002; Sanchez and Mahoney, 1996; Zaheer and Venkatraman, 1994)).

It should also be noted that in addition to all the theoretical reasoning provided above, another economic logic supports the current paper's prediction that greater frequency of transactions might actually lead to a **greater** reliance on contracting. Klein and Leffler (1981) provide an economic model where an increased frequency of transactions may lead to less opportunistic behavior since the shadow of the future will result in the discounted economic value of future profitable opportunities making it less likely that a firm will behave opportunistically for short-term gain. In such a case, the market/contracting mechanism itself is "self-enforcing" and thus economic market forces can ensure economic performance when frequency is high. The e-business technology allows firms to streamline their supply chain management operations thus increasing the likelihood that contracting and outsourcing via Internet technology is more efficient than vertical financial ownership when there is a **high** frequency of transactions. The theoretical arguments above lead us to our first hypothesis:

**Hypothesis 1:            Electronic contracting will be preferred to vertical financial ownership when there is **high** frequency of exchange.**

"Thin markets" increases the likelihood of costly (small-numbers) haggling in contractual exchange and increases the likelihood of vertical financial ownership (Williamson, 1975). Once again, the empirical evidence that associates vertical financial ownership with small-numbers problems has been corroborative (e.g., Caves and Bradburd, 1988; Knoeber, 1989; Levy, 1985; MacDonald, 1985; Pisano, 1990). Considering the alternative of contracting using the B2B technology platform (Mukhopadhyay and Kekre, 2002), however, may lead us to different organizational form predictions today. A B2B technology platform can reduce transactions costs (such as output measurement and quality standards). The potential of connecting with alternative suppliers via Internet technology leads us to predict that a costly vertical financial ownership solution is not necessary. We emphasize that the logic of transaction costs theory is durable. What has changed, however, are the available technologies that offer new organizational form solutions, which minimize transaction costs. Thus, by potentially decreasing contract transaction costs, outsourcing via the Internet (B2B) increases the likelihood that contracting would be more preferred than vertical financial ownership even when there are a small number of potential trading partners. Hence, the predictions are somewhat different for standard contracting and electronic contracting. Given the preceding logic, our second hypothesis follows:

**Hypothesis 2a:**        **Vertical financial ownership will be preferred to standard contractual outsourcing when there are a small number of potential trading partners.**

**Hypothesis 2b:**        **Electronic contracting will be preferred to vertical financial ownership even if there are a small number of potential trading partners because of potential transaction cost savings and increased efficiency benefits.**

There are three major dimensions to asset specificity: site, physical, and human capital. As site specificity increases, the buyer and seller become locked-in to a relationship so as to economize on inventory and transportation costs. To achieve these economies while avoiding opportunism under transactional conditions of high site specificity, vertical financial ownership is predicted to be the organizational form choice and the empirical evidence has been corroborative (Joskow, 1985; Masten, Meehan and Snyder, 1991; Pirrong, 1993; Shelanski and Klein, 1995; Spiller, 1985).

Physical asset specificity occurs when one or both parties to a transaction make investments in plant and equipment that involve design characteristics specific to the transaction. Such investments involve potentially appropriable economic quasi-rents (Klein, Crawford and Alchian, 1978). Vertical financial ownership minimizes the risk of economic rent appropriation and hence is the predicted organizational form choice. Empirical evidence associating physical asset ownership and vertical financial ownership has been corroborative (e.g., Caves and Bradburd, 1988; Hennart, 1988; Levy, 1985; Lieberman, 1991; Lyons, 1995; MacDonald, 1985; Masten, 1984; Monteverde and Teece, 1982; Weiss, 1992).

Human-capital asset specificity is due to learning by doing and team experience. Once again, vertical financial ownership is the predicted organizational form choice for attenuating economic rent appropriation. Empirical evidence associating human capital asset specificity and vertical financial ownership has been corroborative (e.g., Anderson, 1985; Anderson and Coughlan, 1987; Armour and Teece, 1980; John and Weitz, 1988; Levy, 1985; Lieberman, 1991; MacDonald, 1985; Masten, 1993; Masten, Meehan and Snyder, 1989, 1991, Monteverde and Teece, 1982).

