# Using Formal and Informal Controls to Limit Opportunism: Review and Classification of Remedies to Hold-ups

**Fabienne Miller**
**Worcester Polytechnic Institute**

## ABSTRACT

The hold-up problem, a form of opportunism, has been the subject of much investigation by researchers in fields such as economics or accounting. Despite contractual protections, hold-ups still occur, and firms and researchers continue to search for ways to avoid them and to encourage firms to make investments that are socially optimal and specific to the relationship at hand. In this paper, I review, synthesize, and classify analytical and empirical research aimed at identifying and testing formal and informal hold-up mitigating mechanisms, as well as suggest avenues for future research. My study integrates various streams of research and is organized around strategic decision-making, that is, decisions about organizational design, inter- and intra-firm trade, and resource allocation.

I find that most analytical research has focused on formal controls to hold-ups such as vertical integration, joint ownership, contracts, pricing mechanisms, compensation, and interdependence, and has only recently begun to complement these formal controls with informal substitutes for commitment such as relational contracting and information asymmetry. Empirical research, on the other hand, has focused overwhelmingly on informal controls. As this review reveals, the various research streams have not all pursued investigations of hold-ups to the same extent as research on organizational design and inter-firm trade decisions, even though hold-ups are likely to have an impact on intra-firm trade and resource allocation decisions. In sum, this review not only integrates the findings of the various disciplines and research streams, but also suggests directions future research might take.

**Keywords**: hold-up problem, formal controls, informal control, opportunism

## 1.0 INTRODUCTION

*"Suppose the production of a particular product requires a large capital equipment which is, however, specialized insofar that it can only be used for the particular product concerned or can only be readapted at great cost. Then the firm producing such a product for one consumer finds itself faced with one great risk - that the consumer may transfer his demand elsewhere or that he may exercise his monopoly power to force down the price..."*
*Coase correspondence to Ronald Fowler in 1932* [Coase, 2006, p. 259].

The hold-up problem has been the subject of much investigation by re-searchers in fields such as economics or accounting. Contractual protections and safeguards are not always effective and sometimes too costly to implement. As a result, firms and researchers continue to search for better mechanisms for mitigating hold-ups and for ways to encourage firms to make socially optimal relation-specific investments (i.e., investments that generate a surplus when dealing with a specific economic partner, but lose most, if not all, of their value in alternative uses).

In this study, I present several theoretical perspectives, review and classify analytical and empirical research undertaken after 1997 and aimed at identify-ing and testing mechanisms for mitigating hold-ups, and suggest avenues for future research. My research integrates findings from several disciplines and focuses on strategic decision-making. Following Fredrickson [1985], I define a strategic decision as one that is not routine and that requires the commitment of significant resources, is difficult to reverse, and is likely to have long-term im-plications for the firm. Decisions regarding organizational design, inter- and intra-firm trade, and the allocation of resources are all examples of strategic decisions.

Despite recent reviews of this subject by Shelanski and Klein [1995], Coeurderoy and Quélin [1997], and Rindfleisch and Heide [1997], this review is warranted for at least four reasons: (1) While these reviews presented case studies and archival research, they did not incorporate any findings from ana-lytical research and included only a few experimental studies. Analytical and experimental research sheds new light on the importance of contracts, incen-tives, and information asymmetry as remedies to hold-ups. (2) Extant reviews did not include findings from the field of accounting. (3) Research, since these reviews were published, has evolved in a new direction, focusing increasingly on informal rather than formal controls.[1] Specifically, researchers are examin-ing relational contracting[2] and information asymmetry[3] as mechanisms for

---

[1] According to Fisher [1995, p. 25] and Dekker [2004], controls can create conditions that motivate organizations "to achieve desirable or predetermined outcomes." In an inter-firm setting, controls can be further classified as formal (i.e., safeguards that can be enforced by a third party and take the form of formal governance mechanisms such as contracts) and informal (i.e., safeguards that are self-enforcing such as relational contracting or, more recently, information asymmetry) [Dyer and Singh, 1998, p. 669].

[2] Relational contracting does not view contracts as formal documents and specific terms. Instead, it defines contracts as "exchange relations" in which norms and the context of the relationship frame the rela-tionship [Macneil, 2000].

[3] Although information asymmetry is often presented as a characteristics of the environment, parties to a transaction can also intentionally limit the information made available to their counterpart to reduce the

mitigating hold-ups. These recent investigations into information asymmetry suggest that accounting information can provide an important mechanism for controlling this type of opportunism. (4) This review integrates several theoretical perspectives, thereby providing a comprehensive picture of solutions to various types of hold-up problems. As such, this review exposes scholars to new perspectives and suggests ways in which the various approaches overlap or complement each other.

The unique perspective this review takes also has value for accounting scholars. Specifically, this review introduces accounting researchers to findings from disciplines with long traditions of researching the hold-up problem. This has the potential to improve the operationalization of constructs and help scholars to avoid duplicating effort as well as identify the boundaries of prior research. For example, Che and Hausch [1999] show that while establishing an initial contract (a solution to the hold-up problem proposed by accounting researchers [cf. Edlin and Reichelstein, 1995]) encourages selfish idiosyncratic investments, it is ineffective when dealing with cooperative investments. Furthermore, I organize the extant literature according to the type of strategic decision regularly investigated by accounting scholars, namely, decisions regarding organizational design (i.e., make or buy decisions), inter- and intra-firm trade (i.e., purchase transaction between buyer and supplier and transfer pricing, respectively), and resource allocation. This organization facilitates the sharing of knowledge and suggests new areas scholars might investigate, thus helping to create new knowledge. For instance, while aggregation of accounting information mitigates opportunism in a resource allocation setting [cf. Arya, et al., 2000], the effectiveness of this solution when the hold-up accompanies a trade decision (wherein negotiation might be hindered by information asymmetry) warrants further examination [cf. Miller, 2007].

This paper aims to overcome the narrow focus of previous reviews by creating a unified body of knowledge that addresses how formal and informal controls can help mitigate the hold-up problem. This paper has three main advantages over previous reviews. First, despite the fact that transaction cost economics has provided the dominant framework for analyzing hold-ups, this paper presents a comprehensive review of the various theoretical perspectives that have proposed solutions to the hold-up problem, highlighting their common features and differences. Second, this paper integrates research from the fields of economics, experimental economics, accounting, law, marketing, and organizational behavior and organizes their findings regarding strategic decisions (i.e., decisions relating to organizational design, trade, and resource allocation). Third, it highlights current challenges and opportunities for addressing the hold-up problem and suggests avenues for future investigation by accounting scholars.

When firms make strategic decisions involving investments in relation-specific assets, theory predicts that the investor will expect their economic partner to behave in an opportunistic manner *ex post* by appropriating most of

---

likelihood that this information will be used opportunistically. I thank the anonymous referee for suggesting this clarification.

the surplus generated by the relation-specific investment. That is, once the relation-specific investment is made, the investor will bear its full cost, but will at best receive only a small portion of the surplus the investment creates. Accordingly, the investor is likely to under-invest, thereby causing the hold-up problem.[4] By definition, the hold-up problem, which is the subject of this review, includes three elements: (a) a one-sided socially optimal relation-specific investment that creates quasi-rents, (b) no credible commitment from the non-investor to refrain from appropriating these quasi-rents, and (c) potential opportunism by the non-investor, leading to their appropriation of a portion of the quasi-rents.

Since the non-investor is unlikely to make a credible commitment, potential solutions to the hold-up problems often seek to provide substitutes for this commitment. These substitutes take the form of formal or informal controls that make it costly for the non-investor to behave opportunistically *ex post*. Indeed, vertical integration, detailed and long-term formal contracts, allocation of property rights, distribution of scarce resources, incentives, and social norms have all figured in various theories as ways of reducing the likelihood that the non-investor will appropriate the surplus generated by the investment. Scholars have developed analytical models and tested the predictions of these theories in empirical studies. While their findings are generally consistent with the theories discussed herein, they also suggest that accounting information in the form of aggregated cost information and individual preferences can play a role in mitigating hold-ups.

The rest of this paper is organized as follows: Section 2 presents the hold-up problem in greater detail and provides theoretical predictions from the fields of organizational economics and law based on transaction cost economics, property rights, the resource-based view of the firm, principal-agent, and relational contracting theories. Section 3 presents the findings of research aimed at mitigating the hold-up problem and focuses on strategic decisions such as those regarding organizational design, inter- and intra-firm trade, and resource allocation, while suggesting areas for future investigation. Section 4 concludes.

## 2.0 THE HOLD-UP PROBLEM: AN OVERVIEW OF THEORIES

The earliest economic investigation into the hold-up problem was initiated by Coase [1937]. This investigation attempted to determine the antecedents of organizational boundaries and contracting arrangements between firms by investigating a range of governance structures, from arm's length (i.e., price-based governance and outcome-based contracts) to integration (i.e., governance through a unified authority structure). The premise of this research stream is that organizational boundaries result from decisions aimed at minimizing cost. Analysis of the hold-up problem was advanced much later with the introduction of transaction cost economics [Williamson, 1975], property rights theory [Grossman and Hart, 1986; Hart and Moore, 1990], the resource-based view of

---

[4] Although the term *hold-up* was first used by Goldberg [1976], the concept originated with Coarse [1937] and has evolved from Goldberg's original meaning of the appropriation of surplus to the underinvestment in idiosyncratic assets owing to the anticipation that that surplus will be subsequently appropriated.

the firm [Penrose, 1959], principal-agent theory [Jensen and Meckling, 1976], and relational contracting theory [Macneil, 1980]. I present those theories and their relationship to the hold-up problem after a detailed description of relation-specific investments and the hold-up problem.

## 2.1 Description of Relation-Specific Investments and the Hold-up Problem

When a firm makes a relation-specific investment, the more specific the asset is, the lower the value of the investment in alternative uses. Per Williamson [1983, 1991], relation-specific investments take the form of site specificity (e.g., collocation of electricity generating facility next to a coal mine [Joskow, 1987]), capital asset specificity (e.g., special tooling [Monteverde and Teece, 1982]), a dedicated asset for a single customer, and human capital (e.g., specialized training of personnel to distribute or service products [Anderson, 1985; Jensen and Rothwell, 1998]). Other forms of relation-specific investments have been identified more recently, including brand name capital (e.g., goodwill [Anderson, 1994], and temporal specificity, wherein threats of delays can be used as a way to extract price concessions [Masten, Meehan and Snyder, 1991; Pirrong, 1993]). The expectation that, once a relation-specific investment has been made, non-investors will engage in self-interested behavior causes investors to under-invest in such assets, which leads to the hold-up problem, as detailed below in Figure 1.

### Figure 1 Simplified Timeline of the Hold-up Problem



|  0 | 1 | 2 |
|----|---|---|
| Incomplete<br>contract signed | Relation-specific<br>investment choice | Surplus division |
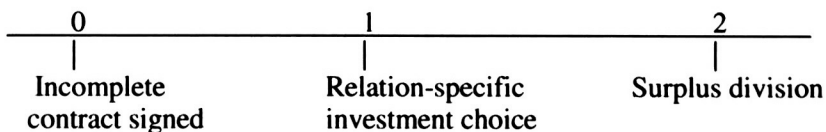
Adapted from Hart and Moore [1988]

A contract was negotiated at time 0 (e.g., for the provision of a certain quantity of product or for a particular price by a supplier for a buyer or of effort by an agent for a principal). Some of the contract terms cannot be specified *ex ante* because they depend on certain parameters whose resolution is highly uncertain (e.g., investment in R&D, success of R&D efforts, resulting size of the net surplus generated by the investment). At time 1, one party must decide whether to make a non-contractible relation-specific investment that will create a surplus should trade or a compensation agreement follow. Time 1 represents the investment stage. The investor's goal is to maximize their payoff at time 2, which represents the surplus division stage. Accordingly, the investor bases their investment decision on the share of the surplus they expect to receive, a share that will either be allocated by the principal or negotiated at time 2. In other words, the investor uses backward induction to make their investment decision.

Because of the specificity of the investment and the incompleteness[5] of the contract, a bilateral monopoly is created *ex post* whereby the non-investor can appropriate the surplus generated by the investment if cooperative behavior is not consistent with self-interested behavior [Tirole, 1988]. Thus, should the non-investor be unable to commit to a mutually agreeable division of the surplus *ex ante,* the investor refrains from making the socially optimal investment and under-invests.

