

Why Firms Make Unilateral Investments Specific to Other Firms: The Case of OEM Suppliers

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Abstract

This paper examines why and under what conditions firms will make unilateral relationship-specific investments to serve their transaction partners. We propose that firms are more likely to make unilateral relationship-specific investments when the investment yields economic spillover values for other transactions with the same exchange partners as well as for third-party transactions. We also model two types of positive inter-project spillover effects that a transaction may generate: knowledge spillovers and reputation spillovers. We find empirical support for our developed theory in the context of Taiwanese suppliers of Original Equipment Manufacturers.

Key words: Unilateral relationship-specific investment, OEM, knowledge spillover, and reputation spillover.

INTRODUCTION

Firms sometimes find it economically desirable to make relationship-specific investments to serve other firms. However, such relationship-specific investments would lose at least part of their economic value if the transactional relationship is terminated. Thus, a firm making such a unilateral commitment runs the risk of opportunistic behavior by transaction partners who have not made a commitment and who are therefore in a superior bargaining position. Transaction cost economics maintains that to mitigate the risk of making relationship-specific investments, far-sighted firms typically use formal contracts and *ex post* governance mechanisms to safeguard the transactional relationship when making these relationship-specific investments. The fundamental economic concept of mutual sunk-cost commitment or “mutual hostage model” (Williamson, 1996) is an exemplar of transaction-costs economics reasoning. The logic is that if the focal firm is to make relationship-specific investments for another firm, then the stability of the relationship is enhanced when the other firm reciprocates by making a relationship-specific investment as well --- i.e., the mutual economic commitment aligns economic incentives.

Despite this economic logic, which seems sound and almost universally accepted by organizational economic theorists, we observe in business practice that in some buyer-supplier relationships it is not uncommon that one firm makes *unilateral* relationship-specific investments in which no reciprocal commitment from the other firm is expected. For example, suppliers to original equipment manufacturers (OEM)¹ often make both tangible and intangible investments that are specialized to the requirements of an OEM buyer (Rokkan, Heide, and Wathne, 2003).

¹ OEM (original equipment manufacturer) refers to a transactional arrangement between a brand name company (OEM buyer) and the contractor (the supplier) where the buyer provides detailed technical blueprints and most of the components to allow the contractor to produce according to specifications (Ernst, 2000: 238).

Contrary to conventional transaction costs economics logic, the OEM suppliers do not receive a reciprocal sunk-cost commitment from the buyer.

Is this unilateral sunk-cost commitment an example of a strategic mistake on the part of an OEM supplier decision maker? Williamson interprets such unilateral sunk-cost commitments without economic safeguards as a poor managerial practice and considers the decision to make such investments as “myopia” (1996: 239). Indeed, the behavior of making relationship-specific investments without requiring any economic safeguards in return, fails to meet the prediction of transaction costs theory. Williamson (1996) interprets theories that predict such behavior (e.g., Pfeffer and Salancik’s (1978) resource-dependence theory) as seriously incomplete since these theories neglect the foresight of managers and their ability to anticipate the transactional hazards that characterize unilateral relationship-specific investments, as well as their ability to adopt governance mechanisms to attenuate these potential (ex post) contractual hazards.

The current paper offers an alternative theory to the managerial myopia interpretation of OEM suppliers’ decisions to make unilateral relationship-specific investments. Under our newly developed theory, the actions taken by OEM suppliers are not viewed as strategic mistakes. On the contrary, the current paper explains the OEM supplier behavior as sound economic value-maximizing behavior. In particular, we go beyond the transaction costs economics approach of considering the individual transaction as the unit of analysis, and move toward a broader systems view of transactions. Specifically, a transaction could yield positive economic values beyond the individual resource exchange between the transaction parties. The greater the potential economic value created for future transactions that the current individual transaction may create, the larger the economic difference between a transaction’s current transactional economic value and its overall net present value, and the greater the real-options value of this individual transaction on

future transactions (Trigeorgis, 1996). In such business cases, it is economically rational to take on investment projects (such as projects that involve unilateral relationship-specific investments) that have negative net present values from the perspective of a single transaction but that have positive overall net present values from a systems view of transactions.

Thus, to be clear, when the unit of analysis is the individual transaction, Williamson's (1996) economic logic is sound. However, in our expanded "real options" approach the behavior of OEM suppliers can be considered rational. The current paper shows that relationship-specific investments can create two types of extra economic values: (1) inter-project spillovers with the same exchange partner, and (2) inter-project spillovers with other transactional parties. We find support to our developed theory from empirical tests on a sample of Taiwanese OEM suppliers.

The paper is organized as follows: We next review the prior explanations for unilateral relationship-specific investments, particularly from transaction costs theory. We then develop an alternative theory, and propose a set of hypotheses. The following section describes the data and measures for empirical tests of the hypotheses, and then reports the empirical results. Concluding remarks follow.

Unilateral Relationship-Specific Investment in Transaction Costs Economics

Transaction costs theory, as developed by Williamson (1996), emphasizes the economic importance of devising or selecting governance structures for an individual transaction in order to reduce contractual hazards. Contractual hazards can arise from unilateral investments specific to the transaction parties. Specifically, the economic value of relationship-specific investments depends on the continuity of the transactional relationship with the exchange partner. A firm that makes such unilateral investments will increase its reliance on its transactional partner, and thus will enter into a subordinate bargaining position.

