

**JAPANESE AUTO PARTS SUPPLY NETWORKS AND  
THE GOVERNANCE OF INTERFIRM EXCHANGE\***

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## **ABSTRACT**

This paper examines purchasing transactions and ownership ties between 11 Japanese automakers and 237 suppliers. Although automakers' equity stakes in suppliers are highly symbolic, they play an economic role as well. Automakers hold shares of suppliers that dedicate to them a large percentage of output, suppliers from which they purchase many different parts, suppliers of difficult to manufacture parts, and small suppliers, indicating that ownership stakes in suppliers are credible commitments facilitating relationship-specific investments. Consistent with a transaction cost interpretation but in contrast to predictions of resource dependence theory, the total number of suppliers and the degree of an automaker's internal production of a part are not related to ownership stakes. I conclude that embeddedness and transaction cost explanations are complementary: embedded ties can serve as a transaction-cost minimizing governance structure. I further conclude that buyer-supplier relationships in the Japanese automotive industry reflect a logic of commitment rather than a logic of control and exploitation.

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### **THE GOVERNANCE OF INTERFIRM EXCHANGE**

#### **INTRODUCTION**

Today, there is little disagreement among organization theorists that economic exchange is embedded in a social, cultural, and institutional context (Granovetter, 1985). Structures of production and exchange are influenced by the state, legal and financial institutions, the structure of social networks, and cultural values; and for this reason, vary dramatically across countries.

But what exactly is embeddedness? A "healthy tension," as Williamson (1994: 77) puts it, exists between organization theorists and transaction cost economists over this question. On one side are organization theorists who argue that to truly understand an organization, one must examine the context in which it is embedded. Orru, Biggart, and Hamilton (1991: 387) for example, write: "Different fundamental principles of control, which are not solely economic in character but rather are drawn from other institutional sources such as the state, the community and the family, are at work in each society. These principles inform predictable social relations in multiple arenas, including the economic..." According to this view, universal theories of organization must be handled with caution. Transaction cost economists, on the other hand, argue that embeddedness is simply another factor to be modeled. Culture, social structure, legal and economic institutions serve as "shift parameters" that change the comparative costs of governance, but do not affect the basic transaction cost minimizing logic (Williamson, 1994: 84). Managers everywhere strive to minimize transaction costs and protect their firms against opportunism, although the costs of governance and consequent choice of governance structure may vary across different economies.

Though in the literature on organizations this debate tends to be framed as a dispute between organization theorists and transaction cost economists, the same debate emerges in all comparative research: can one take theories derived in one context (usually western) and apply them to all situations, or, must one look at each case individually, independent of preconceived, western notions? In this paper, I combine both approaches: the idiographic, culture specific approach of embeddedness with the more generalizable theoretical insights of transaction cost economics. I argue that transaction cost economics offers a useful framework through which to understand interfirm exchange—provided that we carefully shape the assumptions of the theory itself to reflect the social, cultural, and institutional realities in which that exchange is embedded.

I examine an organization form that has long posed a puzzle to researchers: networks of Japanese automakers and their suppliers. In the substantial literature on these networks, scholars have attributed the ability of Japanese automakers to manage close, collaborative, long-term relationships with a handful of highly dedicated suppliers to both factors unique to Japan and more universal theory. This paper addresses one means by which automakers and their suppliers manage economic exchange—automaker equity stakes in suppliers. I refer to these links throughout this paper as "equity ties" from automaker to supplier. These equity ties are a product of a complex interaction between embeddedness and economics. While their meaning is highly symbolic, their role is consistent with a transaction cost framework.

We cannot understand the significance of equity stakes in Japan solely through theory rooted in the Anglo-American system of corporate governance. In Japan, equity is a symbol of affiliation and obligation. An automaker's equity stake in a supplier is a very public statement that a supplier is part of the automaker's group—its business family.<sup>1</sup> An automaker has an obligation to keep members of

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<sup>1</sup> In Japanese corporate networks, firms are often referred to in familial terms. The core company is referred to as the *oya-gaisha*, or parent company. Majority owned subsidiaries are called *kogaisha*, or child companies. Even corporate behavior is described in familial terms: for example, core

this family from economic harm. While this obligation is not stipulated by law, there is evidence that it is supported by very real sanctions. Even when sanctions do not exist, there is a strong sense among Japanese managers that such behavior towards closely affiliated suppliers is expected—taken for granted.

The symbolic significance of equity does not mean that it defies economic interpretation. The obligation represented by an automaker's equity stake in a supplier means that equity can serve as a credible commitment—and as a governance structure quite consistent with the predictions of transaction cost economics. A supplier whose shares are held by an automaker is assured that its customer will not behave opportunistically, and that it is safe to invest in relationship-specific assets. Thus, the web of equity ties extending from automaker to supplier, and the serious obligations symbolized by these ties, has encouraged and enabled parts suppliers to make the investments in relationship-specific assets that have been deemed so important to the success of Japanese auto supply networks (Dyer, 1996).

Once we understand transaction cost economics and embeddedness as complementary rather than as competing poles of a debate, another debate, this time, concerning the management of interorganizational networks, comes into focus. The view of automakers' equity stakes in suppliers that I have proposed above—of equity stakes as symbols of affiliation, of automaker obligation to keep suppliers alive and healthy—suggests that supplier networks are governed by a logic of mutual commitment. An automaker publicly commits to a supplier's survival, and that supplier commits relationship-specific assets to that automaker.

This logic of commitment stands in contrast to a logic of control that is often seen in analyses of

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companies will often describe their treatment of suppliers as *amae*—a term usually reserved to describe a mother's indulgence of her children.

interorganizational linkage. In organization theory, the dominant representative of this logic of control is resource dependence theory (Pfeffer and Salancik, 1978)—in which firms link with others to manage their dependence and stabilize transactions in an uncertain world. In research on Japanese supply networks, the dominant representative of this logic of control is the dual economy perspective, in which large manufacturers hold their suppliers' shares to control and exploit them. Although different in many respects, these theories share an assumption that the decision to link with another firm is unilateral—action that one firm takes strategically to manage an unfavorable position and maximize its power *vis a vis* another.

The notion of governance through embedded ties, through symbols of obligation from buyer to supplier which allow a supplier to invest in specific investments, offers a very different perspective on networks. This perspective is consistent with other research on Japanese interfirm networks, which finds that networks of larger firms (*kigyo shudan*) are permeated by a sense of community, and strong norms of redistributing wealth from the rich to the poor of the group (Lincoln, Gerlach, and Ahmadjian, 1996). This perspective is also consistent with accounts of Japanese auto parts supply networks which find high levels of collaboration and cooperation between automakers and their suppliers (Nishiguchi, 1994; Smitka, 1991).

The first section of this paper presents an overview of the structure of supply relations in Japan. The second section addresses the role of equity as a symbol of commitment in Japan, based both upon my own interviews with Japanese managers and an overview of the literature on cross-shareholding and corporate performance in Japan. In the following section, I derive a number of hypotheses addressing the role of equity as a credible commitment as well as competing hypotheses based upon resource dependence and dual economy perspectives. The analysis section presents tests of these hypotheses on a sample consisting of Japan's 11 automakers and 237 suppliers. I conclude with some questions to be addressed in the future—in particular regarding the circumstances under which automakers have

purchased shares in their suppliers.

## **SUPPLY RELATIONS IN THE JAPANESE AUTO INDUSTRY**

In the mid-1980's, as Japan's global dominance of the automobile industry seemed assured, the purchasing practices of large Japanese managers began to attract the attention of foreign scholars and managers. Observers of the industry reported that the vaunted ability of Japanese firms to respond rapidly to shifts in market demand and endure seemingly endless rounds of cost-cutting stemmed in part from a set of innovative purchasing practices. Curiously, these practices sounded like a case study from an American textbook on how not to conduct business. While theories of management popular in the West cautioned firms to avoid dependence upon suppliers and customers through spreading their business across numerous business partners or through vertical integration (Williamson, 1985; Pfeffer and Salancik, 1978), Japanese automakers contracted out for a large percentage of their parts, depended upon a limited number of suppliers, signed incomplete contracts, and provided suppliers with sensitive information on their business plans and operations (Helper, 1990). Suppliers, too, often relied heavily upon a single customer, committed resources to their customers even before signing a contract, and disclosed crucial information on their cost structures.