Consider the following example of a hold-up problem that might occur in the automobile industry. Suppose that an automobile supplier must decide whether to invest in R&D that can lead to valuable improvements in a component of a specific model of automobile produced by an original equipment manufacturer (OEM). R&D is costly and has no value outside the relationship with this OEM.[6] The supplier will base their decision of whether to invest in R&D on their expectations of the payoff that will come from the OEM's subsequent purchase of the component. That said, the contract is incomplete owing to uncertainty, and the OEM cannot credibly commit to reimbursing the supplier for their R&D investment or to sharing the surplus the investment creates. Foreseeing the potential for the OEM to engage in self-interested behavior during trade negotiations, the supplier under-invests in R&D compared to the socially optimal investment. In the course of conducting an annual survey of the relationships between American automobile suppliers and American OEMs, Henke [2004, 2006] finds evidence to suggest that the scenario described above does occur. Specifically, Henke finds evidence of American OEMs' lack of commitment as they used their knowledge about their suppliers cost structure to put additional price pressure on their suppliers and exploited the suppliers' proprietary information and intellectual property they had obtained.

In sum, the specificity of the asset makes it difficult to safeguard the surplus it generates because self-interest leads the non-investor to deviate from cooperative behavior. The hold-up problem is associated with a loss of efficiency and accordingly can be viewed as an agency problem [Williamson, 1985; Baiman, 1990]. As such, *ex ante* controls (e.g., contracts, allocation of property rights, ownership of resources) and *ex post* controls (e.g., governance, social norms) can be used to minimize the risk associated with the non-investor's opportunism and encourage the investor to make a sufficient relation-specific investment. Below, I describe each of these various approaches in the course of reviewing the predictions of transaction cost economics, property rights theory, the resource-based view of the firm, principal-agent theory, and relational contracting theory. Although these theories contribute to our understanding of how various control mechanisms can be used to mitigate hold-ups, they were not always developed with this issue in mind. Indeed, while transaction costs economics and property rights theory take the hold-up problem as their focus, the resource-based view of the firm, principal-agent, and relational contracting theories address the problem only tangentially.

---

[5] Contract incompleteness arises as the result of bounded rationality and uncertainty [Williamson, 1985]. Uncertainty implies that contingencies might not be easily describable [Tirole, 1999]. Additionally, because outcomes are unobservable or unverifiable, performance might be difficult and costly to monitor [Klein, 1980].

[6] In this setting, R&D constitutes the relation-specific asset.

## 2.2  Transaction Cost Economics

Transaction cost economics (TCE) theory has provided the most frequently used lens for examining hold-ups and ways to mitigate them. Originating in organizational economics [Coase, 1937], TCE owes its development to Klein, Crawford, and Alchian [1978] and to the seminal contribution of Williamson [1975, 1985]. It focuses on organizational boundaries in settings characterized by relation-specific investments and various degrees of uncertainty as well as transaction frequency. Specifically, TCE views the firm as a nexus of transactions. It addresses the problem of cooperative effort when the surplus to be divided *ex post* is significant and asks what is the best organizational form for minimizing the sum of production and transaction costs [Williamson, 1985]. The TCE unit of analysis is the transaction and its premise is that transaction costs are positive. That is, firms incur costs for the purpose of managing their relationship (i.e., *ex ante* bargaining costs and *ex post* monitoring costs) as well as costs resulting from breaches of contract and opportunism [Baiman, 1990]. TCE further posits that different governance mechanisms are associated with different amounts of transaction costs.

TCE relies on several behavioral and environmental assumptions. First, it assumes that individuals are boundedly rational [cf. Simon, 1957] and likely to behave opportunistically by pursuing their own self-interest should the occasion arise [Williamson, 1985, p. 47]. TCE also assumes that individuals are risk neutral [Williamson, 1985, p. 388-389] and that transaction frequency matters—assumptions that researchers tend to overlook [cf. Rindfleisch and Heide, 1997, p. 31]. Second, as a result of bounded rationality and of uncertainty, TCE assumes that contracts are incomplete, which implies that contract renegotiation cannot be avoided and courts are often unable to enforce these contracts. This contractual incompleteness gives rise to exchange hazards and makes it impossible to restrict bargaining to the *ex ante* stage. Based on these assumptions, TCE predicts that, by helping to avoid appropriation, vertical integration provides a mechanism for safeguarding relation-specific investments under conditions of high uncertainty.[7] Empirical research conducted mostly through surveys has provided broad support for this prediction [Shelanski and Klein, 1995; Coeurderoy and Quélin, 1997; Rindfleisch and Heide, 1997; Geyskens, Steenkamp and Kumar, 2006]. Although TCE scholars find that formal controls in the form of vertical integration can curtail *ex post* opportunistic behavior and, thereby, hold-ups, more recent theoretical developments propose that hybrid forms of organization characterized by relational contracting and trust can serve the same purpose, albeit via informal controls [Williamson, 1991, 1993, 2002].

Despite the widespread adoption of transaction cost economics, scholars have criticized it on several dimensions. First, they argue that TCE does not clearly present and measure either the costs and benefits of vertical integration [Grossman and Hart, 1986; Hart, 1989] or the magnitude of transaction costs [Baiman, 1990]. Second, they claim that TCE fails to account for various forms

---

[7] While TCE does not refute the importance of incentive alignment and ownership rights, it argues that they are not sufficient control mechanisms.

of organization within the same industry and for the frequency with which alli-ances and joint ventures fail [Ghosh and John, 1999; Kim and Mahoney, 2005]. These reservations have led scholars to pursue other theories in their search for a solution to the hold-up problem. Two closely linked theories—those based on property rights and the resource-based-view of the firm—complement TCE even as they address these criticisms.

## 2.3  Property Rights Theory

TCE and property rights theory (PRT) share the same origin [cf. Coase, 1937] and espouse a common area of investigation, namely, organizational boundaries in a setting characterized by relation-specific investment. Despite their common origin, PRT has evolved in a different direction, investigating instead the circumstances under which  one firm should desire to acquire the assets of another [Coase, 1960; Grossman and Hart, 1986; Hart and Moore, 1990]. Specifically, PRT views the firm as a set of property rights [Hart, 1989] and improves our understanding of the boundaries of the firm by analyzing how its physical assets might be optimally allocated [Williamson, 1985; Hart, 1989]. PRT's unit of analysis is the asset and its main aim is to address the problem of property rights not clearly defined in contracts. PRT relies on the premise that the allocation of rights of control to one party reduces the rights of the other party [Grossman and Hart, 1986]. It further posits that ownership of an asset confers residual rights of control over that asset [Hart, 1989]. That is, whoever has ownership of the property rights will dictate how the surplus is distributed (i.e., uncertainty is no longer relevant [Holmström and Roberts, 1998]) and provide incentives for the parties to invest in the relationship [Hart, 1989]. Consequently, the surplus will be allocated efficiently.

Moreover, PRT assumes that transaction costs are positive; that contracts are incomplete and that, hence, exchange hazards exist; that contracting parties are effort averse and that effort is not verifiable [Grossman and Hart, 1986]; and that bargaining is costless and knowledge of payoffs is common [Williamson, 2000]. While PRT's predictions have been confirmed through analytical models that present integration as the optimal ownership structure in situations wherein one firm's investment decision is relatively more important than another's, they have not yielded much empirical research.

Although both TCE and PRT improve our understanding of firm bounda-ries, PRT differs from TCE in several ways. First, and most notably, PRT con-siders both the costs and the benefits of vertical integration [Hart, 1989]. Sec-ond, rather than attempting to limit the *ex post* opportunism that occurs when the surplus is distributed, PRT focuses on avoiding the distortion of the invest-ment *ex ante*. That is, it highlights *ex ante* concerns, while playing down con-cerns related to *ex post* surplus division [Hart and Moore, 1990, p. 1152]. These differences suggest to some [e.g., Whinston, 2001, p. 184] that PRT is better suited to the analysis of intra-firm hold-ups than TCE is. Finally, PRT provides a more formal analysis  than TCE does [Whinston, 2001].

Whereas TCE and PRT research focuses on the hold-up problem, the re-source-based view of the firm targets a broader set of questions, but neverthe-less contributes to our understanding of the boundaries of the firm and how hold-ups might be mitigated.

## 2.4 Resource-Based View of the Firm Theory

Like TCE and PRT, the resource-based view of the firm (RBV) aims to improve our understanding of organizational boundaries. Strongly influenced by Penrose [1959], RBV presents the firm as a bundle of related resources and competencies [Penrose, 1959; Williamson, 1999]. RBV examines the management and organization of the firm. Specifically, RBV explains differences in the boundaries and profitability of different firms by testing the importance of various resources (e.g., routines, tacit knowledge, competencies, and property rights) to those firms [Peteraf, 1993; Ghosh and John, 1999; Williamson, 1999]. RBV's unit of analysis is the resources of the firm. Furthermore, RBV relies on the premise that strategic choices related to the use of scarce, immobile, and inimitable resources can give firms a competitive advantage, which, in turn, shapes firm boundaries.

RBV is guided by the implicit assumptions of bounded rationality and incomplete contracting [Williamson, 1999]. It further assumes that transaction costs are positive and that the *ex post* surplus is appropriable [Peteraf, 1993]. Although relation-specific investments are not the focus of RBV, they can exacerbate the imperfect mobility of resources. Empirical research has supported RBV's prediction that the success of integration will depend on the scarcity, immobility, and inimitability of resources. Indeed, TCE and RBV are often presented as complementary approaches [Kogut, 1988; Williamson, 1999]. That said, TCE and RBV approach opportunism and trust differently, with RBV emphasizing resources and trust over opportunism and TCE putting more weight on opportunism [Teece, 2010]. Other purported differences—for example, the contention that RBV is more dynamic than TCE because of its focus on learning and resource management [Hodgson, 1998; Kim and Mahoney, 2005]—have been challenged by Williamson [1999].

TCE, PRT, and RBV all aim to inform our understanding of firms' choices of governance mechanisms. While they all propose that integration (i.e., a formal control) can mitigate the hold-up problem, they present different motivations for such integration: for TCE, lowering transaction costs and reducing the risk of opportunism; for PRT, minimizing the loss of surplus that comes with underinvestment; and for RBV, reducing uncertainty and managing dependence. Principal-agent theory has also shed some light on how to mitigate the hold-up problem, albeit deviating from the emphasis on organizational boundaries.

## 2.5 Principal-Agent Theory

Principal-agent theory addresses how to resolve conflicts of interests between principals and agents for the purpose of maximizing firm profit [cf. Lambert, 2001]. Specifically, principal-agent theory addresses how to align the interests of the principal and the agent primarily through contract terms (i.e., a formal control). Its unit of analysis is the contract that governs the principal-agent relationship. Principal-agent theory relies on several premises. First, the principal typically cannot perfectly observe the agent's actions (i.e., there is hidden action) and the agent frequently possesses private information (i.e.,

there is hidden information) [Baiman and Rajan, 2002, p. 215]. Second, information can often be purchased.

The principal-agent literature that is commonly used to examine the hold-up problem is guided by several behavioral and environmental assumptions. It assumes that individuals are self-interested and rational. Additionally, it generally assumes that while agents are risk and effort averse, principals are risk neutral. This stream of research further assumes that contracting is costless (i.e., transaction costs are zero) and that contracts are generally complete and, accordingly, enforceable by courts [Baiman, 1990]. Thus, in contrast to TCE, PRT, and RBV, which always assume that contracts are incomplete, principal-agent theory relies primarily on contractual terms and incentives to bring the interests of the principal and the agent into alignment [cf. Jensen and Meckling, 1976; Lambert, 2001] when relation-specific investment needs to be encouraged. In other words, an important distinction between principal-agent theory and TCE is that the former generally predicts that *ex ante* mechanisms in the form of contracting can anticipate the hazards due to the separation of ownership and control, thereby encouraging investment in relation-specific assets. In summary, principal-agent theory generally points to contracting (i.e., a formal control) as a simple solution to the hold-up problem through bilateral investments, incentives, and penalties [e.g., Edlin and Reichelstein, 1995].[8] Thus, principal-agent theory seems better suited to settings wherein a clear, contractually defined principal-agent relation exists (e.g., the relationship between employee and principal). Tomkins [2001, p. 166], however, suggests that principal-agent theory "is of limited value . . . when alliances have the aim of developing relationships from which the long-term benefits cannot be precisely predicted or assessed."