Transaction costs theory advises managers not to make unilateral relationship-specific investments unless sufficient economic safeguards are in place. Several types of economic safeguards have been proposed. For example, a firm could sign a formal contract or enter into an equity alliance with its transaction partner to ensure continuity in the exchange relationship. It could also request the transaction partner to post an economic bond or to pay for the specific investments before its commitment. Another safeguard is mutual sunk-cost commitment or “mutual hostage” (Kim and Mahoney, 2006; Williamson, 1983). That is, a firm agrees to make relationship-specific investments only if the transactional partner reciprocates by committing investments specific to the firm as well. All of these economic safeguarding mechanisms ensure substantial negative consequences if the exchange relationship is terminated, which therefore significantly reduces the exchange partner’s economic incentives to behave opportunistically. Without the change of the partner’s financial payoff pattern by economic safeguards, (unilateral) relationship-specific investments give rise to transactional hazards, and are expected to yield a negative net present value (NPV).

Yet in practice, it is not uncommon to observe that some firms make strategic investments specific to transaction parties without being offered reciprocal commitments. For example, sometimes the investments are dedicated assets, which add to a firm’s general capacity but would not have been taken if not for the purpose of serving a particular buyer. Even though dedicated assets in principal can be redeployed, the firm would have significant excess capacity should the buyer prematurely terminate the contract (Williamson, 1996).

Firms that agree to make relationship-specific investments without economic safeguards have been described as “powerless,” meaning that these firms are willing to take the transaction hazard only because no other choices are available (Williamson, 1996: 64). A case in point is

franchising, in which franchisees often are required, and agree, to make franchisor-specific investments. Williamson (1996) maintains that this power perspective is based only on *ex post* reasoning and thus is misleading. Franchisors ask the franchisees to make specific investments not because the franchisors are exercising their power, but because the franchisors want to protect their brand names, which is in the long-run interest of *both* franchisees and the franchisor. Since franchisees are not fully accountable for their shirking behaviors, the franchisees are tempted to cut corners and to withhold quality, which consequently can degrade the brand name of the entire franchise system. The requirement to make franchisor-specific investments increases the economic costs of opportunism to franchisees and solicits greater franchisee cooperation. Thus, franchisor-specific investments are an economic safeguard for franchisors to protect their brand names from franchisees' quality shading by better aligning economic incentives between franchisees and franchisors (Klein and Leffler, 1981). In this case, franchisor-specific investments correct for the negative spillovers to the franchise system of the potential shirking by franchisees.

Yet what about other business cases in which unilateral specific investments do not serve the purpose of better aligning economic incentives between transaction parties? Transaction costs theory suggests that far-sighted firms will not make such commitments due to the contractual hazards associated with the investments. Accordingly, a decision to make unilateral relationship-specific investments is currently categorized as "myopia" (Williamson, 1996: 239).

An Alternative Theory for Unilateral Relationship-Specific Investments

We propose an alternative strategic management theory to the myopia interpretation. Just as relationship-specific investments in franchising serve to correct *negative* spillovers associated with franchising contracts, relationship-specific investments in some business cases, such as in

OEM contracting, may be made for the purpose of capturing *positive* economic spillovers that can be generated from the (initial) contracts.

Transaction costs economics have typically focused their analysis on a *single* transaction and have examined governance structure on this basis. This level of analysis presumes that transactions do not interact. That is, a transaction is assumed to yield no (externality) effects beyond the individual resource exchange between transaction parties. In this particular business setting, economic logic indicates that a transaction involving unilateral relationship-specific investments places the firm in financial risk of bearing a transaction partners' opportunistic behavior, which would generate negative NPV.

However, transactions may be interdependent. For example, a transaction may provide positive influences on other transactions with the same or other transaction parties. Or, put differently, a transaction may have a real option value. Thus, even when a unilateral relationship-specific investment generates negative NPV from the perspective of a single transaction, positive spillovers from the transaction can change the expected payoff from the investment and can turn the investment project into an economically profitable one. Hence, the decision to commit to a transaction involving unilateral relationship-specific investment could be economically sound *when the transaction is examined in its entirety*.

We propose two types of positive spillover effects that a transaction may generate. First, there may be *inter-project spillovers* with the *same* transaction partner. That is, by making unilateral relationship-specific investments for a transaction partner, a firm has the opportunity to develop multiple projects and economic bonding relationships with the particular transaction partner. Specifically, a relationship-specific investment, such as communication codes, may be fungible across different projects with the same transaction partner and thus can improve the

productivity of a firm for the particular transaction partner compared to other competitors. The transaction partner may find it economically valuable to develop other projects with the firm due to lower search and communication costs. In other words, unilateral investments relationship-specific investments may fundamentally transform an *ex ante* asymmetric bargaining relationship into an economically viable *ex post* bilateral exchange relationship.

Second, there may be inter-project spillovers with *other* transaction parties. A firm's transaction relationship with an exchange partner may enhance its bargaining position with other firms. For example, a firm may acquire new knowledge from interacting with the transaction partner and improve its overall capability (Parmigiani, 2007). In addition, a firm's willingness to make unilateral relationship-specific investments may further facilitate knowledge transfer from the transaction partner, because such investments signal the firm's willingness to maintain a long-term cooperative exchange relationship and reduce the transaction partner's concern about the possibility of the firm becoming a future rival. Doing business with a high profile company could also improve a firm's reputation and publicity. The credential of being a supplier to a top brand name buyer helps to reduce other buyers' uncertainty concerning the supplier.

