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ABSTRACT

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We argue that *keiretsu* relationships are drifting from “hybrid” or “network” (i.e., *keiretsu*) governance modes toward the extremes of arms-length contracting and top-down administration. These changes are best understood through a combination of transaction cost and learning perspectives on alliance. Consistent with transaction cost economics, the shift in purchase - supply relationships can be traced to changes in the nature of parts transactions and *keiretsu* governance structures. A learning perspective on alliance complements and extends transaction cost theory, providing additional explanation of the sources of change and the specific governance choices being made.

Our first two cases document a drift in Toyota’s *keiretsu* supply network toward hierarchical form in the management of parts supply transactions. Toyota has effectively internalized its transactions with Daihatsu by taking a controlling interest. Toyota’s strategy toward long-term partner Denso, on the other hand, was very different. Toyota built from the ground up an in-house capability in electronic components—thus (particularly at the high end) buying less from and scaling down its dependence on Denso. A third case considers a general trend in the Japanese auto industry toward greater standardization of parts. With the routinization of quality, reliability, and speed in supply management the need for *keiretsu*-style governance has declined. The withering of *keiretsu* obligations is also traceable to globalization and the continuing weakness of the Japanese economy, which have prompted Japanese firms to question received business practice.

Keiretsu, governance, and learning:
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INTRODUCTION

Transactions between Japanese automobile manufacturers and their suppliers, distinguished by long-term purchasing relationships, intense collaboration, cross-shareholding, and the frequent exchange of personnel and technology, have been a conspicuous reminder that not all viable contracting and governance forms are clustered at the extremes of market and hierarchy. High trust, long-term cooperation between assemblers and their suppliers has made possible reductions in new model development time in the Japanese auto industry, sharing of the costs and responsibilities of innovation, endless rounds of cost-cutting, and quick response to fluctuations in demand. By spinning off much parts development and manufacture to independently managed yet closely linked suppliers, Japanese assemblers could exploit the incentive benefits of market-based exchange while reaping the learning and coordination benefits of internalization within a corporate hierarchy (Clark 1993, Smitka 1991, Nishiguchi 1994).

In recent years, the Japanese automobile industry has been buffeted by shifts in market environment and technology. Of course, change has not been confined to the automotive sector—the effects of globalization, a rising yen, foreign government pressure, and the bursting of the late 80's economic bubble have rippled across all sectors of the Japanese economy. The recessionary 90's have evoked prophecies of gloom and doom—both from smug Westerners who only ten years ago were warning of Japanese world economic domination—and from the Japanese themselves, who in rising numbers fear for the country's economic security, if not its very survival. The *Nihon Keizai Shimbun*, Japan's most prestigious economic newspaper, opened the new year of 1997 with a series entitled "*Nihon ga Kieru*" or "Japan is disappearing."¹ Yet the apocalyptic rhetoric from both sides of the Pacific on the demise of Japan and return of American supremacy is rarely offset by systematic examination of just where and how these changes are actually transforming Japanese economic organization.

Our focus is some major new developments in how Japanese auto manufacturers and suppliers manage their procurement relationships. There are significant cracks in the system of mutual obligation

¹ *Ekonomisuto*, a leading business magazine, announced that the mid-1990's had become a time of Japan "nothing," as Japan's influence in the world economy waned with its economic fortunes (Kurozawa, 1997, see also Yamamura, 1997 for a review of the post-bubble Japanese political economy).

between customer and supplier that historically has distinguished Japanese industrial goods markets. They are not yet gaping fissures, nor are their origins fundamentally cultural in nature—erosion of trust and obligation as Japanese value patterns, for example, or a belated embrace of American individualism. While broader cultural shifts may be encouraging some trends in Japanese business practices, culture, in itself, cannot account for all of the changes in contracting practices. The impetus behind new modes of contracting in the Japanese auto industry comes from alterations in the form and content of transactions and in the business and technological environment in which they are embedded. The drift is away from once dominant hybrid or network (i.e., *keiretsu*) governance modes toward the extremes of arms-length contracting and top-down administration.