At first, these networks were dismissed as a system by which large firms exploited the small, an undesirable product of Japan's late economic development, which left a thin layer of large, technologically sophisticated manufacturers atop a vast majority of small, backward suppliers (Watanabe, 1985; van Wolferen, 1989). By the 1980's, however, it had become difficult to dismiss these purchasing practices so easily. Analyses of the auto industry identified a distinct set of purchasing practices that allowed Japanese automakers to achieve the flexibility and cost-competitiveness that brought them to the forefront of the global economy.

One of the most striking contrasts between Japanese automakers and their American competitors is

reliance upon a limited number of suppliers. While the average U.S. automaker might contract directly with 10,000 suppliers (Dyer and Ouchi, 1993), the average Japanese automaker numbers its direct, or first tier, suppliers in the hundreds. These first tier suppliers control their own set of direct, second tier suppliers who in turn control third tier suppliers. Consequently, a typical Japanese automaker is at the apex of a pyramid of tens of thousands of suppliers (Aoki, 1988).

Japanese and U.S. automakers differ as well in their management of direct suppliers. In Japan, cooperation begins in the earliest stages of new model development. While Japanese automakers claim to choose suppliers based upon competitive bids, relationships between automakers and suppliers tend to be stable and long-lived. Automobile manufacturers responding to a 1993 survey by the Japan Fair Trade Commission reported that on average, 91.7% of their top 30 suppliers had been doing business with them for over 30 years (Japan FTC, 1993: 24). Cooperation between automaker and supplier continues throughout the manufacturing process, with a constant search for cost-reducing redesigns and improvements through value analysis and value engineering (Nishiguchi, 1994; Asanuma, 1989).

Suppliers in Japan have a strong incentive to continuously reduce costs. The written contract contains no fixed prices; rather, twice a year, an automaker announces general price reduction targets and then renegotiates prices with each parts maker individually. A supplier that is able to reduce its costs significantly below the price without compromising quality can pocket the difference—at least until the next round of price negotiations (Asanuma, 1989). If it cannot meet its target, a supplier may lose preferred status or even be required to submit to reorganization.

Despite the high dependence of suppliers upon specific automakers, and automakers upon specific suppliers, "governance structures" in a western sense, appear to be few. Contracts are vague—general guidelines for an ongoing relationship, rather than stipulations of prices and quantities and what to do under specific contingencies (Asanuma, 1989). Automakers very rarely own controlling stakes in



their suppliers—while they often own suppliers' shares, these positions tend to be relatively small.

Researchers have proposed a great number of explanations of the ability for supplier and automaker to avoid rampant opportunism and manage cooperative relationships without resorting to contingent contracts or vertical integration, ranging from the purely cultural to the purely economic, to something in between. Cooperation between automakers and suppliers has been attributed variously to Confucian influence in Japanese culture (Dore, 1983), to mutual self-interest (Nishiguchi, 1994), to carefully crafted trust-enhancing institutions such as supplier associations (Smitka, 1991), to an incentive system consistent with agency theory (Asanuma and Kikutani, 1992), to an effective system of corporate governance through cross-shareholding (Gilson and Roe, 1993), and to the ability of automakers to take advantage of an imbalance of power to force suppliers to cooperate (Arita, 1985).

The truth lies in a combination of all of the above. Any purchasing manager, shuttling back and forth between golf games, end-of-year parties, and other social events with suppliers will attest to the personal nature of these relationships. The success of a number of Japanese auto parts suppliers (most prominently, Nippondenso), supports the notion that these relationships are in the best interest of (at least certain) suppliers as well as the automakers. The effort that automakers and suppliers put into maintaining the web of cross-shareholding and directorate interlocks—and the great attention the business press pays to cases in which these ties are reduced or severed—suggests that these linkages also play an important role in governance.

We could leave it at that—that a dense and complex web of formal and informal ties link automakers to their suppliers and thus these relationships are not reducible to a single governance structure. Yet there are a number of reasons why applying a microscope to a single type of tie, equity, is useful. First, to truly understand embeddedness—how social relationships, cultural context, and institutional environment interact with economic exchange—it is useful to identify a single example of such an interaction, and in Japan, equity, with its symbolic, as well as economic significance, is a particularly

good choice. Second, there is evidence that equity ties are particularly prevalent and important, not only in auto parts supply networks, but across the Japanese economy. A 1993 survey by the Japan Fair Trade Commission found that automakers held shares in almost 60% of their top thirty suppliers (ranked by volume) (Japan FTC, 1993: 27).<sup>2</sup> Automaker equity stakes in suppliers fit into a larger pattern of institutional shareholding in Japan as well. Cross-shareholding links buyers and sellers of industrial products and raw materials as well as diverse firms in both related and unrelated industries—to the extent that in 1991, nonfinancial companies held 25.1% of shares of all listed companies (Teranishi, 1994: 48).

Further evidence of the importance of equity ties in the Japanese economy is apparent in research relating shareholding to firm performance. Firms linked to large business groups—the bank-centered groups (*kigyo shudan*) of Sumitomo, Mitsubishi, Mitsui, Sanwa, Fuyo, and DKB—recover more quickly than independents from financial distress (Hoshi, Kashyap & Scharfstein, 1990) and do so at the expense of higher performing members of these groups (Lincoln, Gerlach & Ahmadjian, 1996). Shareholders often send new management to troubled firms (Kaplan, 1991; Kang and Shivdasani, 1995). They may also infuse cash by purchasing shares held by a troubled firm (Sheard, 1991).

*My discussions with Japanese purchasing managers, as well as a review of published company histories and accounts of rescues of suppliers in the business press, all suggest that automakers (and large manufacturers in other industries) perceive a similar obligation to assist troubled suppliers. Managers described the ends to which they went to help suppliers—from sending their own*

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<sup>2</sup> Automakers hold shares in suppliers with which they do business—instances in which an automaker holds shares of a supplier with which it does no business, merely for the purpose of investment, are rare if not non-existent.

*managers to carry parts from a supplier too troubled to manage its own transportation and inventory system, to sending completely new production lines to suppliers that had lost business when an automaker moved production offshore. Examples of bailouts of suppliers by automakers often appear in the press. In 1993, for example, Toyota Motors arranged for itself and other members of the Toyota group to purchase shares held by Toyota Machine Works, an affiliate facing financial difficulties (Nikkei, 1993).*

*Managers of automakers were quite clear that they perceived an obligation to assist certain suppliers in times of crisis. In interviews, they often began describing obligations towards suppliers in terms of Japanese business ethics: "As a foreigner, you may find this hard to understand, but as Japanese, this is our duty..." Respondents also offered examples of concrete sanctions, suggesting that more than goodwill was at stake. They recounted stories of labor unions picketing companies believed to have treated affiliates badly and suggested that the mass media was constantly on the lookout for scandalous stories of heartless large corporations hurting small, defenseless suppliers. Some managers suggested subtle state pressure as well—one told me that mistreatment of suppliers might bring extra scrutiny by officials at tax time. Even without direct pressure, the state has a number of indirect tools to keep companies behaving appropriately, including allocation of export quotas (Schaede, 1995) and access to subsidies for troubled industries (Tilton, 1996).*

*Managers I interviewed were extremely hesitant to link such responsibilities to shareholding. Many insisted that their firms gave no preference whatsoever to suppliers linked to them by equity, that they were not even aware of which suppliers' shares they held, and that their firms purchased shares in suppliers many years ago for reasons unrelated to their present trading relationship. These managers seemed, however, a bit too adamant about denying a role to equity—perhaps due to discomfort in discussing these issues with an American researcher at a time when trade tensions over auto parts were high and automaker shareholding of suppliers was an issue in trade negotiations.*

*Despite their insistence otherwise, there is reason to believe that equity ties to suppliers are particularly salient to these managers, and do bring a strong sense of obligation. Shareholding is one of the most public, and readily available measures of affiliation between firms. A small industry in Japan is devoted to publishing books and directories that identify equity links (called keiretsu ties in Japanese) between firms. Information on these links are readily available for all listed firms, and for many unlisted firms as well. Newspaper articles about a firm often identify its main keiretsu, or equity affiliation—such as "Tanaka Auto Parts, member of the Toyota keiretsu, announced an early retirement plan yesterday."*