Unilateral Relationship-Specific Investments and Taiwanese OEM Suppliers

In the business context of international outsourcing, an OEM supplier typically makes both tangible and intangible investments in tools, equipment, operating procedures, and systems that are specialized to the requirements of a particular buyer (Bensaou and Anderson, 1999; Stump and Heide, 1996; Zaheer and Venkatraman, 1995). OEM suppliers provide manufacturing services according to OEM buyers' (brand) technical specifications or performance requirements of the components. These suppliers also design their manufacturing equipment and business processes for particular buyers in order to respond rapidly to their clients' demands.

Yet, OEM suppliers hardly receive any formal protections for their relationship-specific investments. For example, the newly adopted just-in-time (JIT) business model by Dell required that its suppliers prepare at least three months buffering in stock. However, Dell did not offer any guarantee on purchasing volumes due to high uncertainty in final product markets. Even after OEM suppliers had made significant investments adjusting to their buyers' specific procurement processes, most of these buyers still hesitated in signing long-term purchasing agreements with small and less-experienced OEM suppliers (Subramani and Venkatraman, 2003). These major OEM buyers would place large and regular orders with an OEM supplier only after a long and careful qualifying process. Since major OEM buyers must certify every aspect of their suppliers' production capability, including cost, speed, delivery, and quality, the smaller transactional party may be required to invest first in order to get the opportunity to work with major OEM buyers.

Taiwan is the world's largest supplier of manufacturing electronic components, personal computers and devices. However, most of the buyers are well-established international brands with superior bargaining positions. According to the 2005 IPO Procurement in Taiwan Survey,² the top twenty IPO purchasing accounted for 97%, and the top five IPO purchasing (HP, Dell, Sony, Apple, and IBM) accounted for 72% of total international IT purchasing in Taiwan. These OEM buyers avoid concentrating their orders with a single supplier, and these buyers frequently adjust their demand volume based on the suppliers' performance. The overall structure of OEM supplying networks further reinforces the asymmetric bargaining relationship between the buyers and the suppliers. Major OEM buyers have a group of first-tier OEM suppliers for a particular product. Although these first-tier suppliers have already met the requirements of production

² The project of IPO (International Procurement Office) in Taiwan Survey was conducted by the Office of Committee for Information Industry Development and the Market Intelligence Center, Institute for Information Industry and was sponsored by the Industrial Development Bureau, Ministry of Economic Affairs. See <http://www.ociid.org.tw/modules/wfsection/download.php?fileid=45>.

quality and procurement process, the buyers can, and sometimes do, source from second-tier OEM suppliers. Recently, these OEM buyers introduced a price-bidding system on the Internet which shifted cost reduction pressures to their suppliers and thereby enhanced further their own bargaining positions.

OEM buyers do cancel orders occasionally, which sometimes may cause an unexpected economic loss for their suppliers. For example, in 2005, Motorola canceled a window-based smart phone launching project (model MPx) due to its internal organizational adjustments. A Taiwanese supplier, COMPAL suffered a severe and unanticipated economic loss from its initial sunk-cost investments, which had been dedicated to Motorola.

The contribution of the current paper to the research literature on vertical integration is to highlight that even knowing that their clients may behave opportunistically some OEM suppliers in Taiwan are still willing to make client-specific investments without economic safeguards. The strategic management logic is that small and inexperienced OEM suppliers in Taiwan view the exchange relationship with computer giants, like Dell, as a necessary strategic move. These OEM suppliers rely on unilateral relationship-specific investments to gain orders from major OEM buyers. These OEM suppliers expect little, if any, economic profitability from the current transactions with major OEM buyers. Instead, these OEM suppliers place much of the economic value of their strategic move on the positive spillovers that these current transactions may yield in future transactions with the same OEM buyers or other parties.

Knowledge Spillovers and Economic Bonding Relationship

The extant research literature suggests that unilateral sunk-cost commitments by OEM suppliers can be seen as an economic hostage (Anderson and Weitz, 1992; Williamson, 1983)

and as a signal of a supplier's willingness to perform effectively (Celly, Speckman, and Kamauff, 1999; Gulati, Khanna, and Nohria, 1994). The current paper emphasizes that unilateral sunk-cost commitments can also be a way to gain from current contracts by capturing economic value via knowledge and reputation spillover effects that will be applied to future contracts.

By making unilateral sunk-cost investments, OEM suppliers have the opportunity to develop multiple projects and economic bonding relationships with a particular buyer. The more dedicated assets that OEM suppliers invest, the more likely that these suppliers will accumulate partner-specific knowledge (von Hippel, 1994; Subramani and Venkatraman, 2003) and thereby will develop inter-organizational routines (Nelson and Winter, 1982). Such knowledge will then enable these suppliers to outperform other potential suppliers in future transactions. Thus, these newly created capabilities can greatly improve exchange efficiency (Madhok, 2000) and can enhance the transaction value (Zajac and Olsen, 1993) perceived by their clients.

In addition, the suppliers' relationship-specific investments may increase the economic incentive of their clients to transfer knowledge and information to these suppliers. The dedicated teams and joint decision making of new product development (Heide and John, 1990) increase the need for information sharing and knowledge exchange between OEM suppliers and buyers (Dyer and Nobeoka, 2000; Kotabe, Martin, and Domoto, 2003; Zaheer and Venkatraman, 1994). Given that the buyers often must provide timely market information and product designs to suppliers, the unilateral investments of these suppliers serve as sunk-cost commitments that reduce buyers' concerns about information leaking to their competitors.