The study of change in auto parts procurement networks is valuable, not only in its own right, but also as an opportunity to consider some critical theoretical issues in research on organizational alliance. Much of the theory of alliance and networks is built on a foundation of cross-sectional data (Nohria 1992). The longitudinal analyses that do exist see evolutionary processes pushing transacting firms toward ever more intense and interdependent relationships (Piore and Sabel 1984; Saxenian 1990). The Japanese automotive industry in the early 1990's, in contrast, was in the throes of discontinuous change. Shifts in technology, global markets, and governance practices bring centripetal force to bear on buyer-supplier relationships. A study of how these changes are reshaping alliances between auto assemblers and suppliers can provide perspective, not only on the automotive industry of the 21st century, but also on the processes that so closely bound buyers and suppliers to one another in the past.

Our theoretical framework draws on two dominant models of alliance formation. One, which we term the “governance approach,” is based on transaction cost economics (TCE), particularly that branch of it that deals with hybrid governance forms (Williamson 1985, 1991). The other—the “learning approach”—melds several theoretical traditions. One of these is the resource-based view of the firm (Wernerfelt 1984), particularly as it applies to relational assets and organizational alliance (Dyer and Singh 1998, Mowery, Oxley and Silverman 1996), plus a broad tradition of scholarship in economic sociology and political science on interfirm networks (e.g. Powell 1990, Baker 1992, Sabel 1994). While transaction cost economics is much maligned in the literature on organizational learning, there has thus far been little to no systematic treatment of how these two paradigms compete with or complement each other in giving a complete picture of alliance (Oxley 1999).

The empirical materials are three case studies. First, we examine Toyota's program of building internal capacity in automotive electronics and its increasingly arms-length relationship with Denso, its long-term supplier of electrical and electronic parts. Second, we examine Toyota's purchase of a controlling (now majority) stake in Daihatsu. The third case is the restructuring of Japanese parts supply

networks due to rising standardization of parts in the world auto industry. We examine the relative merits of the learning and governance perspectives to explain the transformation of purchase supply relationships as evidenced by these cases.

Our observations in this paper are based upon interviews with Japanese auto assemblers and suppliers over the past five years as well as a review of Japanese press coverage of events in the automotive industry (see Appendix for a discussion of our research methodology).

GOVERNANCE AND LEARNING IN ALLIANCES

Research on interfirm alliances has blossomed over the last decade. As is natural in a new and burgeoning line of inquiry, competing theoretical models have multiplied. While the diverse perspectives make this an intellectually rich field, they have also balkanized it. In particular, there is an intellectual tension between two dominant approaches to alliance—governance and learning. Governance theory, best represented by transaction cost economics (Williamson 1985), makes little reference to organizational learning and knowledge creation processes. Adherents to the learning paradigm, on the other hand, are critical of transaction cost reasoning, in particular of what they see to be its exaggerated concern with opportunistic behavior.

From the governance perspective, interorganizational alliance is a governance structure put in place to mitigate contracting hazards. Hazards arise when one or both parties to a transaction make investments in relation-specific, non-redeployable assets. At the extreme, unilateral investment in relation-specific assets makes a firm vulnerable to hold-up by an alliance partner. Even when the partners are mutually dependent, investments in specific assets complicate the management of bilateral adaptation over time (Williamson 1994). Given uncertainties in technology, markets, and the reliability of partners, firms cannot write long-term contingent contracts. Instead, they fashion organizational structures to ensure that the parties will cooperate in good faith when unforeseen contingencies arise.

Early statements of TCE focused on the drawing of organizational boundaries around transactions—whether to conduct exchange through market or administrative means. The hard “markets and hierarchies” polarity has since been softened in acknowledging the existence of hybrids—chiefly, alliances and networks (Williamson 1991). Even when relation-specific investments are involved, a firm may opt for hybrid over hierarchy if the risk of opportunism is low or protective governance structures can readily be fashioned (see Williamson’s, 1985:120-122, description of the Toyota production system). According to this logic, Japanese auto assemblers and suppliers have managed to sustain hybrid

relationships—close, dependent, long-term alliances, absent majority ownership or contingent contracts—because (partly for cultural reasons) of a generally low taste for opportunism: strong norms favoring trust, obligation, and reciprocity in relationships; backed up by such reputation-enforcing formal mechanisms as supplier associations (Sako 1996).