When the level of asset specificity is high, we predict that vertical financial ownership will be more likely and more efficient than contracting even if an e-business infrastructure is operational. The main theoretical reason is that highly specific assets generate appropriable quasi-rents and the

more effective way to protect these economic rents is via ownership. For instance, a highly specific design for a component in an electronics or communications product would be best produced within the boundaries of the firm that originally designed it rather than contracting it out to another separate firm. The contracting and economic haggling costs associated with such highly specific assets could be substantial, which favor the vertical financial ownership solution over contracting or outsourcing. This economic logic is quite durable and is the standard prediction (see cell 8 of Table 1). However, today a relationship-specific IT system (e.g., Wal-mart and P&G) that exhibits mutual sunk cost commitments can support exchange and potentially substitute for hierarchy (cell 8a of Table 1).

**Hypothesis 3:            A high level of asset specificity (site, human, and physical capital) locks trading partners into a “bilateral monopoly” position, which makes contracting hazardous due to potential haggling costs and "hold-up" problems potentially very high and thus makes vertical financial ownership (or a relationship-specific IT system to align economic incentives) more likely.**

Firms often face environmental uncertainty in the form of demand (volume) volatility and technological uncertainty. First, we consider the case of demand uncertainty. To the extent that volatile sales are unanticipated, fluctuations in demand may require vertical financial ownership when compared to standard (i.e., non-electronic) contracting (Levy, 1985). The empirical evidence on the relationship between demand uncertainty and vertical financial ownership, however, has been mixed (Frank and Henderson, 1992; John and Weitz, 1988; Levy, 1985; Lieberman, 1991; Walker and Weber, 1987). In an era of information technology, we predict that electronic contracting or outsourcing inputs using B2B technology allows the firm to adapt its production capacity to forecasted sales and therefore to avoid unnecessary capital expenditures and full vertical financial

ownership costs (Loh and Venkatraman, 1992). Thus, electronic contracting is more efficient in this transactional case.

In the case of technological uncertainty, Balakrishnan and Wernerfelt (1986) provide a mathematical model showing that the higher the degree of technological uncertainty the lower the likelihood of investment in firm-specific sunk cost investments and consequently the lower the likelihood of vertical financial ownership and thus the higher the likelihood of (electronic and/or standardized) contracting. The empirical evidence supports this prediction (e.g., Balakrishnan and Wernerfelt, 1986; Harrigan, 1986; Walker and Weber, 1984).

**Hypothesis 4a: Higher demand uncertainty favors electronic contracting over vertical financial ownership.**

**Hypothesis 4b: Higher technological uncertainty favors electronic (and standard) contracting over vertical financial ownership.**

When the nonseparability problem is high (such as free-riding in team production), it is difficult to measure individual productivity from output observations (Alchian and Demsetz, 1972). Inputs, including labor, need to be monitored effectively. To achieve this monitoring ability, vertical financial ownership is the predicted organizational form solution. Empirical evidence associating the nonseparability problem and vertical financial ownership has been corroborative (e.g., Anderson and Schmittlein, 1984; Anderson, 1985; John and Weitz, 1988). Once again, while the transaction costs logic remains durable, (information) technologies have changed to provide alternative organizational form options to managers.

With e-business technology, the firm can build information portals and standardized interfaces to communicate with its employees, partners, suppliers and customers (Shapiro and Varian, 1999). Such a technological solution reduces the nonseparabilities problem and favors more

de-integrated organizational form choices than had been possible in the past. An IT system can contribute to alleviating the difficulties of measuring outputs and individual productivities in team production settings by specifying and codifying task assignments in a shared interface and by measuring or even capturing workflow inputs and outputs by different agents or employees in the organization. The business intelligence and related firm-level management software offered by software developing firms (e.g., SAP and PeopleSoft) illustrate these enhanced IT system capabilities to better measure individual firm-level performance and to track employee and managerial performance against established benchmarks. Such information systems would minimize agency costs of monitoring and measuring inputs and outputs and thus would enhance firm-level economic value and strategic performance. This economic logic leads us to our fifth hypothesis:

**Hypothesis 5:           The e-business technology allows for lower nonseparability problems and thus increases the likelihood of an electronic contracting organizational form solution over the vertical financial ownership solution (since the reduced asymmetric information contractual problem of identifying individual firm-level productivity facilitates inter-firm business relationships).**