Taiwanese OEM suppliers have used relationship-specific investments to develop close ties with their clients. Indeed, some Taiwanese suppliers invest heavily in equipment to meet any

possible performance requirement of component or subsystem production, and to assure that their products or services are irreplaceable. Once a supplier has built a substantial amount of physical plant and equipment, and has adjusted their human resources and business processes to fit its clients' routines, the clients will rely more on its capital investments (Parmigiani, 2007; Srinivasan and Brush, 2006). Thus, these relationship-specific investments, together with partner-specific knowledge that the OEM supplier has gained from prior projects, increase the likelihood of winning new and more economically valuable projects from the same transaction partner.

Taiwanese OEM suppliers have tried to ensure long-term exchange relationships with their buyers by broadening their vertical scope in the value chain (Ernst, 2000; Richardson, 1996). On-going transactions permit the contractual parties to reward cooperative behaviors thus fostering collaboration and reciprocity in future business transactions (Barthelemy and Quelin, 2006; Heide and Miner, 1992). Opportunistic behavior can be curbed if the economic value of future transactions exceeds the short-term economic gains achieved through such behavior (Telser, 1980). Therefore, OEM suppliers can reduce their transaction hazards by offering value-added services to their clients.

For example, turnkey production arrangements in the personal computer industry allow Taiwanese suppliers (e.g., Mitac International) to integrate various stages of the value chain and to offer OEM buyers (e.g., Compaq) not only manufacturing services but also knowledge-intensive supporting activities and after-sales services. Adapting to the OEM buyers' demand for flexible products and speedy delivery, some Taiwanese suppliers have developed into a 'one-stop shopping center,' which provides coordinated services to their clients. The business routines developed from providing manufacturing services to the transaction partner can also support these expanded services.

To summarize, by making relationship-specific investments, an OEM supplier can gain learning advantages and can leverage this knowledge-based advantage to future transactions with the same client. The greater the expected advantages, the more likely OEM suppliers will accept transactional hazards associated with the client. We therefore propose:

Hypothesis 1: The greater the economic value of inter-project knowledge spillover effects *with a particular client*, the more likely OEM suppliers will make unilateral relationship-specific investments.

Knowledge Spillovers and Capability Leveraging

The exchange relationship between an OEM supplier and its buyer enables the supplier to develop capabilities that over time enable this OEM supplier to gain economically profitable business from other buyers. The OEM supplier can apply its newly created capabilities not only to various stages of vertical supply chain activities with the same buyer but also to a broader customer scope (Nobeoka, Dyer, and Madhok, 2002; Uzzi and Gillespie, 2002).

An example of an inter-project spillover with other buyers would be a Taiwanese supplier that over time acquires strategic resources, such as tacit knowledge and positive reputation, from an OEM-supplier relationship and then leverages these resources in dealing with third parties. OEM buyers typically have superior technology and resource positions than their suppliers. The asymmetric flow of knowledge between OEM buyers and suppliers (Inkpen and Beamish, 1997) results in significant improvements in the suppliers' resource profiles, capabilities and absorptive capacity (Cohen and Levinthal, 1990). Because OEM buyers are responsible for final product quality, typically these buyers must transfer key technology and timely information to their suppliers (Ernst, 2000).

The company HIPRO provides a typical example. Founded in 1992, the company won its first order of personal computer power supplies from a major OEM buyer, Dell, ten years ago by building just-in-time (JIT) warehouses near Dell assembly sites worldwide. Being a supplier to Dell has been an economically valuable asset for HIPRO. According to our interviews with managers at HIPRO, Dell regularly sent staff members to visit their suppliers in Taiwan. In the process of qualifying to supply Dell, HIPRO learned how to improve its procurement and production control methods, to upgrade its knowledge of design-for-manufacturing, and to improve the efficiency of its own production networks. HIPRO has been able to leverage this knowledge when transacting with other buyers.

In sum, by making relationship-specific investments and serving their client, an OEM supplier can upgrade its capabilities, which it in turn can leverage to a broader customer scope. The knowledge of how to improve product quality acquired from one OEM buyer can be used to improve product quality for other clients (Kogut and Zander, 1992; Nobeoka, Dyer, and Madhok, 2002). We therefore propose:

Hypothesis 2: The greater the economic value of inter-project knowledge spillover effects *with other clients*, the more likely OEM suppliers will make unilateral relationship-specific investments.

Reputation Spillovers and Endorsement Effect

In addition to knowledge spillovers from OEM buyers to OEM suppliers, there are also reputation effects for being associated with major OEM buyers (Stuart, Hoang, and Hybels, 1999). OEM buyers typically have more confidence in suppliers who have shown the capabilities to meet the procurement requirement of other major OEM buyers, such as Dell. The economic

value of a reputation spillover effect would be greater for suppliers like HIPRO whose products are embedded in the system with no brand name recognition (Stuart, 2000). After winning an order from Dell, HIPRO found it easier to approach other OEM buyers (i.e., Cisco). Therefore, even if the profit margin of manufacturing services with Dell was initially not a competitive rate of return on investment and its relationship-specific investments for Dell were not protected by long-term purchasing agreements, both the potential learning effect, and the reputation effect of being classified as a top-tier supplier, led to strategic advantage in dealing with other buyers and thus provided HIPRO with economic value beyond the transaction at hand.

Another example of leveraging strategic assets acquired from OEM buyers can be found in a company called WISTRON, which was a member of the ACER computer business group. WISTRON segmented its clients into four categories in the notebook computer business: international, local, channel, and distributor brands. Top-tier buyers, for example international brands, are in superior bargaining positions because these buyers purchase larger volume, make superior technology transfer, and give direct access to market information. Serving top-tier OEM buyers (e.g., IBM) improved the market status (Podolny, 1993) of WISTRON. Since other tiers of clients prefer to do business with suppliers serving top-tier OEM buyers, WISTRON has a better bargaining position and can extract economic rents from them. Thus, although it may suffer economic losses from making unilateral investments specific to top tier clients, it can more than recover these economics losses from transacting with other-tier clients.