*Further evidence of the significance of an equity stake is the eagerness of suppliers for their customers to purchase their shares, to make public their commitment (Ballon and Tomita, 1988). Purchasing managers of large manufacturers told me that their companies were often hesitant to purchase suppliers' shares—such a public affiliation was not something to be entered into lightly. A relationship between automaker equity stakes and supplier performance shows up statistically as well. In a study of performance of 125 auto parts suppliers during the 1980's and early 1990's, Ahmadjian (1997) finds that suppliers whose shares are held by automakers tend to recover more quickly from economic distress, and in certain cases—such as suppliers of Toyota—do not encounter distress in the first place.*

## **THEORY AND HYPOTHESES**

### **Equity as a credible commitment**

**Shareholding in Japan represents more than a legal arrangement. An equity tie between an automaker and a supplier symbolizes a commitment—an obligation for an automaker to protect the supplier in times of trouble (and to keep it out of trouble in the first place). This obligation is supported by informal, but no less powerful, social, political, and economic**

**institutions particular to Japan. Orru, Biggart, and Hamilton (1991: 387) write:**

**"Asian firms, like all firms, operate in an institutional environment that presents a structure of constraints and possibilities, but, most importantly, of normative forms of economic action. Each of these economies, our data suggest, fashions itself after a distinctive institutional environment, generating a characteristic pattern of business relationships. These relationships are not simply ones of convenience or efficiency, but represent enactments of socially acceptable, institutionalized forms of economic behavior—they are the manifestations of a normative structure that underlies economic activity and provides market order.."**

**In Japan this normative structure involves obligation—of strong firms to weak, of customers to suppliers. Yet this obligation does not exist among all firms, but rather between firms that are publicly associated with the same "group." Perhaps the most public way of defining a group relationship is by equity.**

**Understanding equity as a commitment, rather than a means for one firm to establish control, influence, or monitoring over another, requires us to depart from a U.S.-centered view of equity. This does not, however, mean a complete departure from theory. Equity ties, as they function in Japan, play a role remarkably consistent with the notion of credible commitments, as set out in transaction cost economics. In the transaction cost framework, a credible commitment is an assurance that a party to a transaction will not behave opportunistically once another has invested in dedicated assets. Such commitments often take the form of hostages—investments that a party to the transaction will forfeit if it behaves opportunistically (Williamson, 1985). But an equity stake in Japan is more than a sum that will be lost if a supplier performs poorly or goes out of business. Rather, it represents an obligation that the automaker will not suddenly sever the relationship, and will try to keep the supplier**

healthy.

Although the notion of credible commitment is not exclusive to transaction cost economics, transaction cost economics has made this concept particularly applicable to Japanese supply relations by wedding it to asset specificity. According to transaction cost economics, a credible commitment is one of a range of governance structures that protect a firm that has made transaction-specific investments in assets ranging from specific sites, physical equipment, dedicated capacity, and knowledge and skills (Williamson, 1985). Such specific investments are hazardous due to the "fundamental transformation"—in the case of an auto parts supplier, the change in bargaining position once it has made investments specific to a single automaker.

Students of Japanese automobile supply networks argue that Japanese auto parts suppliers make particularly high levels of customer-specific investments. Auto parts tend to be highly customized to specific automakers and models, and as a result, necessitate considerable investment in non-redeployable assets (Dyer, 1995; Nishiguchi, 1994). Investment in customer-specific sites is common—as seen in the concentration of Toyota suppliers in Toyota City and its immediate environs. Japanese auto parts suppliers also make considerable investments in specific human capital. Guest engineers, dispatched by suppliers to an automaker's facilities, learn everything from how it manages the development process to the shorthand it uses for notes on its drawings (Asanuma, 1989). Suppliers develop informal networks with an automaker's managers and engineers, to obtain information and get things done (Liker et al., 1995).

An automaker is willing to make a costly equity investment in a supplier as a credible commitment because supplier specialization enhances its own performance. This high degree of supplier specialization facilitates information exchange and learning (Dyer, 1996) and has helped Japanese automakers to make drastic reductions in costs and development time, while

keeping quality high. The need to manage only a small handful of highly dedicated suppliers allows automakers efficiencies of coordination and control (Nishiguchi, 1994).

Automakers also make investments dedicated to their suppliers. High customization of parts and low inventories due to the just-in-time system makes it difficult to change suppliers in midstream. Yet there is reason to believe that specific investments weigh more heavily on suppliers than on automakers. Automakers are far larger than suppliers—for example, Nippondenso, the largest auto parts supplier in Japan has only about one-fifth of the assets of its main customer, Toyota. Most suppliers, even first tier suppliers, are smaller. First tier suppliers vary greatly in size: while about 25% of first-tier suppliers of an average automaker have over 1000 employees, nearly half have fewer than 300 (Japan FTC, 1993: p. 7). While the loss of a supplier may be disruptive for an automaker, it can be devastating for a supplier.

Measuring specific investments has been a challenge to researchers in transaction cost economics. Some have addressed this problem through finely detailed interview or survey data (Walker and Poppo, 1991). Others have used general measures likely to relate to specific investments, such as development time and R&D intensity (Monteverde and Teece, 1982; Pisano, 1989). In this study, I use a combination of measures—both fine-grained measures such as the difficulty of manufacture of each part as well as broader measures such as firm size and the degree of dependence of one firm on another for purchases or sales of parts. The entire pattern of results, across a number of measures, provides a more reliable picture of patterns of governance in the industry than single measures taken in isolation.

Although Williamson (1985: 308) warns that “the mere fact that one firm does a considerable amount of business with another...does not establish that specific assets have thereby been exposed,” there is reason to believe that volume dependence is related to asset specificity in the Japanese industry. A supplier that sells a large percentage of its output to a single customer

**is likely to have added production capacity in the understanding that its relationship will be ongoing. It is likely to have made investments in dedicated human assets—in deploying engineers to the automaker and in developing informal communication networks with its employees. Even if it has not made large investments in specific assets, it is unlikely to be able to replace quickly lost business. Typically, an automaker initiates a relationship with a new supplier only very slowly, with small orders at first, until it is assured that this supplier is reliable (Smitka, 1991). A supplier will be willing to limit relationships with other automakers and increase dependence on a single customer if that customer has made a commitment that it will not sever the relationship.**

H1: The larger the percentage of its total output that a supplier sells to an automaker, the more likely that automaker is to hold that supplier's shares.

Another measure of the degree to which a supplier has made customer-specific investments is the number of different parts a supplier sells to that customer. A supplier that sells only one part to an automaker is likely to know the purchasing agents and engineers who deal with that part very well. A supplier that sells many parts will be much more widely integrated into the automaker through both formal and informal relationships. Moreover, given that relationships are built over time, with an automaker making small orders at first, a supplier that sells many parts to an automaker is likely to have spent many years developing this relationship, and investing in customer-specific human and physical capital.

H2: The more parts a supplier sells to an automaker, the more likely that automaker is to hold that supplier's shares.

The smaller the supplier, the more hazardous opportunistic behavior on the part of an automaker is likely to be. The Japanese economy is highly stratified by firm size (Clark, 1979) and larger firms have



greater access to capital and to quality employees. Larger suppliers have considerable technological expertise and marketing savvy. Larger suppliers, for example, were quite proactive in moving into the US market to supply US automakers and Japanese transplants, often moving before their main Japanese customer had developed production facilities (Martin, Mitchell, and Swaminathan, 1995). A larger supplier is thus better able to diversify its customer base in the event that a customer threatens to sever its relationship. Smaller suppliers, with fewer alternatives, will be more likely to require credible commitments before making specific investments.

H3: The smaller a supplier, the more likely an automaker is to hold its shares.

The degree of specific investments is likely to differ across characteristics of the part. Parts that are more difficult to manufacture, due to complexity, specialized skills, and stringent specifications, require a greater level of specific investment on the part of suppliers, in equipment as well as customer-specific skills and relationships (Nishiguchi, 1994).

H4: The more difficult a part to manufacture, the more likely that an automaker holds shares of a supplier of that part.

There is also evidence that the degree to which automakers and suppliers make specific investments varies by automaker. Toyota, in particular, has been identified as most likely to have suppliers make specific investments. Toyota is more likely than other automakers to exchange engineers with suppliers (Liker et al., 1995) and was the first to introduce sophisticated manufacturing and control techniques to its suppliers (Lieberman, Demeester, and Rivas, 1995). While some manufacturers trail closely after Toyota, e.g. Nissan, in the adoption of such practices, others seem to involve their suppliers very little. (A purchasing manager of a smaller automaker said to me: “We never send engineers to suppliers. We give them drawings, they submit parts to us, and that’s that.”)