So far, it has been argued that, on the one hand, high uncertainty (demand and technological) could be better managed by establishing a good e-business technology platform to reduce contracting costs and by streamlining the firm's operations while saving on organizational costs and avoiding the high economic costs of vertical financial ownership. On the other hand, if the degree of asset specificity in a transaction or business segment inside the firm is high, vertical financial ownership will more likely reduce transaction costs, which is a major hypothesis of transactions costs theory (Williamson, 1985). However, few research studies have empirically tested for

interaction terms (exceptions being, Anderson, 1985, Lajili, 1995; Lajili, Barry, Sonka and Mahoney, 1997; Walker and Weber, 1987) and the empirical results are mixed. More empirical research is needed here. Transaction costs logic (Williamson, 1985) suggests that high uncertainty and high asset specificity are likely to increase contractual difficulties and thus require vertical financial ownership to minimize transaction costs. Thus, our sixth and final hypothesis follows:

**Hypothesis 6:           The interaction of high uncertainty and high asset specificity increases the likelihood of vertical financial ownership.**

In summary, analyses of the conceptual map illustrated by Table 1, and the set of research hypotheses developed above, for predicting organizational form choice under firm-specific conditions of asset specificity, business risk, and uncertainty in output and input measurement, and the role of IT electronic market exchange technology (Bakos, 1991; Fulk and DeSanctis, 1995; Grover, Ramanal and Segars, 1999), are highlighted. These conclusions are theoretically supported by organizational economics (e.g., agency and transaction costs) theory, and higher degrees of outsourcing via vertical contracting or relationship-specific IT-systems are explained and predicted.

#### IV. Conclusions and Suggestions for Future Research

This research paper identifies the transactional conditions under which *electronic integration* (e.g., contracting using information technology of the Internet) and vertical financial ownership are efficient organizational forms for minimizing transaction costs. Six hypotheses are generated by combining elements from transactions costs theory (that emphasizes asset specificity) and positive agency theory (that emphasizes input and output measurements). The main result that is new to the research literature derived from this organizational economics analysis is that business uncertainty and risk can potentially be more efficiently managed by adopting an electronic integration solution rather than a vertical financial ownership solution. This derived prediction is in contrast with the standard transactions-costs hypothesis according to which higher uncertainty will result in vertical financial ownership. The current paper maintains that it is not that the transaction costs logic is incorrect. In fact, quite to the contrary, the current paper maintains that transaction costs logic is durable. What have changed, however, are the (information) technologies and the underlying transaction costs associated with these technological changes, which have made new organizational form solutions possible which is consistent with the de-integration trend observed in recent years.

An important business implication that follows logically from the theoretical analysis of the current paper is that for industries characterized with high business risks, it might be more efficient to de-integrate, to down-size, and to opt for an investment in a strong e-business infrastructure. In this way, vertical coordination and communication costs are reduced and the bureaucratic costs of the vertical financial ownership solution are avoided (Mahoney 1992b; Williamson, 1985).

Another argument of the current paper is that the small- numbers hypothesis (Williamson, 1971, 1975) for predicting vertical financial ownership not longer *necessarily* holds in the

information technology age, because vertical contracts can be more complete and *potential* competition remains strong with the capability of firms to quick connect using standardized interfaces. However, the asset specificity hypothesis for the choice of the vertical financial ownership remains fairly robust under the breakthrough of e-business as a powerful information technology and organizational tool (cell 8a of Table 1). Indeed, a high degree of asset specificity (site, physical, human capital) involves a greater risk in terms of appropriable quasi-rents and strategic and proprietary information costs that the firm needs to internalize to reap its benefits. Thus, vertical financial ownership is still the predicted mode when high levels of asset specificity are involved. This prediction would hold, for example, in the case for large high-tech firms such as those in the biotechnology and telecommunications equipment industries. However, in some business cases, such as Wal-mart and P&G a relationship-specific IT system, which features a mutual sunk cost commitment to support exchange, may substitute for hierarchy. How important such a substitution effect is, in real-world practice is an empirical question.