Overall, the economic theories discussed thus far do not systematically yield different predictions, but rather focus on different dimensions of the non-investor–investor relation (e.g., *ex ante* or *ex post* concerns, different variables of interest). Moreover, some of the variables of interest of the respective theories can help explain certain findings of analyses conducted under a different theoretical framework. For instance, Eisenhardt [1989, p. 65] observes that the risk neutrality of managers, a common assumption of principal-agent theory, provides a good explanation for Walker and Weber's [1984] finding that, when assets are highly specialized, uncertainty does not affect make-or-buy decisions for components. These findings could not be explained, for example, by TCE, which does not posit that the risk neutrality of the parties will reduce the influence of uncertainty on the decision.

The theories I have discussed so far all originate from organizational economics [Mahoney and Pandian, 1992]; relational contracting theory, on the other hand, has its origin in field of law.

_____

[8] Although the bulk of the hold-up research that has relied on principal-agent theory has assumed that contracts are complete and, accordingly, commitment is credible, more recent examinations of the hold-up problem by Arya, Glover, and Syvaramakrishnan [1997] and by Arya and his colleagues [2000] have relaxed this assumption and examined a principal-agent model where the principal is unable to commit *ex ante*. This recent stream of investigation points to information asymmetry as an informal control to hold-ups.

## 2.6 Relational Contracting Theory

Whereas TCE, PRT, RBV, and principal-agent theory attempt to limit op-portunistic behavior and encourage relation-specific investments primarily through formal controls (e.g., governance structure, the allocation of ownership rights, resource allocation, or incentives), relational contracting theory relies on informal controls (e.g., social norms and the context of the relationship, reputa-tion). Relational contracting theory aims to improve our understanding of ex-changes by examining social behavior. Strongly influenced by Macneil [1980, 1981], it defines informal organizational structures as a bundle of informal agreements and unwritten codes of conduct [Baker, Gibbons and Murphy, 2002]. Macneil [1986] proposes that relationships between firms include a rela-tional dimension that complements the formal aspect of contracts. While in-formal contracts such as a verbal agreement and a handshake are extreme ex-amples of relational contracts [Palay, 1985], Macneil [1986, p. 578]further specifies that "relational exchange . . . creates circumstances where the long-run *individual* economic (material) interests of each party conflict with any short run desires to maximize individual utility respecting the goods in any particular exchange; the more relational the exchange, the more artificial be-comes the idea of maximization." Specifically, relational contracting takes into account the historical and social contexts in which the relationship occurs for the purpose of explaining how lasting inter-organizational relationships are constructed and how informal agreements, norms, and cooperation can encour-age investment in relation-specific assets [Macneil, 1980, 1981, 2000]. Rela-tional contracting theory's unit of analysis is the relationship. Relational con-tracting relies on the premise that firms are likely to forego current rewards in order to obtain greater rewards in the future. These future rewards, however, must be sufficiently large for firms not to renege [Baker, et al., 2002].

Relational contracting investigations share several assumptions with TCE, PRT, and RBV. Namely, relational contracting assumes that outcomes are ob-servable, but not contractible, and that contracts are incomplete (i.e., relation-specific investments are not contractible *ex ante*). It further assumes that ac-tions are not observable and that relationships create dependence [Macneil, 1980; Williamson, 1985, 1991]. It predicts that social norms (i.e., an informal control) can help moderate the relationship between relation-specific invest-ment and vertical integration.

Relational contracting focuses less on opportunism than TCE does, as it posits that the future benefits to be derived from the relationship serve as self-enforcing mechanisms [Macneil, 1986]. In other words, relational contracting relies on a concept similar to TCE's calculative trust [cf. Bradach and Eccles, 1989; Williamson, 1993]. However, in contrast to TCE, relational contracting does not view each transaction as independent, but as embedded in a relation-ship marked by mutual interest.

As detailed above and presented in Table 1, the different theories vary ac-cording to their level of analysis, the nature of their assumptions, and whether they propose that formal or informal control mechanisms can help mitigate hold-ups. Nevertheless, many overlaps exist.

**Table 1 Overview of Hold-up Theories**

| | TCE | PRT | RBV | Principal-agent | Relational contracting |
|---|---|---|---|---|---|
| **Unit of analysis** | Transaction | Asset | Relationship | Contract | Relationship |
| **Primary area of inquiry** | Organizational boundaries and hold-ups | Organizational boundaries and hold-ups | Organizational boundaries | Aligning interests of principal and agent | Lasting exchanges/ interorganizational relationships |
| **Assumptions** | • Bounded rationality<br>• Opportunism<br>• Incomplete contract<br>• Risk neutrality<br>• Transaction frequency<br>• Action unobservable | • Incomplete contracts<br>• Opportunism | • Incomplete contracts | • Complete contracts*<br>• Rationality<br>• Risk preference<br>• Self-interest<br>• Action unobservable | • Incomplete contracts<br>• Action unobservable |
| **Remedies to the hold-up problem: formal (F) /informal (I)** | Vertical integration and hybrids (F) | Vertical integration and allocation of property rights (F) | Vertical integration and management of dependence (F) | Contracts (F)<br>Information asymmetry (I)** | Prospect of long-term reward (I) |

\* This assumption has recently been relaxed.
\*\* This remedy has been proposed in the context of incomplete contracts.

Research organized around the strategic decisions of organizational design, inter- and intra-firm trade, and resource allocation illustrates how researchers have applied these theories. Section 3 presents their findings, followed by suggestions for future research.

## 3.0 STRATEGIC DECISION-MAKING ASSOCIATED WITH RELATION-SPECIFIC INVESTMENTS

The analytical models and empirical evidence I present below highlight developments in the hold-up literature since the publication of Shelanski and Klein's [1995], Coeurderoy and Quélin's [1997], and Rindfleisch and Heide's [1997] reviews of empirical papers. I also include articles that predate 1997, but were not included in these reviews, whenever they contributed to the development of the theoretical perspectives I have already discussed or have had a significant impact on research. In addition, in this review, I aim to synthesize and classify research on how to mitigate the hold-up problem, and so do not provide a comprehensive list of papers that have simply observed evidence of hold-ups. Table 2 presents the findings of empirical studies, and Table 3 pre-

sents the findings of analytical research. Both tables organize the hold-up literature according to type of strategic decision—namely, those relating to organizational design, inter- and intra-firm trade, and resource allocation—and detail the types of controls each study proposes. This organization is motivated by two factors. First, each of the strategic decisions I chose is representative of a stream of accounting research. Second, substitutes for commitment and mitigating mechanisms can be grouped into two categories. On the one hand, formal controls in the form of vertical integration, joint ownership, contracts, pricing mechanisms, compensation, and interdependence are mostly representative of economic theories (i.e., transaction costs economics, property rights, the resource-based view of the firm, and principal-agent theory). On the other hand, investigations of informal controls are representative of relational contracting theory and recent investigations into firm and individual characteristics as well as information asymmetry research.

## Table 2 Empirical Papers on Remedies to the Hold-up Problem

| | Formal Controls | | | | | | Informal Controls | | | Other | Observations/Proposed Solutions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Integration | Joint Ownership | Contracts | Pricing Mechanisms | Compensation | Interdependence | Private Information | Relationship Characteristics | Firm/Individual Characteristics | | |
| **Organizational design decisions** | | | | | | | | | | | |
| Anderson et al. [2000] | X | | | | | | | X | | | High uncertainty (given idiosyncratic investments) is associated with outsourcing. |
| Coles & Hesterly [1998b] | X | | | | | | | | | | High uncertainty and high relation-specific investments are associated with internal sourcing. |
| Jensen & Rothwell [1998] | X | | | | | | | | | | Difficult monitoring and high relation-specific investments are associated with internal sourcing. |
| Novak & Eppinger [2001] | X | | | | | | | | | | Product complexity is associated with vertical integration. |
| Roodhooft & Walop [1999] | | | | | | | | | | X | Asset specificity and sunk cost bias hinder outsourcing. |
| Whyte [1994] | | | | | | | | | | X | Sunk cost bias affects outsourcing. |
| **Trade decisions** | | | | | | | | | | | |
| *Inter-firm trade* | | | | | | | | | | | |
| Anderson & Dekker | | | X | | | | | X | | | Alignment of transaction and supplier characteristics |

| | Formal Controls | | | | | | Informal Controls | | | Other | Observations/Proposed Solutions |
| | Integration | Joint Ownership | Contracts | Pricing Mechanisms | Compensation | Interdependence | Private Information | Relationship Characteristics | Firm/Individual Characteristics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [2005] | | | | | | | | | | | and control structure |
| Artz & Brush [2000] | | | | | | | | X | | | Collaboration, expectation of continuity and communication |
| Berg et al. [1995] | | | | | | | | | X | | Expectation of reciprocity and trust |
| Chang & Ive [2007] | | | | | | | | X | X | | Partner selection and relational contracting |
| Dekker [2004] | | X | | | | | | X | | | Combination of formal and relational contract mechanisms |
| Dekker [2008] | | X | | | | | | | X | | Combination of formal governance and partner selection |
| Dekker & Van den Abbeele [2010] | | | | | | | | X | X | | Partner experience and partner search |
| Drake & Haka [2008] | | | | | | | X | | X | | Coarse accounting system and choice of whether to share information |
| Dyer [1997] | X | | | | | | | X | | | Evidence of close relationships and joint ownership when relation-specific investments are high |
| Ellingsen & Johannesson [2004] | | | | | | | | X | X | | Communication and inequity aversion |
| Jap & Anderson [2003] | | | | | | X | | X | | | Bilateral investment, goal congruence, trust |
| Krishnan et al. [2010] | | | | | | | | X | | | Collaborative contracting |
| Miller [2007] | | | | | | | X | | X | | Aggregated cost information and fair firm strategy |
| Sloof et al. [2007] | | | | | | | X | | X | | Unobservable investment and fairness |
| *Intra-firm trade* | | | | | | | | | | | |
| No empirical paper subsequent to 1997 | | | | | | | | | | | |
| **Resource allocation decisions** | | | | | | | | | | | |
| No empirical paper subsequent to 1997 | | | | | | | | | | | |

## Table 3 Analytical Papers on Remedies to the Hold-up Problem

| | Formal Controls | | | | | | Informal Controls | | | Other | Proposed Solutions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Integration | Joint Ownership | Contracts | Pricing Mechanisms | Compensation | Interdependence | Private Information | Relationship Characteristics | Firm/Individual Characteristics | | |
| **Organizational design decisions** | | | | | | | | | | | |
| No analytical paper subsequent to 1997 | | | | | | | | | | | |
| **Trade decisions** | | | | | | | | | | | |
| *Inter-firm trade* | | | | | | | | | | | |
| Baiman & Rajan [2002a] | | X | X | | | X | | | | | Initial contract (if selfish investment) Joint ownership and equity stake |
| Che & Hausch (1999) | | | X | | | | | | | | Differential solutions with selfish or cooperative investments |
| Edlin [1996] | | | X | | | X | | | | | Initial contract & up-front payment (under expectation damages) |
| Edlin & Reichelstein [1996] | | | X | | | | | | | | Initial contract and breach remedies (expectation damages and specific performance) |
| Gul [2001] | | | | | | | X | | | | Unobservable investment (if costless negotiations and repeated offers) |
| Taylor & Plambeck [2007] | | | | | | | | X | | | Monitoring or relational contract and repeated interaction |
| Von Siemens [2009] | | | | | | | X | | | | Private seller's fairness preference |
| *Intra-firm trade* | | | | | | | | | | | |
| Anctil & Dutta [1999] | | | | | X | | | | | | Compensation based on both divisional and firm profit |
| Baldenius et al. [1999] | | | | X | | | | | | | Negotiation or cost-based transfer pricing depending on verifiability of cost information |
| Baldenius [2000] | | | X | | | | | | | | Allocation of bargaining power |
| Baldenius [2006] | | | | | X | | | | | | Combination of incentives and empire benefits |
| Edlin & Reichelstein [1995] | | | X | | | | | | | | Initial contract |

| | Formal Controls | | | | | | Informal Controls | | | Other | Proposed Solutions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Integration | Joint Ownership | Contracts | Pricing Mechanisms | Compensation | Interdependence | Private Information | Relationship Characteristics | Firm/Individual Characteristics | | |
| Pfeiffer [2004] | | | | | | | X | | | | Information control |
| **Resource allocation decisions** | | | | | | | | | | | |
| Arya et al. [2000] | | | | | | | X | | | | Late and coarse information system |
| Baiman & Rajan [1995] | X | | | | | | | | | | Allocation of decision rights based on investment magnitude |
| Stein [2002] | X | | | | | | | | | | Allocation of decision rights based on type of information |

The analytical models and empirical evidence identify and investigate mechanisms for mitigating hold-ups. These studies appear in the fields of economics, accounting, finance, marketing, and organizational behavior. Moreover, each type of strategic decision provides a setting in which hold-ups are likely to occur, albeit with some variations.