The governance perspective accounts for why Toyota and other auto assemblers managed to preserve low levels of vertical integration and close and dedicated supplier relationships in the absence of hard, legalistic contracts and comprehensive ownership. It has less to say on why these purchase-supply hybrids have, in this industry at least, outperformed both vertical integration and arms-length procurement (Womack, Jones, and Roos 1989). Further, TCE, as a theory focused on the exigencies of exchange, generally assumes an exogenously-given production function, hence is ill-equipped to explain how new alliance forms might spur technological change. Moreover, TCE does not give a satisfactory accounting of firm differences in the management of a set of ostensibly similar transaction partnerships. The learning perspective, if less rigorous logically, seems better positioned on these counts. It treats the evolution of organizational form as strategy in the search for and success in realizing a superior technological or production regime. Specifically, the interfirm alliance, a hybrid form in TCE parlance, is superior organizationally not merely because it economizes on transaction costs e.g., thwarting opportunism and averting risks. Rather, alliances in and of themselves generate rents through “relational advantage,” and, particularly in today’s global economy, the adroit management of them is a dominant, if by no means the only, path to a higher threshold of technological competence (Dyer and Singh 1998).

With some exceptions, researchers sympathetic to the learning paradigm have been hostile to transaction cost thinking (Oxley 1999). Scholars in this tradition have generally been unconcerned with opportunism and treat governance in only the broadest terms. Moreover, TCE's dour take on human nature is thought at odds with how real people behave, certainly in Japan (Dore 1983) and even in the United States (Macaulay 1963, Uzzi 1996). Others assert that the short-term efficiency perspective of TCE is incompatible with long-term, strategic learning character of most alliances (Zajac and Olsen 1993, Sobrero and Roberts 1996). Research within the learning framework addresses the processes whereby firms collaborate as well as the sources of alliance gains or relational rents. It attributes the smooth functioning of alliances to trust, joint routines built up over time, shared beliefs in the gains to relationship, and such tight interdependence that potentially unruly participants have little choice but to cooperate (Dyer 1996, Nishiguchi 1994, Ring and Van de Ven 1992)

While both the governance and learning paradigms offer interpretations of interfirm alliance, little scholarship to date combines them in making sense of a concrete empirical case. Although a thoroughgoing theoretical integration of these perspectives is beyond the scope of this paper, we

demonstrate that, in the context of the Japanese automotive industry, they have complementary merits, and appear to be largely complementary. Our claim is that these perspectives, taken in concert, offer the most complete explanation of the prima facie less than consistent responses that auto assemblers have made to a variety of significant changes in supplier transactions, market structures, and governance forms.

TOYOTA, DENSO, AND AUTO ELECTRONICS:

FROM HYBRID TO HIERARCHY

In 1988, Toyota opened its Hirose plant, currently the location of four electrical engineering divisions: design and planning of electronic parts, antilock brake systems, car navigation systems, and semiconductors. Besides the investment in plant and equipment, Toyota made a major effort to recruit electrical engineers, both by hiring new graduates and by the relatively unusual step of taking on mid-career engineers. Today, electrical engineers account for 10% of all engineers at Toyota and 30% of new engineering hires.

This creation of internal capacity amounted to a major reversal of Toyota purchasing strategy. Toyota had for many years depended on a close relationship with Denso (formerly Nippondenso) for electrical and electronic parts. Denso began life as a spun-off division of Toyota in 1949, and grew over time into one of the largest auto parts manufacturers in the world (Gerlach and Lincoln, forthcoming, Odaka, Ono and Adachi 1988).² Originally a maker of electrical parts for cars, such as heaters, Denso developed considerable expertise in electronics and its business expanded with the rising profile of this technology in auto design and production. Toyota benefited from Denso's expertise and relied on Denso for all of its purchases of a number of important parts, in so doing breaking Toyota's own rule of having two suppliers of every part. As Denso's capabilities grew, it began, probably with Toyota's blessing, doing business with other assemblers, but (as was true of other key Toyota suppliers), refrained from supplying Toyota archrival Nissan.