This paper is intended as a contribution to organizational economics and to the emerging research literature on e-business and information technology and how it affects organizational form choice for the purpose of reducing transaction costs. The theoretical framework proposed in this paper is deeply rooted in the transactions cost and agency theories and offers a more unified perspective on selecting the more efficient organizational form while highlighting the role that the internet technology might potentially play to shift the boundaries between different organizational models. Empirical testing of the hypotheses presented in this paper could be conducted using firm-level transaction data (e.g., supply chain management decisions) and measuring the different parameters in the decision such as the degree of asset specificity, demand and supply uncertainties, information technology investment and adequate use in the supply chain management. Theoretical

and empirical research at the interface of strategy and economics is fruitful and is needed in the future to improve our understanding of the dynamics of this important organizational form decision.

The transaction-cost-efficient organizational forms for firms in the 21<sup>st</sup> century are likely to be ones that are much more de-integrated and contract-based than those of the 1970s and early 1980s. Recent technology changes in the form of e-business infrastructure result in sizeable efficiency gains that are achieved by lowering communication and coordination costs between upstream and downstream segments of the value chain and by reducing measurement problems in terms of task programmability, productivity measurement and output quality measurement. Recent technology changes further enhance intra-firm and inter-firm information processing and coordination efforts while potentially reducing contractual opportunism hazards through better information sharing and monitoring. In the future, empirical research is needed to test empirically the significance of changes in coordination technologies on the various dimensions of agency and transactions costs and to aid in better explanation and prediction concerning the trends towards vertical de-integration. For this purpose, a microanalytic economic approach such as the one presented in the current paper could be adopted and these hypotheses can be empirically tested for value-chain analysis for firms both in B2B and in more traditional economic settings.

An important conclusion derived from the current paper is that information technology has lead to a lowering of the nonseparability problem of team production (Alchian and Demsetz, 1972) and consequently the measurement costs of using a market solution have been reduced. This conclusion is our main case argument for why we are witnessing the trend toward vertical de-integration. We emphasize that an integrated agency and transaction costs theory provides durable economic principles for explaining organizational form choice for vertical coordination. Technological changes, however, have changed the underlying measurement costs (Barzel, 1982)

and have, at least for now, favored more market solutions (via vertical de-integration), over vertical financial ownership. Clearly empirical work that provides some economic sense of the magnitude of these transaction costs savings would greatly increase our understanding of the current trends toward vertical de-integration that we are currently observing in business practice (Shapiro and Varian, 1999).

**TABLE 1**

**A Conceptual Framework for Predicting Organizational Form in the presence of IT Systems:  
Agency and Transaction Costs Considerations**

		Low Task Programmability		High Task Programmability	
		Low Asset Specificity	High Asset Specificity	Low Asset Specificity	High Asset Specificity
<b>Low Non-separability</b>	<b>No IT System</b>	1: Spot markets	2: Long-term contracts	5: Spot markets	6: Equity joint ventures
	<b>With IT System</b>	1a: Spot markets	2a: Electronic contracts (B2B)	5a: Spot markets	6a: Strategic alliances
<b>High Non-separability</b>	<b>No IT System</b>	3: Relational contracts	4: Clans	7: Inside Contracting	8: Hierarchy
	<b>With IT System</b>	3a: Internal contracts (B2E)	4a: Relationship-specific IT system	7a: Internal contracts (B2E)	8a: Hierarchy OR Relationship-specific IT system

**Definitions:**

**Low Task Programmability:** Observing input (effort) is a poor measure for making rewards.

**High Nonseparability:** Observing output is a poor measure for making economic rewards to individuals or organizations (if outsourcing applies)

**High Asset Specificity:** Human, physical and/or site firm-specific investments are high.

**Spot markets:** The price system works smoothly.

**Long-term contracts:** Obligations of principals and agents are specified and enforced by third-parties (courts).

**Short-term contracts** same as above but shorter in duration

**Electronic contracts (B2B platform):** same as above with longer duration supported by a B2B platform

**Relational contracts:** Obligations of principals and agents are specified and self-enforced. Social conditioning is applicable.

**Inside Contracting:** A hybrid arrangement between contract and hierarchy that is best described as a "manager as monitor" setup.