## 3.1 Organizational Design Decisions

The organizational design literature investigates whether insourcing (i.e., vertical integration) or outsourcing encourages investments in relation-specific assets. Its investigations have been overwhelmingly empirical in nature, as they have traditionally aimed to test the validity of TCE predictions by examining the organizational design decisions firms make.

### 3.1.1 Analytical models

Organizational design has not been the focus of analytical research be it pre or post 1997.

### 3.1.2 Archival empirical evidence

On the other hand, economics research has provided archival empirical support for TCE's claim that governance structures that take the form of vertical integration and detailed, long-term contracts (i.e., formal controls) encourage investment in relation-specific assets when uncertainty is high [cf. Shelanski and Klein, 1995] pre 1997. The post 1997 empirical research has focused more on vertical integration as detailed in Table 2.

Jensen and Rothwell [1998] have augmented this research by conducting detailed task-related analyses of the operation of nuclear power plants and ex-

amining what factors lead firms to use their own employees instead of subcontractors. They find that, consistent with TCE predictions, plants are more likely to internally source critical tasks (i.e., engage in vertical integration) when monitoring is difficult and firm-specific investments are high.

Accounting and finance research has recently contributed to this line of inquiry by investigating firms' outsourcing decisions in the presence of relation-specific investments and various forms of uncertainty. Coles and Hesterly [1998b] is one of the earliest studies to examine the interaction between two important transaction attributes, namely, uncertainty and relation-specific investment. Their results are, once again, consistent with TCE's predictions insofar as, in private hospitals, combining increasing technological uncertainty with physical- and human-asset specificity significantly increases the likelihood that the transaction will be internally sourced. In sum, Coles and Hesterly propose that vertical integration serves as a formal control against hold-ups as shown in Table 2. Novak and Eppinger [2001] focus on product complexity, another form of uncertainty, and, using data from the automobile industry, rely on the property rights framework to show that vertical integration helps firms capture the benefits of their investment in relation-specific skills. Thus, this empirical evidence supports the TCE and property rights proposition that, when firms are faced with high uncertainty, vertical integration can help protect firms from the hold-up problem.

Still, not all research supports the premises of TCE. Anderson, Glenn, and Sedatole [2000] also study the relationship between uncertainty, relation-specific investment (in this case, dies), and outsourcing decisions. In contrast to TCE's theoretical predictions and prior empirical evidence, they find that the greater the uncertainty, the greater the likelihood of outsourcing. To explain this counterintuitive finding, they suggest that, whereas prior empirical evidence examined investments in long-term capacity, their study provides insights about the sourcing decision given the existence of capacity. In other words, the sourcing decision they examine does not aim to minimize the sum of production and transaction costs, and thereby violates a premise of TCE. Additionally, they find no evidence of the OEM engaging in opportunistic behavior after the suppliers made the relation-specific investment in dies, and they attribute this finding to relational contracting (i.e., involving the suppliers in the relationship early on).

Hence, as shown in Table 2, consistent with TCE and other economic theory, research suggests that firms that attempt to mitigate hold-ups through organizational design decisions do so mostly through formal mechanisms such as vertical integration. Additionally, this stream of research demonstrates the importance of informal safeguards against hold-ups, such as close relationships, and offers preliminary support for relational contracting.

### 3.1.3  Experimental empirical evidence

Although the evidence presented in most of the archival empirical articles supports the theories presented above, Whyte [1994] proposes that investors' cognitive biases, and not their fear of hold-ups, drive vertical integration decisions. Results from an experiment in which subjects were asked to make a vertical integration decision demonstrate that the sunk cost bias influences their

choice of governance structure, thus providing an alternative explanation for such decisions. Roodhooft and Walop [1999] also show how the sunk cost bias affects outsourcing decisions. In their experiment, manager-subjects include past sunk costs and asset specificity as factors in their sourcing decision. They find that both asset specificity and sunk costs hinder outsourcing.[9] Similar, as well as new, insights apply to trade decisions.

## 3.2   Trade Decisions

The trade decisions that are associated with a relation-specific investment have been the subject of extensive scrutiny in both inter- and intra-firm transactions. Tables 2 and 3 split the research into that which addresses trade decisions between firms (i.e., inter-firm research) and that which addresses trade decisions between divisions (i.e., intra-firm and transfer pricing research) since these two streams have evolved in different directions.

### 3.2.1   Inter-firm trade decisions

In this setting, a hold-up can occur between a supplier and a buyer when one of the parties must decide whether to make a relation-specific investment that will benefit one or both parties. This investment will then be followed by trade with a specific firm.

### ANALYTICAL MODELS

Scholars model hold-ups between two parties with a single period. Analytical models initially focused on mitigating hold-ups through the use of contractual mechanisms and later turned to information asymmetry. Indeed, Edlin [1996] and Edlin and Reichelstein [1996] propose using the overinvestment created by breach remedies to counterbalance the underinvestment associated with relation-specific investments. Specifically, Edlin [1996] demonstrates that, under expectation damages (i.e., damages that fully compensate the victim of the breach), relation-specific investment will be encouraged when parties can sign an initial contract that specifies high quality and quantity and when the non-investor makes an up-front payment. This up-front payment creates interdependence between the parties and makes it more attractive for the non-investor to honor, rather than breach, the contract. Since this leaves the investor as the only one likely to breach the contract, he invests efficiently. Importantly, the formal controls Edlin proposes (i.e., contracts and interdependence, as shown in Table 3) assume that courts have sufficient information to estimate damages.

Edlin and Reichelstein [1996] build on Edlin's finding and introduce specific performance as an additional remedy to breaches of contract in settings marked by one-sided investment and those marked by bilateral investment. They conclude that one-sided investment can be encouraged through a non-

---

[9] Interestingly, Troeger [2002] shows, with an evolutionary model, that the sunk cost bias can actually encourage investment in relation-specific assets over the long-run as investors benefit from the non-investors' propensity to include sunk costs in their offer decision.

contingent fixed-price contract as long as specific performance or expectation damages are provided. Conversely, bilateral investment can be encouraged only with application of specific performance. In sum, choosing an initial contract and the appropriate breach remedies (i.e., formal controls) prior to investing should mitigate the hold-up problem provided damages can be estimated *ex ante*.

Although the nature of the relation-specific investment (i.e., whether it is selfish or cooperative) is not addressed in most papers (with the notable exception of Baiman and Rajan [2002]), insights from Che and Hausch [1999] suggest that initial contracting has limited value as a solution to the hold-up problem. Che and Hausch highlight how the effectiveness of contracting arrangements as safeguards against opportunistic behavior varies depending on whether the investment made generates a benefit only for the investor (i.e., a selfish investment such as an investment that yields cost reductions for the investor) or for both the investor and the non-investor (i.e., a cooperative investment such as an investment in R&D). Che and Hausch point out that, although several articles propose contracting as a solution to the hold-up problem, such a solution is only effective with selfish investments and only under certain conditions.

In their 2002 survey of the literature, Baiman and Rajan build on Che and Hausch's findings. They propose that, with selfish investments, a simple non-contingent contract (i.e., a formal control) that specifies the quantity to be exchanged and the price at which the exchange is to take place will eliminate the hold-up problem because this contract improves what would be the investor's status quo outcome. As shown in Table 3, Baiman and Rajan also indicate additional formal mechanisms for mitigating hold-ups, such as joint ownership of the asset and interdependence, with the buyer taking an equity stake in the supplier.

In sum, as presented in Table 3, the aforementioned papers follow in the tradition of principal-agent theory and present some form of formal contracting as a solution to the hold-up problem. Some economists [e.g., Che and Hausch, 1999], however, argue that although complete contracting would eliminate hold-ups, many contracts are incomplete or associated with cooperative investments. Accordingly, mitigating mechanisms other than contracting must be considered.

As a result, scholars have begun to investigate areas beyond formal controls and have turned to information asymmetry and relational contracting as informal mechanisms that can serve as substitutes to commitment and induce socially optimal relation-specific investment. Their findings are also summarized in Table 3. It is important to note that the information asymmetry that helps safeguard against hold-ups is typically not a characteristic of the environment, but, instead, is chosen by the contracting parties. For instance, the investor may choose not to divulge that he made an investment as in Gul [2001] or the principal may choose an information system that provides late and coarse information as in Arya et al. [2000].

Gul [2001] examines how information asymmetry about whether the relation-specific investment took place (i.e., the investment is unobservable by the non-investor) can help increase the investor's bargaining power and, thereby, mitigate the hold-up problem. The intuition is that the investor's private infor-

mation allows him to obtain information rents, which provide incentives to invest. The investor's private information, however, also hinders trade negotiation because the non-investor is unable to determine the size of the net surplus. Thus, the hold-up problem is not mitigated. Still, Gul demonstrates that, in situations wherein the relation-specific investment cannot be observed by the non-investor, when negotiations are costless and the non-investor makes repeated take-it-or-leave-it offers, the hold-up problem is eliminated. To address the limitations of private investment information as a mechanism for mitigating hold-ups, von Siemens [2009] investigates another type of private information. He shows that the investor's private fairness preference provides incentives to invest in relation-specific assets because the investment itself signals the investor's type. In other words, the investor's very act of investing suggests to the buyer the investor's (i.e., the supplier's) preferences for fairness (i.e., higher trade expectations), and this information, in turn, affects the buyer's trade behavior and results in larger trade offers.

Taylor and Plambeck [2007] turn to relational contracting and the promise of repeated interaction as ways to encourage relation-specific investment in capacity. They present two mechanisms for mitigating the hold-up problem. First, they show that a complex informal relational contract, wherein the buyer orders more than he needs in order to monitor the supplier's investment, mitigates hold-ups. Second, they find that a simpler contract with the promise of repeated interaction achieves a similar result.

Empirical investigations of the formal contractual mechanisms proposed above have been rather sparse. While analytical models have focused on alleviating trade opportunism and encouraging relation-specific investment through contractual mechanisms and private information of the investor, empirical research has instead supported relational contracting, social norms, trust, individual characteristics, or private information as remedies to the hold-up problem. I organize the empirical literature into two streams. Archival research, the first stream, is informed by organizational behavior and economics research and focuses on relational contracting, partner search, selection, and prior experience, as well as the quality of the relationship between trading partners. Experimental research, the second stream, borrows from negotiation and economics literature and examines how characteristics of the negotiators (e.g., their preferences for various forms of fairness and propensity to trust) or of the relationship and the investor's private information might mitigate hold-ups by alleviating the problems that derive from the non-investor's lack of commitment.

## ARCHIVAL EMPIRICAL EVIDENCE

Table 2 presents the archival empirical literature related to inter-firm trade. Such research shows first that contracts and formal mechanisms cannot sufficiently protect firms from hold-ups. To that effect, Chang and Ive [2007] study the Channel Tunnel project to show that, since, in a typical project, bargaining power fluctuates between buyer and supplier and uncertainty is high, contracts cannot offer firms sufficient protection from hold-ups. Therefore, partner selection and relational contracting must serve as informal controls against hold-ups and complement formal controls such as contracts. Artz and Brush [2000] find that informal controls such as collaboration, the expectation of continuity, and

communication moderate the positive relation between asset specificity, uncertainty, and negotiation costs. Finally, based on a survey of small to medium IT firms, Dekker [2008] also finds support for partner selection as a means to reduce firms' appropriation concerns and provides further evidence to suggest that partner selection complements formal governance mechanisms.

An exploratory survey conducted by Dyer [1997] shows that Japanese OEMs can use promises of high volume and repeated business to encourage relation-specific investment. Additionally, Dyer finds evidence of the OEM and the supplier having joint ownership in relation-specific assets (i.e., a formal mechanism), thus providing preliminary support for both property rights theory and relational contracting theory. Dekker [2004] provides similar support for the importance of organizational governance mechanisms and informal forms of control (e.g., repeated interactions, reputation, trust) and proposes a framework that can address the appropriation concerns that occur with asset specificity and uncertainty.

Following this stream of research, Jap and Anderson [2003] find, in their survey of buyer-supplier relationships in four Fortune 50 manufacturing companies, that goal congruence, interpersonal trust, and bilateral relation-specific investment act as safeguards against opportunism. In essence, informal relationship characteristics (i.e., goal congruence and interpersonal trust) and formal interdependence (i.e., bilateral investment) serve as commitment devices and are associated with relationships with longer time horizons. Anderson and Dekker's analysis of transactions between close partners [Anderson and Dekker, 2005] further refines our understanding of the importance of relational contracting. They show that aligning transaction, supplier characteristics, and control structures can mitigate *ex post* opportunism in a sector characterized by high relation-specific investments (i.e., the information technology sector).