Early strains in the relationship between Toyota and Denso emerged with Denso's establishment of a factory in Battle Creek, Michigan, before Toyota began producing automobiles in the United States. From the outset, Denso's plant was expected to sell to the U. S. "Big Three," and eventually it even serviced Nissan's U.S. operations (although, as noted, within Japan the taboo on Toyota suppliers selling

² Toyota's stake in Denso as of September 1999 was 24.58%.

to Nissan still held). While not formally discouraging its suppliers from seeking other customers (excepting Nissan), Toyota is displeased when its affiliates collaborate closely with the competition. Toyota, we were told,³ was unhappy with Denso's extensive assistance to Chrysler in the development of the subcompact Neon, which early on was perceived to pose a challenge to Japanese dominance in small cars (Lincoln, Mason, and Ahmadjian 1998).

Further evidence of a deterioration in the Denso and Toyota bond is apparent in the conspicuous absence of assistance from Denso in Toyota's endeavors to acquire expertise in electronics. In autos, as in other industries in Japan, exchange of engineers between customer and supplier for the purpose of facilitating technology transfer and development of new capabilities is common, even indispensable, given the difficulty under the traditional Japanese employment system of recruiting mid-career engineers and managers. Toyota informants told us that they had initially received help from Denso in developing an in-house electronics capability. A course to offer electronics training to Toyota engineers was first staffed by university professors and Denso engineers. Toyota's worsening relationship with Denso ended that. In 1994, six engineers were dispatched from Denso—in 1995, none. As a Toyota human resource manager put it: "We have graduated from the Denso phase." Even today, however, when Toyota's electronics program is quite advanced, Denso's program of training employees in electronics is perceived as superior to that of Toyota.⁴

Toyota continues to procure parts from Denso, and for a number of components, volume has remained steady or even grown. Our Toyota informants said, for example, that their vertical integration into electronics was part of no broader plan to reduce Toyota's overall rate of external procurement. Toyota's outsourcing rate (the ratio of externally purchased parts to total components used) had been approximately 70%, a rate that the company intended to maintain. Toyota managers informed us in the summer of 1997 that Denso was now supplying 50% of Toyota's total electronic component needs. Judging from data we compiled on Toyota's purchases from Denso over the period 1984 - 1993, the 50% figure is down from the level of four years ago (see Table 1). Even over the earlier period, some marked declines in Toyota's parts procurement from Denso can be seen: in nitrous oxide sensors, spark plugs, glow plugs, traction control systems, antilock brake systems, speedometers, and power relays. Big declines are evident in Toyota's purchases from Denso of such high-value technologies as traction

³ Based on an interview with a Japanese business scholar close to Toyota.

⁴ Based on an interview we conducted in late 1999 with two Japanese scholars close to both companies.

control and antilock brake systems. These support Toyota's claim that it will design and make electronic parts that contribute to organizational learning but will otherwise go outside.⁵

Table 1 about here

In addition to building internal electronics capacity, Toyota has been seeking other partners for new products and technologies. In 1996, Toyota announced a joint venture with Texas Instruments, through its close affiliate Toyoda Automatic Loom Works, to manufacture semiconductors (Nikkei 8/8/96).⁶ Denso, itself a semiconductor producer, was not involved. Nor does it appear that Denso was a participant in the development of the Prius, Toyota's high profile electric – gasoline hybrid car, unveiled recently to much fanfare in the press.⁷ In 1997, Toyota announced a venture with Sony to manufacture liquid crystal displays—expanding its sphere of relationships outside of the automotive industry. Around the same time, Denso announced plans to open its own LCD plant.

Governance and learning in the Toyota - Denso alliance

Toyota's investment in an internal capability in high-end electronic components represents a shift from hybrid to hierarchical control of electronics. Explaining the decision to make versus buy a part is a key concern of transaction cost theory (see for example, Monteverde and Teece 1982). According to TCE, a firm is likely to move production of parts within its boundaries as uncertainty, asset specificity, and hazards of opportunism rise. A firm's vulnerability to hold-up by a supplier is directly proportional to the asset specificity of the transaction and inversely proportional to the efficacy of existing governance in monitoring and mitigating opportunism. From a governance standpoint, Toyota's move to bring electronics under administrative control reflects increased hazards stemming from the changing nature of automotive electronics. This interpretation, however, leaves an important question: if Toyota's only

⁵ For other parts, such as alternator, distributor, starter, air conditioner, and flasher, Toyota and Denso's relationship continues much as it always has, with Denso as sole source.