**Internal contract (B2E platform):** an IT system directed to coordinating information flows internally between management and employees

**Equity joint ventures:** An equity agreement whereby a separate entity is created.

**Strategic alliances:** Cooperative partnerships between two or more rivals in one industry to achieve a win-win situation (outcome is higher than in Nash equilibrium in a Prisoners' dilemma game)

**Hierarchy:** A superior-subordinate relationship; financial ownership.

**Clan:** Organization that is based on a vital sense of human solidarity.

**Relationship-specific IT system:** Mutual sunk cost commitments in an IT system are made by both firms (e.g., Walmart and P&G).

## References

- Alchian, A. A. and H. Demsetz (1972). Production, information costs, and economic organization. American Economic Review, 62 (December), 777-795.
- Anderson, E. (1985). The salesperson as outside agent or employee: A transaction costs analysis. Marketing Science, 4, 234-254.
- Anderson, E. (1988). Transaction costs as determinants of opportunism in integrated and independent sales forces. Journal of Economic Behavior and Organization, 9, 247-264.
- Anderson, E. and A. T. Coughlan (1987). International market entry and expansion via independent or integrated channels of distribution. Journal of Marketing, 71, 71-82.
- Anderson, E. and D. C. Schmittlein (1984). Integration of the sales force: An empirical examination. Rand Journal of Economics, 15 (Autumn), 385-395.
- Ang, S. and D. W. Straub (1998). Production and transaction economies and IS outsourcing: A study of the U.S. banking industry. MIS Quarterly, 22 (4): 535-552.
- Armour, H. O and D. J. Teece (1980). Vertical integration and technological innovation. Review of Economics and Statistics, 62, 470-474.
- Bain, J. S. (1968). Industrial Organization. New York, NY: John Wiley & Sons, Inc.
- Bakos, J. Y. (1991). A strategic analysis of electronic markets. MIS Quarterly, 15 (3): 295-310.
- Bakos, Y. and E. Brynjolfsson (1993). Information technology, incentives, and the optimal number of suppliers. Journal of Management and Information Systems 10 (2): 37-53.
- Baldwin, C. Y. and K. B. Clark (2000). Design Rules: The Power of Modularity. Cambridge, MA: MIT Press.
- Balakrishnan, S. and B. Wernerfelt (1986). Technical change, competition, and vertical integration. Strategic Management Journal, 7 (4), 347-359.
- Barzel, Y. (1982). Measurement costs and the organization of markets. Journal of Law and Economics, 25 (April), 27-48.
- Bensaou, M. (1997). Interorganizational cooperation: The role of information technology --- An empirical investigation of U.S. and Japanese supplier relationships. Information Systems Research, 20: 467-486.

- Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance: An empirical investigation. MIS Quarterly, 24 (1): 169-196.
- Blankenburg Holm, D., K. Eriksson and J. Johanson (1999). Creating value through mutual commitment to business network relationships. Strategic Management Journal, 20: 467-486.
- Brynjolfsson, E. (1994). Information assets, technology and organization. Management Science, 40 (12), 1645-1662.
- Brynjolfsson, E., T. Malone, V. Gurbaxani and A. Kambil (1994). Does information technology lead to smaller firms? Management Science, 40 (12): 1645-1662,
- Buttrick, J. (1952). The inside contract system. Journal of Economic History, 12, 205-221.
- Caves, R. E. and R. M. Bradburd (1988). The empirical determinants of vertical integration. Journal of Economic Behavior and Organization, 9, 265-279.
- Chatterjee, S. M., M. Lubatkin and T. Schoenecker (1992). Vertical strategies and market structure: A systematic risk analysis. Organization Science, 3 (1), 138-156.
- Choate, G. M. and S. M. Maser (1992). The impact of asset specificity on single-period contracting. Journal of Economic Behavior and Organization, 18 (3), 373-389.
- Clemons, E. K., S. P. Reddi and M. C. Row (1993). The impact of information technology on the organization of economic activity: The 'move to the middle' hypothesis. Journal of Management Information Systems, 10 (2), 9-35.
- Coase, R. H. (1937). The nature of the firm. Economica, 4 (November), 386-405.
- Coles, J. W. and W. S. Hesterly (1998). The impact of firm-specific assets and the interaction of uncertainty: An examination of make or buy decisions in public and private hospitals. Journal of Economic Behavior and Organization, 36 (3): 383-409.
- Crowston, J. S. Sawyer and R. Wigand (2001). Investigating the interplay between structure and information and communications technology in the real estate industry. Information Technology and People, 14 (2): 163-183.
- D'Aveni, R. A. and D. J. Ravenscraft (1994). Economies of integration versus bureaucracy costs: Does vertical integration improve performance? Academy of Management Journal, 37 (5), 1167-1206.
- Dewan, S. S. C. Michael and C. Min (1998). Firm characteristics and investments in information technology: Scale and scope effects. Information Systems Research, 9: 219-232
- Dow, G. K. (1987). The function of authority in transaction cost economics. Journal of Economic

Behavior and Organization, 8 (1), 13-38.