Finally, Krishnan, Miller, and Sedatole's [2010] examination of a Fortune 500 firm's formal contracts with its customers leads them to conclude, in support of relational contracting, that the supplier is more likely to own a relation-specific asset when contracts are collaborative. Krishnan et al. also show, in support of TCE, that the likelihood of collaborative contracting increases when uncertainty makes performance difficult to measure.

In sum, like the research on decisions related to organizational design, the archival empirical research on decisions related to inter-firm trade support the predictions of the economic theories outlined above. As shown in Table 2, this research also provides overwhelming support for the importance of partner selection and relationship characteristics as substitutes to commitment, thus supporting relational contracting theory. Although extant research demonstrates the effectiveness of both formal and informal controls, of special interest to accounting scholars is the investigation of the relation between these controls. Building on research that has yielded mixed results about whether formal and informal controls are substitutes or complements [e.g., Gulati, 1995; Poppo and Zenger, 2002], Dekker and Van den Abbeele [2010] examine how the search for a partner and a partner's prior experience inform the design of controls when asset specificity and uncertainty render such controls necessary. They find that formal and informal controls can act as both substitutes and complements, as a partner's experience can facilitate the design of effective formal controls based on the information it provides even as it reduces the need for

such controls. They further find that a substitutive relation exists between the search for a partner and a partner's experience.

Whereas archival research has examined the hold-up problem in a trade setting, conducting analyses at the level of the transaction or the firm, experimental research has approached the problem from the perspective of the individual.

## EXPERIMENTAL EMPIRICAL EVIDENCE

Table 2 presents a summary of the experimental evidence related to strategic decisions about inter-firm trade. Experimental empirical research has examined how private information and the negotiators' personal characteristics can mitigate hold-ups by acting as substitutes for commitment. The seminal work of Berg, Dickhaut, and McCabe [1995] is among the earliest investigations of hold-ups in an experimental setting. In this study, participants have the option of sending a portion of their show-up fee to another party. Should they so choose, the amount they send will be tripled. The receiving party then has the option of reciprocating and can return any amount they choose. Whereas economic theory holds that participants should not send any portion of their show-up fee to their counterpart (i.e., they should not invest in a relation-specific asset), based on the assumption that their counterpart will appropriate the surplus created by the participant's investment, Berg et al. found that most participants (30 out of 32) forwarded money to their counterpart. Additionally, Berg et al. found that more than half of the participants who received money (16 out of 28) returned at least as much as they received. Berg et al. therefore conclude that informal controls related to social norms and individual characteristics can be used to mitigate hold-ups. In particular, they propose that the participants' expectations of reciprocity led them to trust their counterparts and to invest in relation-specific assets. This premise is supported by the fact that some individuals reciprocated (i.e., they did not behave opportunistically). Variations on this experiment have since been conducted [e.g., Cox, 2004; Malhotra, 2004], and scholars have obtained similar results.

Ellingsen and Johannesson [2004] enrich the analysis of Berg et al. by examining the informal effect communication (i.e., a characteristic of relationships) has on hold-ups. Their findings and conclusions are consistent with those of Berg et al. Specifically, they find that, when communication is not possible, some investment is made nevertheless; they also find some evidence of inequity aversion wherein non-investors reimburse the investment cost and share the surplus with the investor. When communication is possible, they find that the offers are even higher. In sum, as shown in Table 2, Ellingsen and Johannesson find that relationship characteristics (here, communication) and individual characteristics (here, inequity aversion) can mitigate hold-ups.

While empirical support for relational contracting is strong, the claim (made by analytical research) that private information helps mitigate hold-ups finds only mixed support both in experimental economics and in empirical papers in the field of accounting. Sloof, Oosterbeek, and Sonnemans [2007] test Gul's model [cf. Gul 2001] and the prediction that private information in the form of unobservable investment decreases under-investment in relation-specific assets. Sloof et al. conclude that the economic predictions hold when

considerations of fairness and reciprocity are low (i.e., when relation-specific investment costs for a fixed surplus are high), but not when there is room for fairness (i.e., when the investment costs for a fixed surplus are low). They further suggest that their study documents an interaction between fairness (i.e., an individual characteristic) and the observability of the investment (i.e., private information) that affects the likelihood of investment; they do not, however, measure this interaction.

Drake and Haka [2008] are also interested in the effects of information asymmetry and fairness. They conduct an experiment in a setting wherein the relation between two trading partners includes both product architectural interdependence and asymmetric information. Drake and Haka provide evidence that information asymmetry (i.e., private information in the form of coarse product cost) mitigates trade opportunism. Thus, they lend support to the mitigating role of information asymmetry at the trade stage of the hold-up problem (i.e., tome 2). Their findings support the premise that individuals are motivated by concerns about inequitable outcomes (see individual characteristics in Table 2). However, they neither measure the participants' actual preferences for fairness, nor examine whether coarse product cost information encourages investment in relation-specific assets (i.e., has a mitigating effect at tome 1 of the hold-up problem).

In sum, experimental papers provide preliminary support for the premise that individual characteristics, such as social preferences, and an investor's private information can mitigate hold-ups. Nevertheless, researchers should be cautious before concluding that, because of some individuals' preference for fairness, the risk of opportunism is low and, accordingly, hold-ups are not as severe as economic theories predict. Indeed, managers are typically not left to follow their own preferences, but rather are guided in their actions by their firm's corporate culture and strategy [Liedtka, 1989]. Thus, the extant experimental research might have overstated the effectiveness of personal preferences for fairness as a safeguard against hold-ups.

Miller [2007] addresses this issue by investigating the effects of firm-induced strategy (i.e., an informal control that takes the form of fair or self-interested purchasing strategy) and information asymmetry on hold-ups. She documents that coarse cost information (i.e., aggregated investment and production cost information) has a positive effect on the supplier's decision to invest in relation-specific assets. In addition, she finds that the level of aggregation of supplier-provided cost information and firm strategy interact to affect strategic decisions regarding trade and investment.

Overall, the findings of archival and empirical research are consistent with economic predictions that highlight the role of formal controls. These streams of research also provide evidence that informal controls, such as social norms, characteristics of the relationship, the firm, and the individual (as proposed by relational contracting theory), and private information offer additional safeguards against hold-ups, as shown in Table 2. However, these streams of research suffer from some limitations. First, they have largely ignored the role that firm strategy might play in the hold-up problem. Second, research on inter-firm trade has ignored how incentives might affect the hold-up problem. This, despite the fact that Kumar [1996] presents anecdotal evidence that firms such as Procter & Gamble use incentives to motivate managers to refrain from hold-

ing-up their trading partners. While intra-firm trade has evolved in a different direction, it nevertheless might benefit from similar insights as we still lack a thorough understanding of the differences between inter- and intra-firm transactions [Baiman and Rajan, 2002b, p. 214].

### 3.2.2  Intra-firm trade decisions and transfer pricing

In models of intra-firm trade, that is, transfer pricing, divisional managers must choose whether to make an investment that will benefit the entire firm but offer little value to external customers (i.e., a relation-specific investment). At the time the investment must be made, the managers do not possess sufficient information to determine the necessary size of the transfer (i.e., the investment is not contractible), contracts between the divisions are incomplete, and the non-investing division cannot commit to refrain from behaving opportunistically. Analysis of transfer pricing mechanisms has suggested that negotiated transfer pricing leads to under-investment, as the divisions split the surplus generated by the investment only one of the divisions has made. Initial transfer pricing models proposed either commitment (i.e., no renegotiation) between the divisions [Rogerson, 1992] or a centralized mechanism of profit allocation, wherein the headquarters intervenes in the process, as remedies to the hold-up problem. More recently, scholars have investigated how contracting, transfer pricing mechanisms, and compensation can mitigate hold-ups. This research has been conducted primarily by accounting scholars and has overwhelmingly focused on the analytical investigation of safeguards against hold-ups (see Table 3).

### ANALYTICAL MODELS

The analytical research on this subject is organized around controls in the form of incentives and information asymmetry, as summarized in Table 3.

### INCENTIVES

The first set of analytical articles I discuss below assumes that there is information symmetry between the investor and non-investor divisions. As shown in Table 3, these articles propose that while formal mechanisms in the form of initial contracts and cost-based transfer pricing mitigate hold-ups, they must be supplemented by other mechanisms in order to address the problems of trade distortion and moral hazard.

Edlin and Reichelstein [1995] assume that two divisions of the same firm have equal bargaining power. They find that investment will be efficient if the divisions sign a fixed-price contract prior to investing (provided the investor can ensure that the contract is fulfilled) and then negotiate on quantity once all uncertainty has been resolved. In sum, as shown in Table 3, they predict that formal contracts can mitigate hold-ups in an intra-firm setting. Furthermore, Edlin and Reichelstein show that when divisional managers are subject to moral hazard, negotiation of the division managers' transfer payment and a decentralized divisional profit measurement system help align the interests of the firm with those of the managers. Instead of investigating contracting as a

safeguard against trade opportunism, Baldenius, Reichelstein and Sahay [1999] turn to pricing mechanisms and compare the effectiveness of negotiated and cost-based transfer pricing as safeguards against hold-ups. They show that whether a negotiated or cost-based transfer pricing mechanism is preferable depends in part on the verifiability of the cost information provided by the selling division.

Baldenius [2000] extends this analysis to models that include asymmetric information. He concludes that, to reduce the risk of hold-ups, bargaining power should reside with the investing division and that, to minimize trade distortion, bargaining power, allocated through formal contracts, should reside with the division that has the most private information.

Building on the findings of principal-agent theory, a few of the articles presented in Table 3 have analyzed how compensation can be used to formally align the interests of the division managers with those of the firm. Anctil and Dutta [1999] investigate incentive compensation as a safeguard against hold-ups in the presence of information symmetry. They demonstrate that the optimal compensation contract is one based on divisional as well as firm-wide profit, with the former allowing for some risk-sharing between risk-averse divisional managers. Thus, they conclude that formal incentives can help divisions mitigate hold-ups.

Baldenius [2006] expands on the analysis of hold-ups under asymmetric information to include the scenario wherein managers' payoffs comprise incentives and empire building (i.e., managers derive benefits of control from the assets they manage, provided the assets are productive). Baldenius suggests that managers' propensity to take advantage of their private information for the purposes of distorting trade can be mitigated by their desire for trade to take place so that they can derive empire-building benefits. Low-powered incentives cause division managers to place greater value on empire-building benefits, encourage cooperative bargaining, and, consequently, increase relation-specific investment, (i.e., alleviate hold-up problems). In sum, formal incentives and empire building can help safeguard divisions against hold-ups.

In sum, as presented in Table 3, this stream of transfer pricing literature relies on formal contracting, pricing mechanisms, and compensation to mitigate hold-ups.

## INFORMATION ASYMMETRY

Unlike most of the literature I present in this paper, Pfeiffer [2004] does not address the distribution of the surplus by proposing a substitute for commitment. Instead, he suggests that limiting the accounting information provided to division managers will help the investment decision-making process, thus increasing the surplus generated. Specifically, Pfeiffer assumes that headquarters sets the information structure. Pfeiffer then shows that installing an information system that controls the accounting information made available to division managers (i.e., information on the state of nature, differentiating bad from good states with high and low states combined) can help generate relation-specific investments even in the low state and thus mitigate hold-ups.

As shown in Table 3, analytical research has demonstrated that formal mechanisms such as incentives, or informal mechanisms such as information

asymmetry can mitigate hold-ups when firms are faced with making strategic decisions about intra-firm trade.

## ARCHIVAL AND EXPERIMENTAL EMPIRICAL EVIDENCE

To date no empirical paper has examined remedies to the hold-up problem in this intra-firm setting. The absence of empirical evidence on whether divisions actually use formal contracts led Pfeiffer [2004] and Baldenius et al. [1999] to question the validity of contracts as formal mechanisms for mitigating hold-ups related to transfer pricing decisions. Indeed, our understanding of how divisions actually deal with these issues would benefit from empirical research, which could either confirm or disconfirm the importance of the formal mechanisms that are associated with contracting between divisions. Specifically, empirical research could test the existence and effectiveness of the specific contracting mechanisms—for example, divisional contracts, pricing mechanisms, or incentive compensation—examined in the analytical literature.