H5: Toyota is more likely than other automakers to hold shares of its suppliers.

## Equity ties as a means of control

I have argued above that equity serves as a credible commitment from buyer to supplier—as an assurance that the buyer will not take advantage of a supplier that has made investments in specific assets. This perspective diverges from western organization theory in that it considers equity as having a symbolic role—embedded in the cultural, social, and institutional context of the Japanese economy.

This view of a buyer using equity as a credible commitment to a supplier also diverges from an alternative perspective on Japanese buyer-supplier relations—one of power and control. Discussion of power is never far away in the study of Japanese supply networks. The *nijyu kozo*, or *dual economy framework*, provided the dominant outlook on supply relations in Japan for many years. *The view of suppliers as a disadvantaged group, easily susceptible to opportunistic behavior on the part of automakers dominated both the thinking of Marxist economists and conservative politicians and bureaucrats. In 1957, the official Economic White Paper described Japan as a dual economy, and concern about the viability of small firms led to numerous institutions and laws to assure these firms of preferential access to capital, and prevent exploitation by large manufacturers (Arita, 1985).*

*According to the dual economy perspective, ties of control flow exclusively from buyer to supplier. There is some empirical evidence supporting this. In their analysis of linkages between 250 large firms, Lincoln, Gerlach, and Takahashi (1992) find that while reciprocal holdings are common among larger firms, the degree of reciprocity decreases when smaller firms are involved.*

*H6: Equity ties extend from automaker to supplier; not in the other direction.*

*Resource dependence theory (Pfeffer and Salancik, 1978) is another theoretical perspective that takes into account dynamics of power and dependence and has implications for equity linkages*

*between automakers and suppliers. According to this perspective, organizations manage dependence through a variety of strategies. While Japanese-style equity positions have not been considered in this context, they may be means to manage dependence. If large enough, a shareholding stake enables an automaker to influence a supplier's behavior. Even smaller stakes are often accompanied by dispatch of directors (Lincoln, Gerlach, and Takahashi, 1992) who can bring to a supplier personal influence. Suppliers may use this strategy as well—holding shares in an automaker to minimize dependence, or requesting an automaker to purchase its shares and dispatch directors as a means of co-optation.*

*According to resource dependence theory, an organization is dependent upon another to the extent that a part is critical, a supplier has discretion, and the buyer has few other alternatives. A relationship in which an automaker purchases a large percentage of its inputs of a part from a supplier is a particularly critical one; if such a supplier demands higher prices, the automaker has little choice but to agree. With inventories cut to a bare minimum in the just-in-time production system, the loss of a supplier can be disastrous—even if many suppliers of similar parts exist.*

*H7: The larger of a percentage of its total purchases of a part that an automaker purchases from a supplier, the more likely that automaker will hold that supplier's shares.*

*If equity links from automaker to supplier manage dependencies, these ties will be especially prevalent in cases in which an automaker has few other alternatives. Conversely, they should be less frequent when an automaker has other alternatives. If an automaker is able to manufacture a part in-house, it can make a credible threat that it will withdraw its orders. Automakers able to produce a part in-house are less dependent upon suppliers and do not need to hold their shares.*

*H8: An automaker that produces a part internally is less likely to hold shares in a supplier of that*

*part.*

*An automaker is also less likely to need to reduce dependence on parts for which there are many alternative suppliers. Research on resource dependence has paid particular attention to market concentration, a measure of the existence of alternatives, as a condition that increases dependence (Burt, 1983). This is a point upon which resource dependence and transaction cost economics differ. According to transaction cost economics, the actual number and concentration of suppliers does not matter, since the important issue is the degree of specific asset investments.*

*H9: The more suppliers that sell a part, the less likely an automaker will hold shares of a supplier of that part.*

### **Equity ties and history**

Equity links between automaker and supplier may be related to particular historical circumstances. In the early years of the auto industry, auto parts suppliers were not particularly sophisticated; if an automaker was to have viable suppliers it had to invest in developing them. Apprehension about the future of the auto industry and labor unrest in the early post-war years made automakers hesitant to develop capabilities internally, and gave them more incentive to either invest in, or establish, independent suppliers (Cusumano, 1989; Odaka, Ono, and Adachi, 1988). In the 1960's, another wave of investment by automakers in suppliers occurred, as suppliers asked automakers to hold their shares and protect them from takeover as Japanese financial markets were opened to foreign firms (Ballon and Tomita, 1988).

If equity linkages are remnants of a particular historical period, we should expect them to be limited to firms that existed, or at least were well-established, during this period. Later entrants into the auto industry, such as Honda and Mitsubishi Motors, will be less likely to hold shares in suppliers than earlier entrants such as Nissan and Toyota.

H10: Early entrants to the auto industry are more likely to hold shares in their suppliers.

Another circumstance under which an automaker holds shares in a supplier is when the supplier is a spun-off division. This process of spin-off, in which a firm sets up a division as an independent firm, is quite prevalent in the Japanese economy, and has increased over time (Ito, 1995). A number of prominent suppliers, in particular Nippondenso, are spun-off divisions of automakers. An parent company tends to maintain equity in its spin-offs, although it gradually decreases the size of its stake over time. If this is the case, we should expect to see newer suppliers with equity ties to automakers, as these represent the most recent spin-offs.

H11: Automakers are more likely to hold shares of younger suppliers (suppliers with later founding dates).

An automaker may also take an equity position in a troubled supplier to provide it with capital—and that equity tie may remain even after the financial crisis eases. These incidents tend to be firm specific, and depend upon the policies of each individual company towards bailouts. In this case, we should expect to see quite a bit of variation in patterns of shareholding among automakers, that cannot be explained by such systematic measures as firm size, founding date, and transaction characteristics.

## DATA AND METHODS

The data set draws from a number of sources. Data on parts come from *Jidosha Buhin no 160 Hinmei no Seisan Ryutsu Chosa* (A survey of manufacture and distribution of 160 auto parts) published in 1987 by IRC, a private purveyor of business information (1987). This report lists first tier suppliers of each of the 11 Japanese auto manufacturers for 160 automobile parts. This source includes the name of each supplier as well as the volume provided to each auto manufacturer. Thirty parts were omitted from the final sample—either because they were used for only a limited number of models or by a limited number of automakers, or because information on the difficulty of manufacture was unavailable.

Data on suppliers and automakers, including assets, founding data, and composition of shareholders were obtained from the 1989 volumes (containing firm data for 1987) of *Kaisha Nenkan* and *Kaisha Sokan*, annual corporate reports for firms listed on any Japanese stock exchange and approximately 10,000 unlisted firms, respectively. These volumes are published annually by the *Nihon Keizai Shimbun-sha*, a leading publisher Japanese economic data. Data on unlisted firms not included in these volumes were obtained from *Kaisha Soran*, a directory published by *Diamond* (1989).

In total, 455 firms supplied these 130 parts. I was able to obtain data for virtually all of the 131 listed suppliers. Of the 324 unlisted firms, data for only 106 were available. The data set covers 74% of the transactions involving these customers, suppliers, and parts, although it only covers 50% of all suppliers involved. Despite incomplete coverage of unlisted firms, inclusion of a limited number of unlisted firms has some advantages. Since unlisted firms tend to be smaller, it enables inclusion of many small firms. This is important in analyses of supply networks, where the issue of how automakers treat their smallest suppliers is especially controversial.







*supplier. Information on ties extended in this direction is available for both unlisted and listed firms. Data on supplier shareholding of automakers are available for listed firms only.*

### **Independent variables**

**Volume dependence PCTSU** is the percentage of an automaker's purchases of a part from a supplier, averaged over all parts that automaker purchases from that supplier. If automaker *j* purchases 50% of its inputs of part *x* from supplier *i*, and 40% of its inputs of part *y* from supplier *i*, this measure takes the value of 45%. A similar measure, PCTCU, was constructed for supplier dependence on each automaker.

**Number of suppliers per part** This represents the existence of alternative suppliers for a part. It is the number of suppliers per part, averaged over all parts that automaker *j* purchases from supplier *i*. If a supplier sells an automaker part *x* and part *y*, and there are a total of 2 suppliers of part *x* in the market, and 4 suppliers of part *y*, this takes the value of 3.