These business cases indicate that a supplier's relationship with one contractual party (a major OEM buyer) can benefit its transactional relationship with other contractual parties (other OEM buyers). Being endorsed by a major OEM buyer reduces the uncertainty of other buyers concerning the supplier. Such reputation effects should be highest when there are substantial

differences in market status between transaction parties. When the economic value of reputation spillovers is large enough to compensate for the potential economic loss from contractual hazards, the OEM supplier will make these unilateral sunk-cost commitments. We therefore propose:

Hypothesis 3: The greater the economic value of reputation spillover effects with other clients, the more likely OEM suppliers will make unilateral relationship-specific investments.

METHOD

The research setting and data collection

Manufacturers in two industries --- information technology and bicycles --- were selected as the research setting for this study. The first sampling frame included all of the more than 400 electronic manufacturers listed in the Taiwan Stock Exchange Market. The second sampling frame was from a list of 290 local exhibitors in the 2006 Taipei International Cycle Show.

We chose both the information technology industry and the bicycle industry for several reasons. First, both industries are characterized by a high degree of asset specificity. OEM suppliers in the two industries must follow their clients' production specification and quality standards. These suppliers typically make substantial investments in tools, equipment, operating procedures, and systems that are specialized to the requirements of a particular buyer. Second, Taiwanese OEM suppliers play a major role in serving international brand players in these two industries. Indeed, Taiwan is the world's largest supplier of manufacturing electronic components, personal computers, and devices (Ernst, 2000). Consider notebook computers as an example. Taiwan has become the world largest manufacturer of notebook computers since 1994. In 2005, almost 65% of the notebook computers sold under the international brand are designed and

manufactured by Taiwanese firms under OEM arrangement. Taiwan is also well known for providing bicycle assembly services and accessories for leading world brands (e.g. Shimano, Specialized and Trek). Third, a majority of the IT manufacturers, and all of the bicycles manufacturers in Taiwan, serve international OEM buyers. Thus, manufacturers in these two industries are particularly suitable for our empirical testing.

We sent a packet containing: (i) a cover letter stating the purpose of our research study and promising anonymity; (ii) a questionnaire; and (iii) a return envelope, to firms in information technology industry in November 2005. We asked managers in charge of OEM business to be respondents. These managers had title positions of project manager, sales manager, marketing vice president, and president. To increase the accuracy of the responses, respondents were asked to focus on a transaction relationship with OEM buyers within the last five years for which they had been responsible. Two weeks after the first mailing, we sent a follow-up letter and collected the mailed questionnaires. A total of 82 usable responses were received, resulting in a response rate of 17.5%. This response rate is considered acceptable since some of the manufacturers did not have OEM business or had signed non-disclosure and confidentiality agreement (NDA) for client information. Non-response bias was assessed by comparing early and late respondents as suggested by Armstrong and Overton (1977). There were no statistically significant differences between early and late responding firms in terms of capital and numbers of employees.

The data of bicycle industry were collected through on-site interviews. We excluded non-manufacturing companies, and contacted all the exhibitors in the export area, mainly parts and accessories manufacturers, in the Taipei World Trade Center Exhibition Hall during the 4-days exhibition in March, 2006. Forty-five qualified OEM suppliers agreed to participate and a total of 41 usable responses were obtained. We compared our data with members of Taiwan Bicycle

Exporters' Association, and found statistically no significant differences in capital or in numbers of employees.

Measurement

The survey instrument was developed based on field interviews and previous research studies. Before designing our survey questionnaires, we conducted a case study of eight firms from information technology, animation, footwear, and furniture industry to explore the possible spillover effects that an OEM supplier anticipates with international outsourcing. In-depth interviews with owners and managers with these case companies provided us with items for construct measurement. The interviews with the first five firms were exploratory and focused on characteristics of relationship-specific investments, possible economic safeguards, and spillover effects. In later interviews, we targeted three companies in information industry and clarified key constructs and relationships among them, including relationship-specific investment, multiple projects and services, capability upgrading, and market visibility.

The draft of the questionnaire was developed and personally administered with one marketing vice president and one product manager. Executives from these two companies helped us identify questions that were unclear, subject to multiple interpretations, and difficult to answer. The revision was then pre-tested in a medical equipment trade show. Table 1 reported the key constructs and the details of items used in the analysis.

Insert Table 1 about here

Dependent Variables

Relationship-specific Investment

We measured relationship-specific investment by seven indicators capturing both the tangible and intangible aspects of investment in the OEM supplier-buyer transaction setting. The tangible investment was measured by three items based on Heide and John (1990) and on our field interviews, which describe the physical investment made by an OEM supplier in tooling, equipment and engineering expenses that are specific to the requirements of an OEM buyer. The intangible investment was measured using four items that describe the investment made by the OEM supplier in business processes and procedures, and in people that are specific to the requirement of an OEM buyer (Zaheer and Venkatraman, 1995). All of the indicators were measured on a seven-point scale from ‘extensive investment in terms of time and effort’ to ‘minimal investment.’ The Cronbach alpha measure of reliability for this construct is 0.897.

Independent Variables

Knowledge spillovers

We utilized both *multiple projects* and *integrated services* to capture the inter-project spillover effects with the same transactional party. The construct of multiple projects was operationalized as a single item that reflected the degree of horizontal scope of an OEM-supplier relationship. The item was measured on a seven-point scale from ‘strongly agree’ to ‘strongly disagree.’ The construct of integrated services was measured as the logarithm of the number of activities along the value chain, such as global logistics and after-sales services, which the respondent had offered for the same OEM buyer. This item captures the degree of vertical scope of the exchange relationship.