Although hold-ups are likely to accompany investments in human capital when strategic decisions must be made about capital budgeting, resource allocation research has investigated them to a lesser extent than organizational design or trade research. The findings of this burgeoning line of inquiry are detailed below.

### 3.3 Resource Allocation Decisions

Resource allocation decisions[10] refer to those intra-firm decisions that can require a relation-specific investment on the part of the manager who searches for and then presents a capital project to the principal. In this setting, a hold-up can occur when the manager exerts effort to acquire firm-specific information about a capital project. The effort the manager invests in the search for a project—here, this effort constitutes the relationship-specific investment—is followed by the firm choosing which capital project to allocate resources to. The manager's acquisition of information is often noncontractible, and the principal cannot commit to rewarding the manager for his investment in the project search. Thus, the manager is unlikely to fully invest in the project search.

Although much of the information a manager acquires in the course of a project search is specific to the firm the manager works for, most of the capital budgeting literature disregards both the process of searching for a project and the specificity of the agent's project search. Indeed, much of the resource allocation literature assumes that the manager is endowed with private information about the capital project [Antle and Fellingham, 1997, p. 905; Lambert, 2001, p. 79]. Thus, this research stream assumes that the resource allocation decision is based on information elicited by the principal and that the manager exerted no effort in acquiring that information. In other words, the bulk of the resource allocation literature ignores the relation-specific investment the manager makes in the project search and, as such, ignores the resulting hold-up problem.

---

[10] For a review of the resource allocation literature, please see Chang, Ho, and Lin [2002].

That said, a few capital budgeting papers do assume that investment in the search for information is endogenous.

### 3.3.1  Analytical models

These papers propose that the agent must exert effort to acquire the necessary knowledge about the proposed project and that the value of this knowledge is specific to the agent's firm (i.e., a relation-specific investment is made). These papers disagree, however, on whether hold-ups are likely to accompany such an investment. The first group of papers [Lambert, 1986; Kim, 2006] assumes that the principal can contractually commit to sharing the quasi-rents with the manager. Lambert [1986] proposes that the allocation of risk to the agent can, under certain circumstances, motivate the agent to exert the effort necessary to acquire information and thereby select the best project. Kim [2006] shows that when information acquisition costs are high, auditing the agent's report (regardless of whether the agent reports high or low productivity) reduces the agent's opportunity costs of becoming informed. Auditing and allocating more capital to the project can motivate the agent to invest in the search for information. In sum, although Lambert and Kim assume that the information acquired is specific to the firm, these studies do not consider the principal's potential opportunistic behavior and, accordingly, do not examine hold-ups.

The second group of papers [Baiman and Rajan, 1995; Arya, et al., 2000; Stein, 2002] assumes that the principal cannot commit to rewarding the manager for his investment in acquiring firm-specific project information. Thus, these papers do satisfy the main assumptions of the hold-up problem; that is, a relation-specific investment creates appropriable quasi-rents and the non-investor cannot commit against appropriating these quasi-rents. Table 3 presents the results of this stream of research under the heading "resource allocation decisions."

Stein [2002] models how bank managers can be encouraged to acquire firm-specific information about their customers' projects. He argues that, when information is soft (i.e., when it cannot easily be passed on to headquarters), the manager who exerts the effort necessary to acquire information risks having his effort wasted if headquarters chooses not to allocate funds to the projects he proposes. Stein recommends formal decentralization (see Table 3 under the heading "integration") as the preferred mechanism for encouraging managers to invest in information acquisition as it gives managers the authority to allocate funds and to obtain the quasi-rents from their investments.

Baiman and Rajan [1995] model a capital investment decision wherein the manager is required to invest in firm-specific human capital, thus obtaining private information about a capital investment project for their firm. The outcome of the project is a function of the level of investment, the manager's effort, and some state outcome. Baiman and Rajan propose that assigning capital investment decision rights to the owner can lead the owner to act opportunistically and appropriate the manager's quasi-rents when the owner designs the manager's compensation package. Baiman and Rajan conclude that it is the size of the manager's firm-specific investment in human capital that drives the assignment of capital investment decision rights: centralized decision rights

with no specific investment, shared rights with a moderate investment, and manager-assigned rights with a large investment. Thus, as Stein shows in the context of soft information, Baiman and Rajan suggest that the allocation of decision rights (i.e., a formal control in the form of integration) can mitigate hold-ups.

Arya et al. [2000] address the same problem, namely, the potential appropriation of the manager's quasi-rents, but focus instead on how the principal could, through informal mechanisms, commit to refrain from behaving opportunistically. They propose that a manager can be motivated to increase their search for a profitable project (i.e., make a firm-specific investment in human capital) if the principal's information system creates slack by providing coarse and late information. Arya et al. conclude that the interaction between fineness and timing of information mitigates the hold-up problem.

Thus, in addition to providing support for economic theories' emphasis on formal controls by demonstrating the importance of allocating decision rights (i.e., a formal control), analytical papers point to informal controls in the form of private information as potential safeguards against hold-ups, as shown in Table 3. Still, our understanding of how hold-ups might be mitigated when resource allocation decisions are made would benefit from more analytical as well as empirical research.

### 3.3.2 Archival and experimental empirical evidence

To date no empirical paper has examined remedies to the hold-up problem in this resource allocation setting. Yet, empirical studies of resource allocation decisions could help scholars demonstrate that firm-specific projects searches are common (thus, highlighting the risk of hold-ups in decisions about capital budgeting) and help identify remedies to hold-ups related to resource allocation.

My review of the strategic decisions discussed above yields two observations. First, the various research streams have not investigated the hold-up problem to the same extent. For example, investigations into decisions around resource allocation have largely ignored the specificity of the agent's investment in human capital and, accordingly, have sidestepped the hold-up problem. Second, while the hold-up problems and the solutions thereto that one research stream identifies are likely to inform another research stream, such findings must be carefully tested before they are applied to another stream, as the division of surplus will not pose the same dilemma for every strategic decision. For instance, in a trade situation, it is important that both parties are able to determine the size of the surplus in order to negotiate. Conversely, in a resource allocation situation, the size of the surplus is irrelevant for the agent who does not get to negotiate its division. As a result, the effectiveness of information asymmetry as a control is likely to vary based on the type of decision being made. These observations suggest that, despite the support extant research provides for the various theories, challenges and opportunities for future research remain.

## 3.4  Challenges and Opportunities for Future Research

The previous sections have presented theories that aim to provide solutions to the hold-up problem and have highlighted the findings of, as well as the gaps in, research for organizational design, trade, and resource allocation decisions. In what follows, I build on these observations to suggest avenues for future scholarship as well as point to some of the challenges that remain.

### 3.4.1  *Theoretical development and selection and measurement of constructs*

#### MULTIPLE THEORY APPROACH

Scholars tend to favor one theory over another, and yet in doing so they often miss the potential contributions another theory could make. As such, one promising avenue for future research involves either comparing and contrasting predictions from several theories or expanding the boundaries of one theory using the predictions of another. For instance, principal-agent theory might provide valuable insights in situation wherein the assumption of risk neutrality that TCE makes is either not valid or could be challenged. Examples of this multi-theory approach are becoming more common [e.g., Dekker, 2004; Kim and Mahoney, 2005]. Scholars proceeding along these lines must be careful not to rely solely on the theory in its original form, but instead include updated versions that take into account, for example, the recent emphasis on informal controls (e.g., trust [Williamson, 1993], private ordering [Williamson, 2002]).

#### CONSTRUCTS SELECTION AND MEASUREMENT

Some of the previously identified weaknesses related to the selection and measurement of constructs [cf. Shelanski and Klein, 1995; Rindfleisch and Heide, 1997] remain fruitful areas for future research; indeed, some key constructs are still unclearly defined, largely ignored, or inconsistently measured. Uncertainty and relation-specific investment are multidimensional constructs that are central to the analysis of the hold-up problem, yet scholars do not always clearly identify the dimension they are analyzing. Volume uncertainty, technological uncertainty [Walker and Weber, 1987], task interdependence, task complexity [Anderson, et al., 2000], the inability to monitor performance [Williamson, 1985], and partnership uncertainty [Bensaou and Venkatraman, 1995] represent different facets of this complex construct. Their various needs as far as flexibility and information processing are concerned suggest that different control mechanisms will be effective with different types of uncertainty [Geyskens, et al., 2006]. As a result, the findings of studies on the relationships between different types of uncertainty, relation-specific investments, and control mechanisms are mixed [e.g., Coles and Hesterly, 1998a; Bensaou, 1999] and warrant further exploration.

Similarly, relation-specific investment may take the form of a fixed asset, human capital, dedicated assets, site specificity [Williamson, 1985], temporal specificity [Masten, et al., 1991; Pirrong, 1993], or goodwill [Anderson, 1994]. While fixed-asset specificity and site specificity have been the subject of much research, the findings related to these types of specificity do not automatically

translate to other types of relation-specific investments [e.g., Coles and Hesterly, 1998b]. Moreover, not all types of relation-specific investments are present to the same extent in all industries and the relations between the different variables examined by hold-up research are unclear.

Not only are uncertainty and relation-specific investments complex constructs in themselves, but how they interact to affect the hold-up problem likely depends on the dimension being analyzed. For instance, firms might refrain from investing in fixed assets and instead prefer to invest in human capital when technological uncertainty is high and technologies are liable to become quickly obsolete [Bensaou, 1999].

The testing of theories also could be improved by building on previous operationalizations of constructs such as uncertainty or relation-specific investment. Using existing scales to construct new surveys is likely to increase the reliability of our tests. Doing so facilitates the comparison of new results with those of previous studies and has enabled researchers such as Dekker and Van den Abbeele [2010] to obtain satisfactory construct validity.

Finally, future research might productively explore variables that so far have been under-investigated. This encompasses theoretically relevant, but seldom investigated, constructs such as transaction frequency, risk aversion, and opportunism, and variables that, although examined by other research streams, might nevertheless influence the risk of opportunistic behavior and the need for controls. Specifically, extant trade research has primarily investigated the relation-specific investments of suppliers; yet, the role of the investing party, be it the buyer or the supplier, might also influence the effectiveness of a particular control, given that buyers are more likely to make selfish investments (e.g., investments in product differentiation) and suppliers are more likely to make cooperative investments [cf. Che and Hausch, 1999; Buvik and Reve, 2001].

### 3.4.2  Improved methodology

Because surveys have been the primary source of data for empirical research, the limitations of this method of data collection will inevitably affect what can be learned from hold-up research. A multi-method approach to data collection would therefore likely shed new light on this research. For instance, close examination of contractual clauses might better capture the complexity of the investment in relation-specific assets, identify the various types of uncertainty the buyer and supplier face, and measure control mechanisms such as incentives and the parties' intentions when entering into relational contracts. Following up such examination with surveys of the contracting parties would then enable researchers to compare actual behavior (and potential opportunism) with intended behavior. Researchers who do not have access to a proprietary source for contracts might want to access contracts available from the Contracting and Organizations Research Institute (CORI) at the University of Missouri (http://cori.missouri.edu/wps/index.htm). In addition, experimental methods could provide tighter controls, clarify causal relationships, and assuage concerns about endogeneity. The experiment presented in Berg et al. [1995] could be utilized for this purpose and test remedies to the hold-up problem, such as information asymmetry, that have been under-explored.

While the above recommendations apply to all researchers, the suggestions below specifically target accounting scholars.

### 3.4.3   Suggestions of special interest to accounting scholars

Accounting scholars can contribute to research on the hold-up problem by measuring transaction costs incurred by firms and by examining a broader range of controls. TCE predictions are based on the premise that, when uncertainty is high and investment is relation-specific, transaction costs are lower within the firm than between firms. Although this premise is key, these costs have typically not been measured. Accounting scholars' familiarity with contracting, monitoring, and opportunistic behavior, as well as their expertise with measurement, makes them uniquely qualified to tackle this issue and provide a proxy for transaction costs.