Eccles, R. G. (1981). The quasifirm in the construction industry. Journal of Economic Behavior and Organization, 2 (December), 335-358.

Eisenhardt, K. M. (1985). Control: Organizational and economic approaches. Management Science, 31 (2), 134-149.

Frank, S. D. and D. R. Henderson (1992). Transaction costs as determinants of vertical coordination in the U.S. food industries. American Journal of Agricultural Economics, 74, 941-950.

Fulk, J. and G. DeSanctis (1995). Electronic communication and changing organizational form. Organization Science, 6 (4): 337-349.

Garud, R., A. Kumaraswamy and R. N. Langlois (Eds.) (2003). Managing in the Modular Age: Architectures, Networks and Organizations. Malden, MA: Blackwell Publishers.

Grossman, S. J. and O. Hart (1986). The costs and benefits of ownership: A theory of vertical and lateral integration. Journal of Political Economy, 94 (4), 691-719.

Grover, V., P. Ramamal and A. H. Segars (1999). Information exchange in electronic markets: Implications for market structures. International Journal of Electronic Commerce, 3 (4): 89-102.

Gulati, R. and H. Singh (1998). The architecture of cooperation: Managing coordination costs and appropriation concerns in strategic alliances. Administrative Science Quarterly, 43: 781-814.

Gurbaxani, V. and S. Whang (1991). The impact of information systems on organizations and markets. Communications of the ACM, 34 (1), 59-73.

Harrigan, K. R. (1986). Matching vertical integration strategies to competitive conditions. Strategic Management Journal, 7(6), 535-555.

Heide, J. B. and A. S. Miner (1992). The shadow of the future: Effects of anticipated interaction and frequency of contact on buyer-supplier cooperation. Academy of Management Journal, 35, 265-291.

Helfat, C. E. and D. J. Teece (1987). Vertical integration and risk reduction. Journal of Law, Economics, and Organization, 3, 47-67.

Hennart, J-F. (1988). Upstream vertical integration in the aluminum and tin industries. Journal of Economic Behavior and Organization, 9, 281-299.

Hitt, L. (1999). Information technology and firm boundaries: Evidence from panel data. Information Systems Research, 10 (2): 134-149.

- Holmstrom, B. (1979). Moral hazard and observability. Bell Journal of Economics, 10: 74-91.
- Jensen, M. C. and R. H. Meckling (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3 (October), 305-360.
- John, G. and B. A. Weitz (1988). Forward integration into distribution: An empirical test of transaction costs analysis. Journal of Law, Economics and Organization, 4, 337-355.
- Jones, G. R. (1987). Organizational-client transactions and organizational governance structures. Academy of Management Journal, 30 (2): 197-218.
- Joskow, P. L. (1985). Vertical integration and long-term contracts: The case of coal burning electric generating plants. Journal of Law, Economics, and Organization, 1 (Spring), 33-80.
- Klein, B. (1985). Self-enforcing contracts. Journal of Institutional and Theoretical Economics, 141: 594-600.
- Klein, B., R. Crawford and A. Alchian (1978). Vertical integration, appropriable rents, and the competitive contracting process. Journal of Law and Economics, 21 (October), 297-326.
- Klein, B. and K. Leffler (1981). The role of market forces in assuring contractual performance. Journal of Political Economy, 89 (August), 615-641.
- Klein, S. (1989). A transaction cost explanation of vertical control in international markets. Journal of the Academy of Marketing Science, 17, 253-260.
- Knoeber, C. R. (1989). A real game of chicken: Contracts, tournaments, and the production of broilers. Journal of Law, Economics, and Organization, 5 (2), 271-292.
- Krickx, G. A. (1995). Vertical integration in the computer mainframe industry: A transaction cost interpretation. Journal of Economic Behavior and Organization, 26, 75-91.
- Lajili, K. (1995). Vertical Coordination Arrangements in Agricultural and Food Markets: An Agency/Transactions-Costs Approach. Unpublished doctoral dissertation, University of Illinois at Urbana-Champaign.
- Lajili, K., P. J. Barry, S. T. Sonka and J. T. Mahoney (1997). "Farmer's Preferences for Crop Contracts." The Journal of Agricultural and Resource Economics. 22(2), 264-280.
- Lam, C. K. M. and B. C. Y. Tan (2001). The internet is changing the music industry. Communications of the ACM, 44 (8), 62-68.
- Langlois, R. N. (2002). Modularity in technology and organization. Journal of Economic Behavior and Organization, 49 (1): 19-37.
- Leiblein, M. J. and D. J. Miller (2003). An empirical examination of transaction- and firm-level