A *capability upgrading* scale was developed to describe the inter-project knowledge spillover effects with other transaction parties. This construct is measured by the extent to which an OEM supplier had experienced significant improvement in several aspects of capability, such as capacity turnover, production processes, quality control, new product development, and managerial capability. We used five indicators to measure various types of capability improved after serving this OEM buyer. All of the indicators were measured on a seven-point scale from ‘strongly agree’ to ‘strongly disagree.’ The Cronbach alpha measure of reliability for this construct is 0.92.

Reputation spillovers

Reputation spillover effect refers to the degree to which the prominence of a business partner affects the market status and visibility of the OEM supplier that leads the supplier to gain new markets and other clients (Rindova, Williamson, Petkova, and Sever, 2006; Stuart, 2000). The *reputation enhancement* scale was developed to assess the positive spillovers that an OEM supplier can generate due to the endorsement effect (Stuart, Hoang and Hybels, 1999) of a good reputation of its buyer. We use three indicators to measure the benefits of being associated with a prominent buyer. All of the indicators were measured on a seven-point scale from ‘strongly agree’ to ‘strongly disagree.’ The Cronbach alpha measure of reliability for this construct is 0.92.

Control Variables

We included two types of control variables: industry/firm-level controls and a measure of economic safeguards. First, we controlled for *industry* effects by including a dummy variable to differentiate information technology industry and bicycle industry. Second, we controlled for the

length of association in our model by using the logarithm of number of years of the exchange relationship. A long-term relationship cultivates confidence between the two exchange partners (Hoetker, 2005), and therefore may increase the OEM supplier's willingness to invest in specific assets. Third, we included *firm size* and *relative scales* in our model to control for extraneous factors, such as resource advantages and bargaining power, which may influence both the asymmetric flows of knowledge and the investment decision of relation-specific assets. For instance, larger OEM suppliers have more resources to invest in research and development or branding that in turn will reduce their dependency on external sources of knowledge and OEM buyer's endorsement. These suppliers may be in a better bargaining position to require reciprocal commitments in comparison to smaller suppliers and thus are more likely to make relationship-specific investments. The variable of firm size was measured as the logarithm of the number of employees in 2005. The variable of relative scales was judged by comparing the focal company and its OEM buyer in terms of the average sales in the past two year (2004-2005). This item was measured on a five-point scale from 'much larger than your OEM buyer = 5' to 'much smaller than your OEM buyer = 1.' Fourth, we controlled for *formal contract* as a form of *ex ante* economic safeguards by including a dummy variable that is equal to one if there exists a formal contract between the OEM buyer and supplier before the supplier makes specific investments. A formal contract in place increases a supplier's confidence in on-going transaction relationships and the economic incentives to commit. Finally, we controlled for the degree of *reciprocal investments* by OEM buyers, which are viewed as mutual sunk-cost commitments (Bensaou and Anderson, 1999; Joshi and Stump, 1999). This construct describes the extent to which an OEM buyer provides effort to become familiar with its supplier's personnel and business procedures, and modifies its product features to accommodate the supplier's specifications for components.

We use four indicators to measure relationship-specific investments that OEM buyers made for their suppliers. All of the indicators were measured on a seven-point scale from ‘strongly agree’ to ‘strongly disagree.’ The Cronbach alpha measure of reliability for this construct is 0.84.

RESULTS

Table 2 reports the descriptive statistics and correlations between variables. The largest correlation coefficient between two independent variables is 0.644 (between capability upgrading and reputation enhancement). We tested the potential effects of collinearity by checking variance inflation factors (VIF). The largest VIF coefficient is smaller than 3, well below the threshold of 10, indicating no serious threat of multicollinearity. Hypothesis 1, 2, and 3 predict conditions under which OEM suppliers will make unilateral relationship-specific investments. The research hypotheses were tested using OLS regression models.

Insert Table 2 about here

Table 3 contains the empirical results from regression analysis in which the dependent variable is the extent of relationship-specific investments made by OEM suppliers. We tested hypotheses by introducing variables sequentially in the models. The first model includes control variables only, and the remaining models test our hypotheses. As shown in Models 2 and 3, the coefficients of multiple projects and integrated services are positive and statistically significant at the 0.1 level or below, confirming the positive relationship between horizontal and vertical scope of transactions and the decision of relationship-specific investments. Thus, the first hypothesis that the greater the economic value of inter-project knowledge spillover effects *with a particular client*, the more likely OEM suppliers will make unilateral relationship-specific investments is empirically supported.

Insert Table 3 about here

The two other sets of hypotheses concern the spillover effects of relationship-specific investments beyond the current transactional party due to capability upgrading and reputation enhancement. In models 4 and 5, we find empirical evidence that corroborates hypothesis 2 and hypothesis 3. The coefficients of capability upgrading and reputation enhancement are all statistically significant and with the expected positive signs. We thus conclude that the expected economic value from other transaction parties influences the investment decision on the current transaction. Model 6 pooled all of the explanatory variables in one model and yielded empirical results that are largely consistent with previous models.

Among the control variables, the time-length of association has positive effects on relationship-specific investments. The buyer's reciprocal investment is also positively associated with the level of specific investments that a supplier has made for the buyer, suggesting that reciprocal commitments promote cooperative exchange relationships. However, formal contracts were statistically insignificant in predicting relationship-specific investments in our models. We discuss this unexpected finding in the next section.