As noted above, remedies to the hold-up problem that have proven effective with some types of strategic decisions have not always been tested with other decisions. Accounting scholars might be particularly interested in testing the effectiveness of input and output controls such as monitoring practices and incentives. Indeed, this avenue of research has remained largely unexplored in areas such as inter-firm trade and resource allocation, despite evidence confirming the presence of these controls in these settings [e.g., Kumar, 1996]. Accounting scholars are also well positioned to contribute to research on the different types of information asymmetry (namely, less precise, aggregated, or delayed information), both in relation to cost and to non-financial measures such as quality. Information asymmetry may enable the investor to capture the rents their investment generates. Yet, the various types of information asymmetry that have been investigated to date (e.g., uncertainty about whether a relation-specific investment was made, aggregated production and investment cost, aggregated and late surplus information) have not only yielded different findings about the effectiveness of information asymmetry as a control to hold-ups, but also have been unevenly evaluated in terms of the various types of strategic decisions. Furthermore, investigating information asymmetry can both refine our understanding of how to balance the costs and benefits of this informal control and enable us to explore its relationship with formal controls, as well as its effect on performance.

Finally, accounting scholars might benefit from assessing more systematically whether a specific problem (e.g., information sharing, learning, project search) might best be treated as an underinvestment or hold-up problem. In other words, when a transaction involving a small number of participants is surrounded by uncertainty, ignoring the specificity of the investment might lead researchers to underestimate the risk of opportunism and, accordingly, the vulnerable party's reluctance to invest.

### 4.0   CONCLUSION

Transaction cost economics, property rights, the resource-based view of the firm, and principal-agent theories have until recently provided the main framework for analyzing the hold-up problem. They have each suggested as solutions to the hold-up problem formal controls such as vertical integration, allocation

of property rights, and incentives. While analytical research and early empirical research [cf. Shelanski and Klein, 1995; Coeurderoy and Quélin, 1997] have, to a great extent, supported these economic theories' predictions, recent analytical and empirical studies have focused more on relational contracting theory and informal controls as substitutes for the commitment of the non-investor. These studies have suggested that characteristics of the relationship, the firm, and the individual limit firms' and individuals' tendencies to behave opportunistically and to appropriate the surplus a relation-specific investment generates. Information asymmetry, whereby the information available to the non-investor is limited, also appears to be a promising means by which to mitigate hold-ups.

The findings of the well-developed body of research on the hold-up problem indicate both challenges and opportunities for future research. Despite the proliferation of analytical research on contract clauses as safeguards against hold-ups, such clauses have been under-investigated empirically (with the notable exceptions of Joskow [1985], Anderson et al. [2000] and Krishnan et al. [2010]). This suggests that additional empirical investigations of contracts might enrich our understanding of the dangers associated with incomplete contracting, improve our measurement of key constructs, and help scholars identify ways to curtail the risk of the *ex post* opportunism associated with hold-ups. Second, although relation-specific investments occur in the areas of organizational design, trade, and resource allocation, some streams of research largely ignore the idiosyncratic nature of the investment (i.e., resource allocation) or offer little empirical research on safeguards against hold-ups compared to other research streams (i.e., intra-firm trade and resource allocations). Conducting additional research in these areas would improve our understanding of how to address the hold-up problem and could also highlight the role accounting information might play in mitigating hold-ups.

Finally, there are several fruitful avenues for future research that are likely to appeal to accounting scholars in particular. These include the investigation of controls such as incentives, monitoring, and information asymmetry. Since information characteristics such as fineness, precision, and timeliness are of interest to accounting scholars, accounting research is uniquely positioned to further investigate the role that information asymmetry can play in mitigating hold-ups. Thus, despite the relative paucity of accounting studies on remedies to the hold-up problem, accounting scholars might be uniquely qualified to identify new controls and, accordingly, to make a significant contribution to research on mitigating hold-ups.

# ANNOTATED BIBLIOGRAPHY

Arya, A., J. Fellingham, J. Glover, and K. Sivaramakrishnan. 2000. Capital budgeting, the hold-up problem and information system design. *Management Science* 46 (2): 205–16.

Arya et al. [2000] propose that a manager's motivation to search for a profitable project (i.e., a firm-specific human-capital investment) will increase if the principal provides an information system characterized by coarse and late information. Such a system would create slack for the manager, and thereby provide incentives for the manager to increase their effort. Arya et al. conclude that the interaction between fineness and timing of information helps to mitigate the hold-up problem because it creates private information that guarantees the manager that the principal will not be able to appropriate the surplus generated by the manager's investment in the project search.

Baiman, S., and M. Rajan. 2002. Incentive issues in inter-firm relationships. *Accounting, Organizations and Society* 27 (3): 213–38.

In their 2002 survey of the literature, Baiman and Rajan propose that a simple non-contingent contract (i.e., a formal control) that specifies the quantity to be exchanged and the price at which the exchange will take place eliminates the hold-up problem with selfish investments. Baiman and Rajan argue that this initial contract changes the relative bargaining position of the investor insofar as it improves the investor's status quo outcome, essentially granting the investor what was guaranteed in the initial contract plus a share of the surplus through renegotiations. Baiman and Rajan also point to additional formal mechanisms for mitigating the hold-up problem, such as joint ownership of the asset and interdependence, with the buyer taking an equity stake in the supplier.

Baldenius, T., S. Reichelstein, and S. Sahay. 1999. Negotiated vs. Cost-based transfer pricing. *Review of Accounting Studies* 4 (2): 67–91.

Baldenius et al. [1999] focus on pricing mechanisms and compare the effectiveness of negotiated and cost-based transfer pricing as safeguards against the hold-up problem. Under their model of cost-based transfer pricing, the selling division presents the cost report and the buying division decides how many units to purchase. Baldenius et al. point out that even as cost-based transfer pricing encourages one division to invest in relation-specific assets, it creates an additional problem. First, should the selling division be the one to invest and thereby gain monopolistic pricing power (i.e., engage in trade distortion), the buying division will reduce the quantity they are willing to purchase, thus reducing the selling division's investment incentives. Second, should the buying division be the one to invest, the selling division will appropriate part of the return generated by the investment by charging higher transfer prices (assuming the selling division's costs are not verifiable). However, when the selling division is constrained in the costs it can report, cost-based transfer pricing is preferred. In sum, whether a negotiated or cost-based transfer pricing mecha-

nism is preferred will depend in part on the verifiability of the cost information the selling division provides.

Berg, J., J. Dickhaut, and K. McCabe. 1995. Trust, reciprocity, and social history. *Games and Economic Behavior* 10: 122–42.

Berg et al. [1995] conduct a two-stage version of the dictator game. The first set of subjects decides how much of their show-up fee to send to an anonymous counterpart (i.e., a relation-specific investment). Any money they forward to their counterpart is tripled. Their counterpart then decides how much (if anything) s/he would like to return to the sender. The game is not repeated and communication is not allowed in order to avoid any reputation concerns. Whereas economic theory holds that the subjects should not send money to their counterpart as s/he will appropriate the whole amount, Berg et al. observe that 30 out of 32 subjects forward money. Additionally, Berg et al. observe that 16 of the 28 subjects who received money returned at least as much as they received (the remainder returned trivial amounts or nothing). In a second experiment, wherein the subjects knew how the group that received the money previously behaved, the dispersion of the offers changed and the correlation between the amount sent and the amount returned increased. Berg et al. conclude that informal mechanisms related to personal characteristics affect hold-ups. In particular, the subjects' expectations of reciprocity led them to trust their counterparts and to send a portion of their show-up fees to other subjects (i.e., to invest). Additionally, some subjects reciprocated (i.e., did not behave opportunistically).

Gul, F. 2001. Unobservable investment and the hold-up problem. *Econometrica* 69: 343–76.

Gul [2001] examines how information asymmetry about whether the relation-specific investment actually took place (i.e., the investment is unobservable to the non-investor) can help increase the investor's bargaining power and, as a result, mitigate the hold-up problem. The intuition is that the investor's private information allows him to obtain information rents, which provide incentives to invest. That said, the investor's private information hinders trade negotiation and, ultimately, the hold-up problem persists. Still, Gul demonstrates that, in situations wherein the relation-specific investment is unobservable to the non-investor, conducting costless negotiations and the non-investor making repeated take-it-or-leave-it offers can eliminate the hold-up problem.

Sloof, R., H. Oosterbeek, and J. Sonnemans. 2007. Does making specific investments unobservable boost investment incentives?. *Journal of Economics and Management Strategy* 16 (4): 911–42.

Sloof, Oosterbeek, and Sonnemans [2007] test Gul's model [cf. Gul 2001], which predicts that private information in the form of unobservable investment will reduce under-investment in relation-specific assets. They construct a two-stage experiment and, keeping the surplus generated by the investment constant, vary the investment observability (i.e., private information) in combina-

tion with the cost of the investment. As Gul predicts, Sloof et al. observe that, when investment costs are high, subjects do not invest when the investment is observable, but do invest when it is unobservable. However, when investment costs are low, subjects invest regardless of the observability of the investment. These results lead Sloof et al. to conclude that economic predictions hold when considerations of fairness and reciprocity are low (i.e., when there are high investment costs for a fixed surplus), but not when there is room for fairness (i.e., when there are low investment costs for a fixed surplus). They also observe that, during trade, some subjects reimburse the investor for his investment and share the surplus. Sloof et al. further suggest that their study documents an interaction between fairness (i.e., a personal characteristic) and the observability of the investment (i.e., private information) that affects the likelihood of investment.

# REFERENCES

Anctil, R., and S. Dutta. 1999. Negotiated transfer pricing and divisional vs. firm-wide performance evaluation. *The Accounting Review* 74 (1): 87-104.

Anderson, E. 1985. The sales person as outside agent or employee: a transaction cost analysis. *Marketing Science* 4 (3): 234-54.

———. 1994. Transaction cost analysis and marketing. In *Transaction Cost Economics and Beyond*, edited by J. Groenewegen, 65-83. Boston/Dordrecht/London: Kluwer Academic Publishers.

Anderson, S., and H. Dekker. 2005. Management control for market transactions: The relation between transaction characteristics, incomplete contract design and subsequent performance. *Management Science* 51 (12): 1734-52.

Anderson, S., D. Glenn, and K. Sedatole. 2000. Sourcing parts of complex products: evidence on transactions costs, high-powered incentives and ex-post opportunism. *Accounting, Organizations and Society* 25: 723-49.

Antle, R., and J. Fellingham. 1997. Models of capital investments with private information and incentives: A selective review. *Journal of Business Finance and Accounting* 24: 887-908.

Artz, K., and T. Brush. 2000. Asset specificity, uncertainty and relational norms: An examination of coordination costs in collaborative strategic alliances. *Journal of Economic Behavior & Organization* 41 (4): 337-62.

Arya, A., J. Fellingham, J. Glover, and K. Sivaramakrishnan. 2000. Capital budgeting, the hold-up problem and information system design. *Management Science* 46 (2): 205-16.

Arya, A., J. C. Glover, and K. Sivaramakrishnan. 1997. The interaction between decision and control problems and the value of information. *Accounting Review* 72 (4): 561-74.

Baiman, S. 1990. Agency research in managerial accounting: a second look. *Accounting, Organizations and Society* 15 (4): 341-71.

Baiman, S., and M. Rajan. 1995. Centralization, delegation, and shared responsibility in the assignment of capital investment decision rights. *Journal of Accounting Research* 33: 135-64.

———. 2002. Incentive issues in inter-firm relationships. *Accounting, Organizations and Society* 27 (3): 213-38.

Baker, G., R. Gibbons, and K. J. Murphy. 2002. Relational contracts and the theory of the firm. *Quarterly Journal of Economics* 117 (1): 39-84.

Baldenius, T. 2000. Intrafirm trade, bargaining power, and specific investments. *Review of Accounting Studies* 5: 27-56.

———. 2006. Ownership, incentives and the hold-up problem. *The Rand Journal of Economics* 37 (2): 276-99.

Baldenius, T., S. Reichelstein, and S. Sahay. 1999. Negotiated vs. cost-based transfer pricing. *Review of Accounting Studies* 4 (2): 67-91.

Bensaou, M. 1999. Portfolios of buyer-supplier relationships. *Sloan Management Review* 40 (4): 35-44.

Bensaou, M., and N. Venkatraman. 1995. Configurations of interorganizational relationships: A comparison between U.S. and Japanese automakers. *Management Science* 41 (9): 1471-92.

Berg, J., J. Dickhaut, and K. McCabe. 1995. Trust, reciprocity, and social history. *Games and Economic Behavior* 10: 122-42.

Bradach, J., and R. Eccles. 1989. Price, authority, and trust: From ideal types to plural forms. *Annual Review of Sociology* 15: 97-118.

Buvik, A., and T. Reve. 2001. Asymmetrical deployment of specific assets and contractual safeguarding in industrial purchasing relationships. *Journal of Business Research* 51 (2): 101-13.

Chang, C., and G. Ive. 2007. The hold-up problem in the management of construction projects: A case study of the Channel Tunnel. *International Journal of Project Management* in press.