**Extent of internal production** This is the percentage of its inputs of a part manufactured by automaker *j* internally, averaged over all parts that automaker *j* purchases from supplier *i*.

**Total number of parts supplied by supplier *i*** This is the total number of different kinds of parts that supplier *i* sells to automaker *j*.

**Difficulty of manufacture** Difficulty of manufacture of a part ranges from 1=very simple to 3=very difficult. It is averaged over all of the parts that supplier *i* sells to automaker *j*. Parts that are difficult to manufacture are complex, require high levels of skill, and have very stringent specifications (i.e. tight tolerances). I requested three engineers, who were responsible for parts procurement for three Japanese transplants in the U.S, to evaluate the difficulty of manufacture of a list of parts. Each engineer evaluated the parts with which he had the most experience.

**Other variables** Other independent variables include year of founding of supplier and automaker, total assets of supplier and automaker, whether a supplier is listed on the stock exchange or not, and a set of dummy variables for automaker and parts system.

## FINDINGS

Table 1 presents an overview of differences between automakers in patterns of transactions. It shows that automakers have varying propensities to hold shares of suppliers. It also highlights variations in propensity to manufacture parts internally and dependence upon suppliers.

### **Equity as credible commitment**

Table 2 presents descriptive statistics and correlations for selected variables. Table 3 reports models explaining the effects of various characteristics of automakers, suppliers, and transactions on the existence of an equity tie from automaker to supplier. The model in column 3 includes dummies for automakers, while the model in column 4 includes dummies for parts subsystems.

The results presented in Table 3 support the proposition that equity ties are a credible commitment from automaker to supplier. I argued that in Japan, dependence of a supplier on an automaker for purchases is related to customer-specific investments. A supplier that supplies a number of different parts to an automaker is also more likely to have made specific investments—in physical equipment as well as specific knowledge and informal relationships with an automaker's engineers and managers. Likewise, more difficult to manufacture parts require higher levels of specific investments.

Hypotheses concerning all of these variables are supported. The larger the percentage of its output a supplier offers to an automaker, the more types of parts it sells to an automaker, and the more difficult its parts to manufacture, the more likely that automaker holds the supplier's shares. Automakers are also more likely to hold shares in their smaller suppliers, as posited by Hypothesis 3. Smaller suppliers are more liable to be adversely affected by an automaker's opportunism, and thus

more likely to require a commitment.

Column 4 of Table 3 examines the relationship between various parts systems and automaker equity links to suppliers. This model includes dummy variables for five parts systems (the omitted categories are wheels, suspension, body parts, and miscellaneous parts). Automakers are more likely to hold shares in suppliers of transmission and steering parts and less likely to hold shares of makers of body parts, wheels, and miscellaneous parts including air conditioners, clocks, and radios. Parts system is not correlated with manufacturing difficulty and seems to measure an unknown dimension of the transaction that requires further examination. It is interesting to note that automakers are not significantly more likely to hold shares in suppliers of engine parts, although engine parts require perhaps the highest level of cooperation and interaction between automaker and supplier of all the systems. If cooperation is related to asset specific investments, these results suggest a curvilinear relationship between asset specificity and governance, in which equity helps to govern transactions involving moderate levels of specific investment.

Column 3 of Table 3 examines variation among automakers. The model includes dummy variables for six automakers: Toyota, Nissan, Mitsubishi Motors, Honda, Mazda, and Isuzu. Five firms, Suzuki, Nissan Diesel, Fuji, Hino, and Daihatsu were omitted due to problems with multicollinearity. Toyota and Nissan are most likely to hold equity in their suppliers, which is expected if suppliers of Toyota and Nissan are most likely to make specific investments. An alternative interpretation of this result is firm size. The log of automaker assets is positively and significantly related to the likelihood of an equity link to a supplier. The fit of the model does not improve when dummy variables for automakers are substituted for a continuous measure of automaker assets, suggesting that firm dummies and assets capture the same effects.

Why are larger automakers more likely to hold equity in their suppliers? A simple answer is that larger automakers have deeper pockets and more capital to invest. Alternatively, the relationship between

automaker size and equity investment in suppliers may be the result of reverse causality. If automakers hold shares in suppliers that have made specific investments, and specific investments by their suppliers lead to higher economic returns for automakers, those firms which purchased supplier shares in order to encourage them to make specific investments may have been more successful and grown faster than those that did not. Another explanation involves power and exploitation: if automakers use equity shares in suppliers to extract excess rents, automakers who have these links may have been able to grow faster.<sup>3</sup>

There is also a possibility that the relationship between size and equity is an artifact of the sample. Smaller automakers may hold shares of very small, unlisted suppliers, for which data on shareholder composition were not available. Alternatively, they may hold small positions that do not appear among the top 10 in larger suppliers. Yet percentage of missing suppliers does not appear to be highly correlated with number of equity ties to suppliers. Mitsubishi, for example, is more likely than Suzuki, Daihatsu, Fuji, Nissan Diesel, or Hino to hold supplier shares, even though many Mitsubishi suppliers are missing from the data set. Although a high percentage of Isuzu suppliers are included, Isuzu holds shares of far fewer suppliers than Toyota or Nissan. When the sample is limited to listed firms, for which no suppliers are missing, the estimates of propensity to hold supplier shares are virtually the same as estimates for the entire sample.

### **Equity as symbol**

Table 4 presents models in which an equity tie from automaker to supplier is measured as a continuous variable. These results lend further support to the notion of equity as a symbolic commitment. The first column presents a tobit regression of continuous ties from automaker to supplier for all automaker-supplier dyads. The second column presents ordinary least squares analysis of continuous equity ties from automakers to suppliers, for dyads in which an equity tie exists. This model addresses the question: “Given the existence of an equity tie, how much does the actual

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<sup>3</sup> I also conducted analyses separately for each customer. I found that the while propensity to hold shares in suppliers differed by automaker, the basic relationships, between volume dependence, size, and manufacturing difficulty varied in intensity but not direction.

intensity of the tie matter?”

In the OLS analysis, many of the significant effects disappear. Number of parts procured from a supplier, size of supplier, and difficulty in manufacture all lose significance and strength. The effect of supplier dependence on an automaker (PCTSU) remains significant, but is quite small. While selling 100% of its output to an automaker nearly doubles the log odds that an automaker holds a supplier’s equity, a move from 1% to 100% reliance of a supplier on an automaker is associated with an increase in equity stake of only about 0.12. These results show that equity ties from automaker to supplier are public symbols of affiliation rather than means of control.

### **Equity and the dual economy**

At first glance, some of the results reported above as supporting a credible commitment interpretation of equity ties are consistent with a dual economy perspective. An automaker that holds enough of a supplier’s shares can exert considerable control and require the supplier to sell it a large percentage of its output—even if the supplier prefers to become more diversified. An automaker that holds a large stake in a supplier can also use its influence to extract excess returns, and prevent the supplier in investing in its own growth. As a result, suppliers tied to their customers with equity will be smaller and more dependent than independent suppliers.

Table 4 presents counter-evidence. An automaker’s ability to keep a supplier weak and dependent should increase with the size of its equity stake and its resulting ability to exert control. The results in Column 2 of Table 4 show that the size of an automaker’s equity stake has no relationship to a supplier’s size, and only a slight relationship to supplier dependence.

### **Equity and resource dependence**

As postulated in Hypothesis 6, the more an automaker purchases from a supplier, the more likely it is to hold that supplier’s shares. This finding in itself is consistent with resource dependence theory:

an automaker that depends upon a supplier for inputs of a part will try to manage this dependence by purchasing its shares. Other results, however, call this interpretation into question. Furthermore, analyses presented later in this paper indicate a high degree of reciprocity in shareholding when automakers are dependent upon suppliers—suggesting something other than the unilateral management of dependence posited by resource dependence theory.

Further evidence against resource dependence is the finding that, contrary to Hypothesis 8, internal production capability does not reduce an automaker's likelihood of holding supplier shares. In fact, an automaker is even more likely to hold shares of suppliers of parts that it produces internally. This lends further support to a credible commitment interpretation. A supplier will be particularly unwilling to make specific investments in an automaker that can easily internalize production—and requires a credible commitment that its customer will not suddenly bring all production in house. It is also possible that parts an automaker manufactures internally require the highest degree of specific investment; thus, an automaker must make a credible commitment to encourage suppliers of such parts to make the necessary investments.