DISCUSSION AND IMPLICATIONS

This research study develops and tests new theory to explain why firms sometimes make unilateral relationship-specific investments without economic safeguards. We propose that firms make such investments when these investments carry real-option values (Trigeorgis, 1996). The current paper's context of OEM buyer-supplier transactions shows that relationship-specific investments can yield both positive knowledge and reputation spillovers. Farsighted firms that

anticipate such spillover effects will make investments specific to their exchange partner even when their exchange partner fails to offer reciprocity. Thus, specific investments without ex ante economic safeguards are not necessarily a strategic mistake.

We emphasize that mutual sunk-cost commitments typically provide the appropriate economic safeguard to support contractual exchange (Williamson, 1983). However, if a supplier in a weak bargaining position insists on requesting an *ex ante* bilateral sunk-cost commitment from the outset, such a supplier might not have the opportunity to serve major OEM buyers, and to gain positive spillover effects from serving these buyers. By judging the potential economic value beyond a single transaction and by *evaluating transactions and investments in their entirety*, the weak supplier's strategic move of making a unilateral sunk-cost investment can be understood as an economic value maximizing strategy.

This paper extends transaction costs analysis of sunk-cost investment beyond the usual consideration of economic safeguards with the *single* transaction as the unit of analysis (see also Argyres and Liebeskind, 1999). The current paper develops a dynamic approach, which focuses on the economic value of unilateral commitments and their potentially positive economic consequences for reciprocal effects and economic bonding in a multiple transaction setting. The novelty of this dynamic approach is that a smaller contractual party that is initially in a weaker bargaining position is more likely to accept a negative NPV project because in an economic calculation beyond the single project, sunk-cost investments associated with one project may generate positive economic values concerning future transactions with the particular party and to the transactions with other transaction partners.

Although previous research studies portray formal contracts as an economic safeguard to relationship-specific investments, the current paper's findings suggest that such contracts do not

necessarily promote relationship-specific investments. A possible explanation is that in our particular empirical context, formal contracts in OEM business practice provide little protection to suppliers. During our interviews, we found that the terms and conditions in a formal contract between the OEM buyer and supplier are actually in favor of the *buyer*. For example, OEM suppliers often sign a Vendor Management Inventory (VMI) agreement with the buyers. This contractual agreement requires that OEM suppliers maintain sufficient materials and components dedicated to a specific buyer. Yet, this same contract does not require OEM buyers to provide material supply forecast to the suppliers, nor does it obligate the buyers to purchase the materials that they requested. Therefore, even with a formal contract in place, OEM suppliers' specific investments are not properly safeguarded. The details of the contract reinforce the view proposed in this paper that it is the economic spillovers that these specific investments can potentially yield that influences OEM suppliers' investment decisions to make these unilateral sunk-cost commitments.

Suppliers' initial unilateral relationship-specific investments can create positive economic spillovers for subsequent transactions with the same transaction partner. Moreover, since OEM suppliers obtain not only relation-specific but also general capabilities from serving the buyer, these suppliers can leverage these new (general) capabilities to other clients, which over time decreases their dependency on any one buyer.

This paper emphasizes two types of economic spillovers that suppliers can obtain by making such unilateral sunk-cost commitments: reputation effects and knowledge spillovers. Although both of these spillovers are intangible strategic resources that could enhance the OEM suppliers' competitive advantages, these spillovers differ in their dependence on the continuity of the transaction relationships. Reputation spillovers refer to the positive signaling effects that are

created from linkages with a well-known buyer. Once the exchange relationship with major OEM buyers is discontinued, it might signal a negative image. Capability upgrading, however, is the improvement in the overall ability that the suppliers gain from working with their clients, and can be retained even with the termination of the initial transaction relationship.

This paper has several limitations. First, there is a single source for data on relationship-specific investments and independent variables, which might result in common method bias. However, a single data source in our empirical context should not seriously compromise internal validity because both the dependent and independent variables address actual data rather than an assessment of performance. Thus, the relationship between dependent and independent variables allow for few alternative explanations. We also enhanced the validity of the measures by using Harman's (1967) one-factor test. Un-rotated factor analysis of all variables of interest with an eigenvalue-greater-than-one criterion revealed four factors, and thus common method variance does not account for most of the interrelationships (Podsakoff and Organ, 1986). Second, empirical evidence is limited to a sample of Taiwanese OEM suppliers and external validity requires further investigation. It is quite plausible, however, to believe that the strategic implications yielded from the empirical evidence of this research study can be generalized to other business contexts in which asymmetric transaction relationships prevail.

This paper did not examine the economic effects of knowledge and reputation spillovers from the perspective of OEM buyers and their strategic implications for the buyers' governance decisions (Mayer, 2006). For example, OEM suppliers' strategic behaviors might lead to their buyers' knowledge leakage, which in turn might increase buyer's intentions to internalize manufacturing (Nickerson and Silverman, 2003) or to closely monitor their suppliers (Mayer, Nickerson, and Owan, 2004). If an OEM buyer takes actions to prevent its supplier's economic

value maximizing behaviors (Arruñada and Vázquez, 2006), it might affect a supplier's ability to realize the potential economic value from these spillovers. Future empirical studies comparing the expected economic payoffs between pairs of buyer and supplier will enrich our understanding of the dynamics of economic spillover effects and their consequences concerning governance choices.