- influences on the vertical boundaries of the firm. Strategic Management Journal, 24 (9), 839-859.
- Leiblein, M. J., J. J. Reuer, and F. Dalsace (2002). Do make or buy decisions matter? The influence of organizational governance on technological performance. Strategic Management Journal, 23 (9), 817-833.
- Levinthal, D. (1988). A survey of agency models of organizations. Journal of Economic Behavior and Organization, 9 (2), 153-185.
- Levy, D. T. (1985). The transaction cost approach to vertical integration: An empirical investigation. Review of Economics and Statistics, 67, 438-445.
- Lieberman, M. B. (1991). Determinants of vertical integration: An empirical test. Journal of Industrial Economics, 39 (5), 451-465.
- Loh, L. and N. Venkatraman (1992). Determinants of information technology outsourcing: A cross-sectional analysis. Journal of Management Information Systems, 9 (Summer): 7-24.
- Lyons, B. R. (1995). Specific investment, economies of scale, and the make-or-buy decision: A test of transaction cost theory. Journal of Economic Behavior and Organization, 26, 431-443.
- MacDonald, J. M. (1985). Market exchange or vertical integration: An empirical analysis. Review of Economics and Statistics, 67, 327-331.
- Macher, J. T., D. C. Mowery and T. S. Simcoe (2002). E-business and disintegration of the semiconductor industry value chain. Industry and Innovation, 9 (3): 155-181.
- Macneil, I. R. (1980). The New Social Contract: An Inquiry into Modern Contractual Relations. New Haven, CT: Yale University Press.
- Mahoney, J. T. (1992a). Organizational economics within the conversation of strategic management. Advances in Strategic Management, 8, 103-155.
- Mahoney, J. T. (1992b). The choice of organizational form: Vertical financial ownership versus other methods of vertical integration. Strategic Management Journal, 13 (8), 559-584.
- Mahoney, J. T., D. C. Crank and K. Lajili (1995). Spot markets, vertical contracting, and vertical financial ownership: Competition among organizational forms. Paper presented at Ne-165/WRCC-72 Research Conference, "Interactions between public policies and private strategies in the food industries," June 1994, Delta Hotel, Montreal, Quebec.
- Mahoney, J. T. and K. Lajili (1997). "The Strategy and Governance of Vertical Integration: Empirical Evidence." Keynote paper presented at the Learning Workshop *New Theories of the Firm*. American Agricultural Economics Association Annual Meeting, Toronto, Canada. July 1997.

Malone, T. W., J. Yates and R. I. Benjamin (1987). Electronic markets and electronic hierarchies. Communications of the ACM, 30, 484-497.

Masten, S. (1984). The organization of production: Evidence from the aerospace industry. Journal of Law and Economics, 27 (October), 403-418.

Masten, S. (1993). Transaction costs, mistakes, and performance: Assessing the importance of governance. Managerial and Decision Economics, 14 (2), 119-129.

Masten, S., J. W. Meehan and E. A. Snyder (1989). Vertical integration in the U.S. auto industry: A note on the influence of transaction specific assets. Journal of Economic Behavior and Organization, 12 (2), 265-273.

Masten, S., J. W. Meehan and E. A. Snyder (1991). The costs of organization. Journal of Law, Economics, and Organization, 7 (1), 1-25.