Contrary to predictions based upon resource dependence theory, an automaker is not more likely to hold shares in suppliers of parts for which there are few alternatives. The number of suppliers of a part has no relationship to the likelihood of an equity tie from automaker to supplier, in contrast to Hypothesis 9. This is further evidence of a fundamental transformation to a small numbers bargaining situation once specific investments are made. Even if there are alternative suppliers, it is not easy for an automaker or supplier to initiate new relationships.

Another finding that runs counter to resource dependence theory is the negative relationship between supplier size and equity ties. If automakers purchase shares of suppliers to manage dependencies, they should be most likely to hold shares of their largest, most powerful, suppliers. On the contrary, they are more likely to hold shares of their smallest suppliers. Furthermore, we find that small automakers

are not highly likely to hold equity in large listed suppliers. Resource dependence theory predicts the opposite—given the dominance of the Japanese auto industry by a few large firms, in particular Toyota and Nissan, smaller automakers should try to lock in relationships with suppliers through equity ties.

In the previous section, I argued that the positive relationship between manufacturing difficulty and the likelihood of an equity tie from automaker to supplier was evidence that equity was a credible commitment, as manufacturing difficulty was related to specific investment on the part of the supplier. This finding, however, could also be interpreted through resource dependence theory. A supplier with superior manufacturing skills controls a resource in the form of knowledge and skill that is valuable to the automaker. An automaker is highly dependent upon such a supplier since it cannot reproduce those skills itself, and will consequently hold its shares.

Analysis of the interaction between supplier assets and manufacturing skill, presented in column 2 of Table 3 indicates that this is not the case. The effect of difficulty of manufacture on propensity of an automaker to hold a supplier's shares decreases the larger the supplier. If a customer held a supplier's shares to reduce its dependence, we might expect the opposite. Large suppliers with sophisticated manufacturing skills should pose the biggest danger to an automaker, and thus require a dependence-minimizing equity tie.

## **Reciprocity**

Table 5 presents models of reciprocal shareholding for listed firms. These findings indicate considerable reciprocity—in the existence if not the magnitude of equity ties.

The model in column 1 of Table 5 is identical to column 1 of Table 3. Column 2 adds supplier equity stake in the automaker as an independent variable. The effect of this added variable is strong and significant and the fit of the model improves significantly. When this variable is added, however, the effect of supplier purchases from an automaker (PCTSU) drops to one half of its original size and its significance disappears. The strength of the effect automaker purchases from supplier (PCTCU) also drops and the significance disappears. The inclusion of supplier equity tie to automaker hardly affects coefficients for internal production, difficulty in manufacture, number of parts supplied, and automaker and supplier size.

This finding suggests a reciprocal commitment of equity in cases in which a supplier sells a large percentage of its outputs to an automaker and those in which an automaker purchases a large percentage of its output from a supplier. This may be because in these cases, both parties make considerable investments in relationship-specific assets. In the case of parts that are difficult to manufacture, the supplier is more likely to make relationship-specific investments, and requires a credible commitment from the automaker rather than a reciprocal commitment of equity.

Columns 4, 5, and 6 present models for equity ties from supplier to automaker. Suppliers are significantly more likely to hold shares in automakers upon which they are dependent for a large percentage of their sales, automakers that depend upon them for a large percentage of their purchases, and automakers to which they sell multiple parts. They are also more likely to hold shares in an automaker when they are small and the automaker large. Suppliers that supply parts that are difficult to manufacture or that are produced internally by their customers are not significantly more likely to hold shares of automakers.



As in the previous case, adding automaker equity stake in supplier as an independent variable improves the fit of the model and decreases the effect of supplier dependence. When a supplier is dependent on an automaker for purchases of its output, it tends to both send and receive equity ties—evidence that these relationships are managed through cross-shareholding rather than unilateral equity links extended from the automaker.

While there is considerable reciprocity in automaker-supplier shareholding, the size of supplier equity stakes in automakers is small. While on average an automaker that holds shares of its suppliers has a stake of 15.6%, of suppliers that hold automaker shares, the average position is 0.7%. Extremely small coefficients in the tobit analysis of supplier equity positions in automakers provide further evidence of the small size of supplier shares in their customers.

### **Effects of history**

The effects of year of entrance into the auto industry (in the case of automakers ) or founding (in the case of suppliers) are weak, though the signs are in a direction consistent with the hypotheses. Older automakers are more likely to hold shares of younger suppliers.

Listed status has a large and significant effect: automakers are much more likely to hold shares of listed suppliers. This may be because listed suppliers have more shares available for purchase—many unlisted suppliers are family owned. It is also a common practice for an automaker to purchase shares in a supplier at the time of its listing, as a public demonstration of support—further evidence of the public, symbolic role of equity.

## **DISCUSSION**

Equity plays a significant role in the governance of purchasing transactions in the Japanese auto industry. Automakers hold shares of suppliers that dedicate to them a large percentage of output, suppliers from which they purchase a large number of parts, suppliers of parts which require a high

degree of manufacturing skill, and small suppliers. These patterns suggest that equity is a credible commitment—a public statement that an automaker will not behave opportunistically to a supplier that has made specific investments.

### **Credible commitment or co-optation**

An alternative interpretation of these results is co-optation (Selznick, 1949). As discussed elsewhere in this paper, suppliers are often quite eager for important customers to purchase their shares. We could interpret this as a supplier co-opting a buyer—trying to reduce its dependency by convincing a buyer to make a public commitment that it will not behave opportunistically.

In Japan, shareholders often accompany their equity stake with the dispatch of one or more directors (Lincoln, Gerlach, and Takahashi, 1992), offering further opportunity for a supplier to co-opt a buyer through director interlocks.

There is, however, one very important difference between co-optation and the logic of commitment that I argue is more descriptive of these buyer-supplier relationships. Co-optation suggests one party unilaterally managing its dependence on another. A supplier co-opts an automaker because it is in its own best interest to do so—whether this co-optation benefits the automaker or not is of no concern. The notion of credible commitments, on the other hand, highlights the cooperation involved in a linkage between automaker and supplier. An automaker holds shares of a supplier to assure the supplier that it will not act opportunistically. This is in the best interest of both the supplier and automaker. For this reason, a credible commitment, with its emphasis on benefits to both parties, is a more apt description of linkages between Japanese automakers and their suppliers.

### **Supply networks and power**

The analyses in this paper are consistent with other research on supplier networks in Japan in finding that relationships between automakers and suppliers are reciprocal and cooperative. Equity from automaker to supplier is not a means of exploitation as set out in the dual economy perspective.

Neither is it a means for suppliers and buyers to unilaterally manage their dependencies, as in resource dependence theory. The analyses presented here indicate that contrary to resource dependence theory, automakers are no more likely to hold shares of suppliers when there are few alternative suppliers and are even more likely to hold shares of suppliers of parts that they produce internally.

Yet power cannot be dismissed for several reasons. The first is asymmetry in size of equity linkage. Automakers hold larger stakes in their suppliers than vice versa. I argued that the role of equity ties in managing exchange is largely symbolic. Yet automakers that have equity in suppliers hold an average of 15.6%. While an automaker may not use this influence to exploit a supplier—to obtain higher returns, or force dependence—it may use its influence in other ways. Shareholders fulfilling their obligation to keep affiliates afloat may take drastic measures such as replacing management and redirecting strategy. What appears as a rescue to some is likely to be interpreted as an exercise of power by supplier managers who have lost their jobs.

Equity ties from automakers also represent a valuable resource to a supplier—and for this reason, an equity link from automaker to supplier has a different meaning from a link extending from supplier to automaker. An equity tie from an automaker is a source of legitimacy for a supplier, critical in the Japanese economy where smaller firms and suppliers tend to be lower in status, and have more difficult access to human and financial capital. Suppliers known to be closely affiliated to automakers often receive preferential interest rates from banks (Dyer, 1996). Suppliers, an auto industry manager told me, greatly desire a customer's equity participation, so that they can proudly put “Affiliate of Automaker X” on their signboards. This signal of higher status will help them in recruiting employees, important in an economy where small firms are considered less desirable places to work. It will even help them find other customers, who are relieved to know that a large automaker considers them reliable. Public approval of an automaker opens doors for a supplier—and desire to obtain this approval may constrain a supplier's behavior. Consequently, an equity stake in a supplier may be a

source of power for an automaker, even if the automaker does not use this power to directly dominate and control the supplier.