CONCLUSIONS

This paper has shown how unilateral sunk-cost commitments can be understood not simply as acts of myopia on the part of managers taking such actions, but rather as an economic value-maximizing strategy. We complement transaction costs theory with a real options lens by introducing systemic thinking and broadening the unit of analysis from a single transaction to inter-temporal dyadic exchange relationships and triad interactions. Our empirical evidence based on the OEM business in Taiwan indicates that firms are more likely to make unilateral relationship-specific investments when (1) transactional hazards are mitigated and (2) the investment yields sufficient economic values for other transactions with the same exchange partners and for third transaction parties. Such a finding contributes both to procurement strategy, to the research literature in the field of Strategic Management, and to transaction costs theory on vertical coordination.

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Table 1: Key Constructs

Construct	Items
Relationship-specific investment	<ol style="list-style-type: none"> 1. Your company has made significant investment in production and testing equipment dedicated to this focal buyer. 2. Your company has made significant investment in tooling and engineering design dedicated to this focal buyer. 3. Your company has made significant investment in information technology and logistic systems dedicated to this focal buyer. 4. Your company has spent a lot of time with the focal buyer in learning its operation routines and in building relationships with its staff. 5. Your company has made significant adjustments in your product and production system in order to adapt to this focal buyer's unusual needs and technical specifications. 6. Your company has made significant adjustments in internal operation processes in order to adopt this focal buyer's unusual needs and technical specifications. 7. Your company has spent a lot of time and effort in coordinating the operation processes of your own suppliers in order to adopt this focal buyer's unusual needs and technical specifications. <p>(Likert 7-point scale; 7=extensive investment, 1=minimal investment)</p>
Multiple projects	<p>Your company has developed multiple projects with this focal buyer. (Likert 7-point scale; 7=strongly agree, 1=strongly disagree)</p>
Integrated services	<p>In addition to manufacturing services, which of the following services did your company provide for this focal buyer?</p> <ol style="list-style-type: none"> 1. Manufacturing of higher level products 2. Research and development 3. After-sales and maintenance services <p>(1=yes, 0=no)</p>
Capability upgrading	<p>After working with this focal buyer, your company has gained significant improvement on following capabilities:</p> <ol style="list-style-type: none"> 1. Capacity turnover. 2. Manufacturing process capability. 3. Quality control capability. 4. New product development capability. 5. Overall managerial capability. <p>(Likert 7-point scale; 7=strongly agree, 1=strongly disagree)</p>
Reputation enhancement	<ol style="list-style-type: none"> 1. After doing business with the focal buyer, the market visibility of our company has increased. 2. After doing business with the focal buyer, the market status of our company has been enhanced. 3. After doing business with the focal buyer, it is much easier to obtain new orders from other clients. <p>(Likert 7-point scale; 7=strongly agree, 1=strongly disagree)</p>

Table 2: Descriptive statistics and correlations

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1. Relationship-specific investment	4.50	1.21										
2. Multiple projects	5.10	1.38	.294**									
3. Integrated services	2.69	.85	.221*	.302**								
4. Capability upgrading	4.78	1.20	.517**	.376**	.138							
5. Reputation enhancement	5.04	1.31	.468**	.420**	.273**	.644**						
6. Industry	.34	.47	-.017	-.014	.123	-.216*	-.092					
7. Firm size	948	2395	.115	.082	.109	.211*	.203*	-.523**				
8. Relative scale	2.17	1.13	-.002	-.048	-.011	-.225*	-.357**	.272**	-.177*			
9. Length of association	4.24	1.81	.261**	.171	.001	.106	.076	.120	.079	.055		
10. Formal contract	.59	.49	.165	.047	-.028	.249**	.119	-.067	.119	.082	.069	
11. Reciprocal investment	3.29	1.43	.406**	.135	-.123	.349**	.251**	-.168	.149	.045	.088	.333**

N=123; * p<0.05; ** p<0.01 in a two-tailed test

Table 3: Result of regression analysis for relationship-specific investment

<i>Model</i>	1	2	3	4	5	6
<i>Control variables</i>						
Industry ^a	.070 (.691)	.062 (.632)	-.001 (-.007)	.103 (1.135)	.012 (.130)	.021 (.231)
Firm size	.068 (.689)	.055 (.575)	.002 (.017)	.038 (.434)	-.001 (-.008)	-.029 (-.326)
Relative scales	-.040 (-.467)	-.028 (-.327)	-.034 (-.406)	.060 (.749)	.124 (1.472)	.112 (1.344)
Length of association	.214** (2.547)	.182** (2.187)	.205** (2.501)	.175** (2.307)	.196** (2.559)	.177** (2.334)
Formal contract	.022 (.255)	.023 (.272)	.032 (.372)	-.047 (-.593)	-.002 (-.020)	-.033 (-.416)
Reciprocal investment	.383*** (4.333)	.358*** (4.111)	.414*** (4.760)	.259*** (3.131)	.279*** (3.357)	.269*** (3.213)
<i>Independent variables</i>						
Multiple projects		.209** (2.541)				-.011 (-.131)
Integrated services			.273*** (3.284)			.159* (1.952)
Capability upgrading				447*** (5.345)		.293*** (2.852)
Reputation enhancement					.429*** (5.066)	.215** (2.003)
<i>F value</i>	5.521***	5.877***	6.367***	9.938***	9.405***	8.066***
<i>R</i> ²	.222	.263	.285	.377	.364	.425
<i>Adj. R</i> ²	.182	.219	.240	.339	.325	.373
ΔR^2		.041**	.069***	.155***	.142***	.210***

* p<0.1, ** p<0.05, *** p<0.01; N=123; ^a Industry: 0=Information technology, 1=Bicycle; and the numbers in parentheses are t statistics.