Monteverde, K. and D. J. Teece (1982). Supplier switching costs and vertical integration in the automobile industry. Bell Journal of Economics, 13 (Spring), 206-213.

Mukhopadhyay, T. and S. Kekre (2002). Strategic and operational benefits of electronic integration in B2B procurement processes. Management Science, 48 (10): 1301-1313.

Orlikowski, W. J. and S. R. Barley (2001). Technology and institutions: What can research on information technology and research on organizations learn from each other? MIS Quarterly, 25 (2): 145-165.

Ouchi, W. G. (1979). A conceptual framework for the design of organizational control mechanisms. Management Science, 25 (9), 833-848.

Ouchi, W. G. (1980). Markets, bureaucracies, and clans. Administrative Science Quarterly, 25, 124-141.

Pirrong, S. C. (1993). Contracting practices in bulk shipping markets: A transaction costs explanation. Journal of Law and Economics, 36 (October), 937-976.

Pisano, G. P. (1990). The R&D boundaries of the firm: An empirical analysis. Administrative Science Quarterly, 35, 153-176.

Poppo, L. and T. Zenger (1998). Testing alternative theories of the firm: Transaction cost, knowledge-based and measurement explanation for make-or-buy decisions in information services. Strategic Management Journal, 19: 853-877.

Powell, T. C. and A. Dent-Micallef (1997). Information technology as competitive advantage: The role of human, business, and technological resources. Strategic Management Journal, 18 (5), 375-

405.

Sambamurthy, V., A. Bharadwaj and V. Grover (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. MIS Quarterly, 27 (3): 237-263.

Sanchez, R. and J. T. Mahoney (1996). Modularity, flexibility, and knowledge management in product and organization design. Strategic Management Journal, 17 (December), 63-76.

Scherer, F. M. and D. Ross (1990). Industrial Market Structure and Economic Performance. Boston: Houghton Mifflin Company.

Shapiro, C. and H. R. Varian (1999). Information Rules: A Strategic Guide to the Network Economy. Boston, MA: Harvard Business School Press.

Shelanski, H. A. and P. G. Klein (1995). Empirical research in transaction cost economics: A review and assessment. Journal of Law, Economics and Organization, 11: 335-361.

Simon, H. (1982). Models of Bounded Rationality: Behavioral Economics and Business Organization. Cambridge, MA: MIT Press.

Spiller, P. T. (1985). On vertical mergers. Journal of Law, Economics, and Organization, 1 (2) (Fall), 285-312.

Subramani, M. R. and N. Venkatraman (2003). Safeguarding investments in asymmetric inter-organizational relationships: Theory and evidence. Academy of Management Journal, 46: 46-62.

Teece, D. J. (1980). Economies of scope and the scope of the enterprise. Journal of Economic Behavior and Organization, 1 (September), 223-247.

Teece, D. J. (1982). Toward an economic theory of the multiproduct firm. Journal of Economic Behavior and Organization, 3 (March), 39-63.

Walker, G. and D. Weber (1984). A transaction cost approach to make-or-buy decision. Administrative Science Quarterly, 29 (September), 373-391.

Walker, G. and D. Weber (1987). Supplier competition, uncertainty, and make-or-buy decision. Academy of Management Journal, 30, 589-596.

Weiss A. (1992). The role of firm-specific capital in vertical mergers. Journal of Law and Economics, 35 (1) (April), 71-88.

Whyte, G. (1994). The role of asset specificity in the vertical integration decision. Journal of Economic Behavior and Organization, 23, 287-302.

Williamson, O. E. (1971). The vertical integration of production: Market failure considerations. American Economic Review, 61 (May), 112-123.

Williamson, O. E. (1975). Market and Hierarchies: Analysis and Antitrust Implications. New York: Free Press.

Williamson, O. E. (1979). Transaction-cost economics: The governance of contractual relations. Journal of Law and Economics, 22 (October), 233-261.

Williamson, O. E. (1983).

Williamson, O. E. (1985). The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting. New York: The Free Press.

Williamson, O. E. (1996). The Mechanisms of Governance. New York: Oxford University Press.

Zaheer, A. and N. Venkatraman (1994). Determinants of electronic integration in the insurance industry: An empirical test. Management Science, 40 (5), 549-566.