Chang, C. J., J. L. Y. Ho, and P. Lin. 2002. Managers' resource allocation: Review and implication for future research. *Journal of Accounting Literature* 21: 1-37.

Che, Y., and D. Hausch. 1999. Cooperative investments and the value of contracting. *The American Economic Review* 89 (1): 125-47.

Coase, R. H. 2006. The conduct of economics: The example of fisher body and general motors. *Journal of Economics & Management Strategy* 15 (2): 255-78.

———. 1937. The nature of the firm. *Economica* 4 (16): 386-405.

———. 1960. The problem of social cost. *Journal of Law & Economics* 3: 1-44.

Coeurderoy, R., and B. Quélin. 1997. L'économie des coûts de transactions: un bilan des études empiriques sur l'intégration verticale. *Revue d'Economie Politique* 107: 145-81.

Coles, J. W., and W. S. Hesterly. 1998a. 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 & Organization* 36 (3): 383-409.

———. 1998b. Transaction costs, quality, and economies of scale: examining contracting choices in the hospital industry. *Journal of Corporate Finance* 4 (4): 321-45.

Cox, J. 2004. How to identify trust and reciprocity. *Games and Economic Behavior* 46: 260-81.

Dekker, H. C. 2004. Control of inter-organizational relationships: Evidence on appropriation concerns and coordination requirements. *Accounting, Organizations and Society* 29 (1): 27-49.

———. 2008. Partner selection and governance design in interfirm relationships. *Accounting, Organizations and Society* 33 (7-8): 915-41.

Dekker, H. C., and A. Van den Abbeele. 2010. Organizational learning and interfirm control: The effects of partner search and prior exchange experiences. *Organization Science* 21 (6): 1233-50.

Drake, A., and S. Haka. 2008. Does ABC information exacerbate hold-up problems in buyer-supplier negotiations? *The Accounting Review*.

Dyer, J. 1997. Effective interfirm collaboration: How firms minimize transaction costs and maximize transaction value. *Strategic Management Journal* 18 (7): 535-56.

Dyer, J., and H. Singh. 1998. The relational view: cooperative strategyand sources of interorganizational competitive advantage. *Academy of Management Review* 23 (4): 660-79.

Edlin, A. 1996. Cadillac contracts and up-front payments: Efficient investment under expectation damages. *Journal of Law, Economics, & Organization* 12 (1): 98-118.

Edlin, A., and S. Reichelstein. 1996. Holdups, standard breach remedies, and optimal investment. *The American Economic Review* 86 (3): 478-501.

———. 1995. Specific investment under negotiated transfer pricing: an efficiency result. *The Accounting Review* 70 (2): 275-91.

Eisenhardt, K. 1989. Agency theory: An assessment and review. *Academy of Management Review* 14 (1): 57-74.

Ellingsen, T., and M. Johannesson. 2004. Promises, threats and fairness. *The Economic Journal* 114: 397-420.

Fisher, J. 1995. Contingency-based research in management control systems: categorization by level of complexity. *Journal of Accounting Literature* 14: 24-53.

Fredrickson, J. W. 1985. Effects of Decision Motive and Organizational Performance Level on Strategic Decision Processes. *The Academy of Management Journal* 28 (4): 821-43.

Geyskens, I., J.-B. Steenkamp, and N. Kumar. 2006. Make, buy, or ally: A transaction cost theory meta-analysis. *Academy of Management Journal* 49 (3): 519-43.

Ghosh, M., and G. John. 1999. Governance Value Analysis and Marketing Strategy. *The Journal of Marketing* 63: 131-45.

Goldberg, V. 1976. Regulation and administered contracts. *The Bell Journal of Economics* 7 (2): 426-48.

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

Gul, F. 2001. Unobservable investment and the hold-up problem. *Econometrica* 69 (2): 343-76.

Gulati, R. 1995. Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of Management Journal* 38 (1): 85-112.

Hart, O. 1989. An Economist's Perspective on the Theory of the Firm. *Columbia Law Review* 89 (7): 1757-74.

Hart, O., and J. Moore. 1988. Incomplete contracts and renegotiation. *Econometrica* 56 (4): 755-85.

———. 1990. Property rights and the nature of the firm. *The Journal of Political Economy* 98 (6): 1119-58.

Henke, J. J. 2004. Poor relationships costing US automakers. *Planning Perspectives, Inc.*, http://www.ppi1.com.

———. 2006. Study shows suppliers still prefer Toyota, Honda, but Ford and General Motors are improving. *Planning Perspectives, Inc.*, http://www.ppi1.com.

Hodgson, G. M. 1998. Institutional Economics. *Journal of Economic Literature* 36: 166-92.

Holmström, B., and J. Roberts. 1998. The boundaries of the firm revisited. *Journal of Economic Perspectives* 12 (4): 73-94.

Jap, S., and E. Anderson. 2003. Safeguarding interorganizational performance and continuity under ex post opportunism *Management Science* 49 (12): 1684-701.

Jensen, J. B., and G. S. Rothwell. 1998. Transaction costs, regulation, and subcontracting at nuclear power plants. *Journal of Economic Behavior & Organization* 36 (3): 369-81.

Jensen, M., and W. Meckling. 1976. Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics* 3: 305-60.

Joskow, P. 1985. Vertical integration and long-term contracts: The case of coal-burning electric generating plants. *Journal of Law and Economics* 1 (1): 33-80.

———. 1987. Contract duration and relationship-specific investments: empirical evidence from coal markets. *The American Economic Review* 77 (1): 168-85.

Kim, D. 2006. Capital budgeting for new projects: On the role of auditing in information acquisition. *Journal of Accounting and Economics* 41: 257-70.

Kim, J., and J. T. Mahoney. 2005. Property rights theory, transaction costs theory, and agency theory: an organizational economics approach to strategic management. *Managerial and Decision Economics* 26 (4): 223-42.

Klein, B. 1980. Transaction cost determinants of 'unfair' contractual relations. *American Economic Review Proceedings* 70: 356-62.

Klein, B., R. Crawford, and A. Alchian. 1978. Vertical integration, appropriable rents, and the competitive contracting process. *Journal of Law and Economics* 21 (2): 297-326.

Kogut, B. 1988. Joint Ventures: Theoretical and Empirical Perspectives. *Strategic Management Journal* 9 (4): 319-32.

Krishnan, R., F. Miller, and K. Sedatole. 2010. Collaborative contracts in inter-firm relationships. In *Contemporary Accounting Research Conference*, edited by S. Salterio. Kingston, Canada.

Kumar, N. 1996. The power of trust in manufacturer-retailer relationships. *Harvard Business Review* 74 (6): 92-106.

Lambert, R. 2001. Contracting theory and accounting. *Journal of Accounting and Economics* 32: 3-87.

Lambert, R. A. 1986. Executive effort and selection of risky projects. *The RAND Journal of Economics* 17 (1): 77-88.

Liedtka, J. 1989. Value congruence: The interplay of individual and organization. *Journal of Business Ethics* 8 (10): 805-15.

Macneil, I. 1981. Economic analysis of contractual relations: its shortfalls and the need for a "rich" classificatory apparatus. *Northwestern University Law Review* 75 (6): 1018-63.

———. 1986. Exchange revisited: Individual utility and social utility. *Ethics* 96 (3): 567-93.

———. 1980. *The New Social Contract*. New Haven, CT: Yale University Press.

———. 2000. Relational contract theory: Challenges and queries. *Northwest University Law Review* 94: 877.

Mahoney, J. T., and J. R. Pandian. 1992. The Resource-Based View Within the Conversation of Strategic Management. *Strategic Management Journal* 13 (5): 363-80.

Malhotra, D. 2004. Trust and reciprocity decisions: The differing perspectives of trustors and trusted parties. *Organizational Behavior and Human Decision Processes* 94: 61-73.

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

Miller, F. 2007. Information aggregation, strategy, and investment decisions in buyer-supplier relationships. PhD Thesis, Michigan State University.

Monteverde, K., and D. Teece. 1982. Appropriable rents and quasi-vertical integration. *Journal of Law and Economics* 25 (2): 321-28.

Novak, S., and S. Eppinger. 2001. Sourcing by design: Product complexity and the supply chain. *Management Science* 47 (1): 189-204.

Palay, T. 1985. Avoiding regulatory constraints: Contracting safeguards and the role of informal agreement. *Journal of Law, Economics, & Organization* 1: 155-85.

Penrose, E. 1959. *The Theory of the Growth of the Firm*. London: Basil Blackwell Publishers.

Peteraf, M. A. 1993. The Cornerstones of Competitive Advantage: A Resource-Based View. *Strategic Management Journal* 14 (3): 179-91.

Pfeiffer, T. 2004. The value of information in the hold-up problem. *German Economic Review* 5 (2): 177-203.

Pirrong, S. C. 1993. Contracting practices in bulk shipping markets: A transactions cost. *Journal of Law and Economics* 36 (October): 937-76.

Poppo, L., and T. Zenger. 2002. Do formal contracts and relational governance function as substitutes or complements? *Strategic Management Journal* 23 (8): 707-25.

Rindfleisch, A., and J. B. Heide. 1997. Transaction cost analysis: Past, present, and future applications. *Journal of Marketing* 61: 30-54.

Rogerson, W. 1992. Contractual solutions to the hold-up problem. *Review of Economic Studies* 59 (4): 777-93.

Roodhooft, F., and L. Warlop. 1999. On the role of sunk costs and asset specificity in outsourcing decisions: a research note. *Accounting, Organizations and Society* 24 (4): 363-69.

Shelanski, H., and P. Klein. 1995. Empirical research in transaction cost economics: A review and assessment. *Journal of Law, Economics, & Organization* 11 (2): 335-61.

Simon, H. 1957. *Models of Man*. New York: Wiley.

Sloof, R., H. Oosterbeek, and J. Sonnemans. 2007. Does making specific investments unobservable boost investment incentives? *Journal of Economics and Management Strategy* 16 (4): 911-42.

Stein, J. C. 2002. Information production and capital allocation: Decentralized versus hierarchical firms. *The Journal of Finance* 57 (5): 1891-921.

Taylor, T., and E. Plambeck. 2007. Supply chain relationships and contracts: The impact of repeated interaction on capacity investment and procurement. *Management Science* 53 (10): 1577-93.

Teece, D. J. 2010. Forward Integration and Innovation: Transaction Costs and Beyond. *Journal of Retailing* In Press, Corrected Proof.

Tirole, J. 1999. Incomplete contracts: Where do we stand? *Econometrica* 67 (4): 741-81.

———. 1988. *The Theory of Industrial Organization*. Cambridge, Massachusetts: The MIT Press.

Tomkins, C. 2001. Interdependencies, trust and information in relationships, alliances and networks *Accounting, Organizations and Society* 26: 161-91.

Troeger, T. 2002. Why sunk costs matter for bargaining outcomes: An evolutionary approach. *Journal of Economic Theory* 102 (2): 375-402.

von Siemens, F. A. 2009. Bargaining under Incomplete Information, Fairness, and the Hold-Up Problem *Journal of Economic Behavior & Organization* 71: 486-94.

Walker, G., and D. Weber. 1987. Supplier competition, uncertainty, and make-or-buy decisions *The Academy of Management Review* 30 (3): 589-96.

———. 1984. A transaction cost approach to make-or-buy decisions. *Administrative Science Quarterly* 29 (373-391).

Whinston, M. 2001. Assessing the property rights and transaction-cost theories of firm scope. *The American Economic Review* 91 (2): 184-88.

Whyte, G. 1994. The role of asset specificity in the vertical integration decision. *Journal of Economic Behavior & Organization* 23 (3): 287-302.

Williamson, O. E. 1993. Calculativeness, trust, and economic organization. *Journal of Law and Economics* 36 (1): 453-86.

———. 1991. Comparative economic organization: the analysis of discrete structural alternatives. *Administrative Science Quarterly* 36 (2): 269-96.

———. 1983. Credible commitments: Using hostages to support exchange. *The American Economic Review* 73 (4): 519-40.

———. 1985. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. New York, NY: The Free Press.

———. 2002. The lens of contract: Private ordering. *American Economic Review* 92 (2): 438-43.

———. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications* New York, N.Y.: The Free Press.

———. 2000. The New Institutional Economics: Taking Stock, Looking Ahead. *Journal of Economic Literature* 38 (3): 595-613.

———. 1999. Strategy research: governance and competence perspectives. *Strategic Management Journal* 20 (12): 1087-108.