### **Where do equity ties come from?**

The finding that equity ties function as credible commitments does not necessarily mean that these ties were consciously and deliberately crafted to play such a role. In the cross-sectional data set analyzed in this paper, it is impossible to determine whether or not automakers actually purchased supplier shares to anticipate or respond to increasing levels of asset specificity. There is, however, intriguing evidence in other archival materials, particularly published company histories, that the direction of causality is reversed—and the characteristics of transactions evolved to match a governance structure already in place.

Many automakers and suppliers attribute initial purchases of shares to reasons far removed from the management of transactions. In their accounts, automakers purchased suppliers' shares as protection from foreign takeover, or as capital infusions

when a supplier was short of cash or needed to invest in development of new technologies or skills. A manager (of a large consumer electronics firm) offered me an example of how requirements of a transaction could evolve in the course of a relationship. He described a supplier of simple VCR parts, whose business had disappeared as its customer moved VCR production overseas. To save the supplier, his firm moved to it a semiconductor equipment manufacturing line—a completely different business, requiring significantly higher levels of skill and specific investments.

A similar line of reasoning can explain the evolution of supply relations in the auto industry. There is evidence that automakers established equity links to their suppliers in the 1950's and 1960's (Japan FTC, 1991), before the specific-investment-requiring institutions of the *kanban system*, *joint product development*, *value analysis and value engineering* had developed significantly. *Many of these innovations came from Toyota—a firm that had equity stakes in quite a few suppliers in the early post-war years. Did Toyota's existing web of equity relationships provide a governance structure that encouraged suppliers to make specific investments, and allow the innovations known today as Japanese purchasing practices?*

*Japanese management practices, ranging from manufacturing systems to human resource management, are often described as deliberately, thoughtfully constructed systems. Sabel (1994), for example, identifies collaboration between customers and suppliers as an example of evolution through learning. Aoki (1988) and others*

*who explain Japanese practices in the context of economic models do not pay much attention to their evolution—but imply that they are a deliberately crafted, rational set of institutions. Historical analyses of the development of these practices, however, indicates a more path dependent process. Gordon (1985) describes how human resource policies in Japan were, in part, a response to labor unrest after World War II. Recent research on the development of Japanese manufacturing systems suggests that the evolution from a Fordist to Toyota system of production was in part, due to trial and error and path dependence (Shioji, 1994).*

*The relationship between cross-shareholding among Japanese automakers and their suppliers and the development of a unique system of purchasing management, in which suppliers invest heavily in customer-specific assets, may be the result of an evolutionary process (Nelson and Winter, 1982), in which the characteristics of the transaction evolved to match an existing governance structure of equity ties. More research on this co-evolution of governance structure and transaction through longitudinal analysis of the extension of equity ties and evolution of purchasing relationships is necessary.*

## **CONCLUSION**

This research has a number of implications for organization theory. First, it demonstrates that embeddedness and transaction cost economics are not mutually exclusive. Equity ties between Japanese automakers and their suppliers are embedded in the sense that much of their significance derives from factors specific to the Japanese economy. These ties also play a role consistent with transaction cost economics—they serve as a public commitment that an automaker will not take advantage of a supplier that has made relationship-specific investments.

This complementarity of transaction cost economics and embeddedness suggests an alternative approach to comparative research—one which combines case-specific analysis with generalizable theory. Purportedly universal theories, such as transaction costs economics, can be powerful if we carefully shape their assumptions to reflect social, cultural, and institutional realities. This paper demonstrates that transaction cost economics is a useful framework to understand buyer-supplier relationships in Japan, provided that we understand what governance means in a Japanese context, in particular, the symbolic significance of equity.

Second, this research demonstrates a logic of commitment in relationships between Japanese

automakers and suppliers. Automakers hold shares of their suppliers not to control them, but rather as symbols of affiliation and obligation. This is counter to the dual economy perspective, according to which automakers and other large Japanese manufacturers holding shares of their suppliers to better control and extract rents from them. This is also counter to a resource dependence view of interorganizational relationships, in which individual organizations extend linkages to others strategically, to reduce dependence and stabilize transactions in an uncertain world. The governance of buyer-supplier relationships in the Japanese automotive industry is not a matter of control, but rather, a set of highly symbolic, though nevertheless real, commitments.

From a more managerial standpoint, this research suggests limits to the argument that Japanese supply practices are a new paradigm, applicable anywhere in the world (cf. Nishiguchi, 1994). Japanese supply relations are embedded in an environment in which credible commitments from automaker to supplier are taken very seriously. Cross-shareholding provides a readily available means for a buyer to signal its commitment to a supplier. Without such a governance structure in place, it is not possible to replicate Japanese supply practices exactly. Indeed, there is evidence that while U.S. makers have begun to adopt the form of these practices—e.g. increased cooperation with fewer suppliers (Liker et al., 1995)—they have been much slower in adopting the substance, in particular, the notion that an automaker has an obligation to protect its supplier (Helper, 1991).

The Japanese auto industry is in a period of change. Overseas production, reduction of capacity, standardization of parts, and increasing importance of new technologies such as automotive electronics have caused suppliers and automakers to rethink their traditional relationships (Ahmadjian and Lincoln, 1997). Announcements of automakers purchasing parts from suppliers of rival groups and even internalizing production of critical parts (e.g. Toyota's internalization of some manufacture of semiconductors) are evidence that supply networks are changing. It will be interesting to observe how—and if—equity linkages between automaker and suppliers and the obligations associated with

them, change along with the relationships.

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Table 1: Number of relationships, various statistics, 11 automakers

Maker	# dyads	% suppliers with equity tie	% of total supplier shares held by customers (cases in which equity tie exists)	average % of inputs of a part purchased from a single supplier	average % of a supplier's output of a part purchased	average number of parts purchased from a supplier	% of inputs of a part manufactured internally
Toyota	100	.66	.21	.48	.59	14	.08
Nissan	101	.57	.29	.48	.65	6.9	.07
Isuzu	86	.21	.16	.49	.26	5.5	.01
Honda	88	.27	.30	.53	.46	3.9	.02
Mazda	93	.12	.20	.48	.31	6.6	.01
Mitsubishi	109	.13	.16	.42	.32	4.3	.03
N i s s a n Diesel	86	.05	.09	.51	.10	2.6	.01
Daihatsu	79	.06	.39	.59	.18	10.9	.03
Suzuki	90	.03	.10	.52	.20	8.2	.02
Fuji	79	.02	.02	.58	.23	4.4	.007
Hino	73	.12	.13	.56	.12	3.8	.04

Table 2: Means, correlations, 130 auto parts, 11 automakers and 237 suppliers

	mean (sd)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
are held by automaker j	(.36)															
1 if shares of automaker j are held by supplier i	.34 (.47)		1	.31	.14	.02	.09	.14	.12	-.12	.09	-.17	.37	.001	.36	.15
PCTSU:% of output of supplier i purchased by automaker j	.30 (.33)			1	.10	.41	.28	.07	.10	-.03	-.22	-.16	.38	.04	.42	.16
PCTCU:% of output of automaker j purchased from supplier i	.44 (.29)		1	.49	.39	.12	.08	.17	.14	.06	-.09	.04	-.08	.35	.11	.62
# of suppliers per part	7.29 (3.73)				1	-.13	-.22	.13	.12	.05	-.04	-.10	-.2-	-.04	.07	.06
% automaker j input of parts procured from supplier i produced internally	.04 (.14)					1	-.04	.02	-.08	-.04	.03	.14	.13	.19	.11	.003
total number of parts supplied by supplier i to automaker j	2.22 (3.13)						1	.04	-.04	.09	.21	.06	.01	.13	.06	
year of supplier i's founding	40.54 (16.34)							1	.01	-.24	-.29	.04	-.12	.13	.19	
year of automaker j's founding	45.29 (15.14)								1	-.02	-.02	-.09	-.03	-.05	.06	
1 if supplier i is listed	.71 (.45)									1	.56	-.03	.11	-.15	NA	
ln of supplier i's assets	10.82 (1.56)										1	-.01	.16	-.11	.16	
ln of automaker j's assets	13.64 (.90)											1	-.03	.22	.022	
average difficulty of manufacture of parts supplied by supplier i: 3=very difficult, 1=very simple	1.92 (.63)												1	.09	.06	
% of supplier i shares held by automaker j	.03 (.11)														1	.05
% of automaker j shares held by supplier i	.001 (.014)															1





Table 3: Estimates of logit regressions of automaker and supplier equity ties on selected explanatory variables, 130 auto parts, 11 automakers and 237 suppliers

	1=automaker equity share in supplier	1=automaker equity share in supplier	1=automaker equity share in supplier	1=automaker equity share in supplier
PCTSU: % of output of supplier i sold to automaker j	1.872*** (.422)	1.961*** (.429)	2.332*** (.398)	2.185*** (.426)
PCTCU:% of output of automaker j sold to supplier i	2.209*** (.472)	2.509*** (.493)	2.547*** (.478)	1.788*** (.448)
# of suppliers per part	.010 (.035)	-.013 (.036)	.004 (.034)	.022 (.037)
% automaker j input of parts procured from supplier i produced internally	1.865* (.744)	2.549*** (.767)	1.813** (.699)	
total number of parts supplied by supplier i to automaker j	.111*** (.0321)	.105** (.032)	.116*** (.033)	.114*** (.033)
year of supplier i's founding	.007 (.008)	.006 (.008)	.003 (.008)	.013 (.008)
year of automaker j's founding	-.001 (.008)	-.0007 (.008)		-.001 (.007)
1 if supplier i is listed	2.298*** (.368)	2.317*** (.379)	1.961*** (.342)	2.338*** (.379)
ln of supplier i's assets	-.555*** (.098)	.509 (.261)	-.502*** (.097)	-.507*** (.099)
ln of automaker j's assets	.949*** (.150)	.994*** (.154)		.969*** (.152)
average difficulty of manufacture of parts supplied by supplier i: 3=very difficult, 1=very simple	.998*** (.204)	6.596*** (1.387)	.860*** (.193)	.895*** (.214)
difficulty of manufacture*ln of supplier i's assets		-.526*** (.127)		
1 if automaker =Toyota			3.074*** (.406)	
1 if automaker =Nissan			3.077*** (.410)	
1 if automaker =Mitsubishi Motors			1.291** (.433)	
1 if automaker =Honda			1.723*** (.410)	
1 if automaker =Mazda			.644 (.505)	
1 if automaker =Isuzu			1.383** (.439)	
1 if engine part				.202 (.289)
if transmission part				1.425*** (.414)
if steering part				1.256* (.515)
if suspension part				.327

				(.514)
if brake part				.614
				(.581)
autoregression term	-3.511***	-3.577***		-4.065***
	(.772)	(.778)		(.816)
intercept	-14.952***	-26.917***	-3.785**	-16.068***
	(2.579)	(3.961)	(1.216)	(2.629)
log-likelihood(11)	-262.13	-253.14	-269.757	-257.45
pseudo-R <sup>2</sup> (1/10)				
number of dyads	984	984	984	984

\*p<.05; \*\*p<.01; \*\*\*p<.001

1. Slope estimates with standard errors in parentheses. 11 is the log-likelihood for full model with intercept and covariates. 10 is the log-likelihood for intercept only model. Pseudo- R<sup>2</sup> is lower when the model is a perfect predictor and 0 when 11=10. It can be interpreted as the percent of the total "uncertainty" explained by the model (Judge et al. 1985).

Table 4: Estimates of tobit and OLS regressions of automaker and supplier equity ties on selected explanatory variables, 130 auto parts, 11 automakers and 237 suppliers

	% automaker equity share in supplier—tobit—all dyads	% automaker equity share in suppliers—OLS—equity dyads only
PCTSU: % of output of supplier i sold to automaker j	.346*** (.055)	.118* (.054)
PCTCU:% of output of automaker j sold to supplier i	.263*** (.062)	-.059 (.061)
# of suppliers per part	.002 (.004)	.002 (.004)
% automaker j input of parts procured from supplier i produced internally	.249** (.091)	.155 (.079)
total number of parts supplied by supplier i to automaker j	.012** (.004)	.005 (.003)
year of supplier i's founding	.002 (.001)	.003*** (.001)
year of automaker j's founding	-.0007 (.0009)	-.001 (.001)
1 if supplier i is listed	.133** (.042)	.217*** (.039)
ln of supplier i's assets	-.051*** (.013)	-.009 (.016)
ln of automaker j's assets	.113*** (.019)	.007 (.018)
average difficulty of manufacture of parts supplied by supplier i: 3=very difficult, 1=very simple	.115*** (.025)	.032 (.023)
autoregression term	-1.003*** (.172)	-.406*** (.116)
intercept	1.976*** (.341)	.089 (.332)
log-likelihood (l1)	162.81	
pseudo-R <sup>2</sup> (l1/l0)	.51	.53 (adjusted)
number of dyads	984	984

\*p<.05; \*\*p<.01; \*\*\*p<.001

1. Slope estimates with standard errors in parentheses. l

1 is the log-likelihood for full model with intercept and covariates. l0 is the log-likelihood for intercept only model. Pseudo- R<sup>2</sup> is the log-likelihood for full model with intercept and predictor and 0 when l1=l0. It can be interpreted as the percent of the total "uncertainty" explained by the model (Judge et al. 1985).

Table 5: Estimates of logit and tobit regressions of automaker and supplier equity ties on selected explanatory variables, listed firms only

	l=assemb equity share in supplier	l=assemb equity share in supplier	% assemb. share in supplier (tobit)	l=supplie r equity share in automaker	l=supplie r equity share in automaker	% sup. share in automaker (tobit)
l= automaker equity share in supplier					1.893*** (.340)	-.019* (.009)
l = supplier equity share in automaker		2.286*** (.348)	-1.514 (1.257)			
PCTSU:% of output of supplier i sold to automaker j	1.111* (.523)	.651 (.596)	.225*** (.037)	1.055* (.487)	.601 (.534)	.005 (.003)
PCTCU: % of output of automaker j sold to supplier i	1.858** (.576)	1.101 (.633)	.151*** (.040)	1.850*** (.413)	1.516*** (.423)	.009*** (.002)
# of suppliers per part	.008 (.044)	.006 (.046)	-.001 (.003)	.019 (.033)	.021 (.034)	-.0002 (.0002)
% automaker j input of parts procured from supplier i produced internally	2.279* (.899)	2.175* (1.006)	.143* (.064)	1.123 (.902)	.523 (1.055)	.005 (.005)
total # of parts supplied by supplier i to automaker j	.116** (.036)	.090* (.041)	.008*** (.002)	.019 (.033)	.086** (.032)	.0004** (.0002)
ln of supplier i's assets	-.755*** (.120)	-.759*** (.136)	-.048*** (.008)	-.538*** (.089)	-.419*** (.092)	.00008 (.0005)
ln of automaker j's assets	1.194*** (.186)	.877*** (.201)	.090*** (.013)	.894*** (.136)	.648*** (.145)	.0044*** (.0008)
year of supplier i's founding	.019 (.011)	.012 (.012)	.001 (.001)	.018* (.008)	.016* (.006)	.00009 (.00005)
year of automaker j's founding	-.011 (.009)	-.003 (.010)	-.001* (.001)	-.016* (.006)	-.013* (.007)	.000005 (.0004)
average difficulty of manufacture of parts supplied by supplier i: 3=very difficult, 1=very simple	1.126*** (.256)	1.146*** (.269)	.063*** (.016)	.242 (.175)	.069 (.186)	.0006 (.001)
autoregression	-3.849*** (.899)	-4.549*** (1.023)	-4.837* (2.371)	-2.69*** (.473)	-2.691*** (.500)	-2.779*** (.112)
intercept	-13.79*** (3.216)	-10.090** (3.497)	-1.111*** (.222)	-7.921*** (2.281)	-5.587* (2.387)	-.078*** (.013)
log-likelihood (11)	-181.22	-155.13	-28.89	-310.45	-292.77	519.13
pseudo-R <sup>2</sup> (1/10)						
number of dyads	698	698	698	672	672	672
*p<.05; **p<.01; ***p<.001	.42	.51	.84	.27	.31	.65

1. Slope estimates with standard errors in parentheses. 11 is the log-likelihood for full model with intercept and covariates. 10 is the log-likelihood for intercept only model. Pseudo- R<sup>2</sup> is the log-likelihood when the model with predictor and 0 when 11=10. It can be interpreted as the percent of the total "uncertainty" explained by the model (Judge et al. 1985).