⁶ This project was later cancelled due to a worldwide semiconductor glut.

⁷ Based on discussions in December, 1988 with two Japanese scholars close to Toyota. In our search of newspaper articles on the Prius, we found none that says outright that Denso was excluded. Articles did mention Toyota's collaboration with Matsushita and Mitsubishi Electric, while making no mention of Denso (Chinworth, 1998; Lammers, 1997).

concern was contractual hazards, why not simply take a controlling stake in Denso? This question, we believe, is best answered by taking into account learning. Below, we review both TCE and learning interpretations of Toyota's commitment to building an in-house capability.

Increasing asset specificity Toyota's strategic decision to design and manufacture in-house a number of key electronic components is testimony to the changing nature of automotive electronics. On its face, Toyota's move to internalize the design and production of some electronic components accords with the governance framework. From this perspective, the greater the asset-specific investments required to conduct a transaction and the greater the uncertainty surrounding it, the more likely is it that hierarchical governance will be imposed. As electronics technology becomes integrated with all the systems of the automobile (unlike such standardized "bolt-on" electrical parts as starters and generators), it grows in asset or relation specificity. The role electronics will ultimately play in the future of the automobile is not yet clear, but its centrality and interpenetration with the mechanical side will doubtless increase. Automotive electronics technology is now a very hot topic in Japanese auto circles. There is much fascination with navigation systems, built-in TV's, back-seat video games, and, most fundamentally, with electronics as the "brain" and nervous system of the car (*Nihon Sangyo* 1/25/95).

Transaction cost theory also sees the effects of asset specificity and uncertainty as being amplified by the frequency of transaction. Specifically, the importance of finding the right match between transaction type and governance structure should rise in proportion to a transaction's share of total costs. Electronics' share of the total value added in automobile production is rising rapidly. Currently, electronic parts make up about 10% of an average vehicle's total production cost (more in upscale models); Toyota engineers estimate that this will soon rise to 30%.

Measurement and monitoring TCE and parallel frameworks such as agency theory also place considerable stress on information uncertainty, "impactedness," and asymmetry as variables conditioning choice of governance mode. As information problems multiply, firms must devote increased effort to measurement and monitoring tasks. Bringing the transaction within the boundaries of a single firm where it can be put under tighter surveillance via accounting and other information controls is the standard solution (Alchian and Demsetz 1972, Barzel 1982, Williamson 1985). Measurement and monitoring problems figured centrally in Toyota's efforts to better manage its procurement of complex electronic parts and subassemblies. Our interviews with the company, plus a number of other reports on Toyota and Denso's evolving relationship (e.g. Ota, et al. 1994), made clear the difficulty Toyota faced in evaluating Denso's pricing and delivery of electronic components.

The process by which parts prices are determined in the Japanese automotive industry demands that auto assemblers evaluate their suppliers with rigor and precision. Prices generally are not set down in

written contracts between assemblers and their suppliers (Asanuma 1989, Nishiguchi 1994). Rather, provisions are made for price adjustments at regular intervals. Twice a year, assemblers announce targets for price decreases and negotiate every price one-on-one with suppliers. These negotiations are based on an assembler's detailed calculation of a supplier's technology, costs, and cost reduction efforts.

This system of price setting requires that an auto assembler has access to a supplier's cost structure and understand intimately its manufacturing process. For most auto parts, this is a given. Auto assemblers have long been a source of knowledge, skills, and resources for their suppliers (Asanuma 1989). One of the drivers behind the early growth of supplier networks in 1950's Japan, in fact, was the transfer of capital and technology from assemblers to their less knowledgeable suppliers (Odaka, Ono & Adachi 1988). As time passed, vendors and subcontractors developed specialized capabilities and assemblers entrusted the most sophisticated of them with the actual parts design process. Yet knowledge asymmetries between customer and supplier posed few problems when the technology behind the parts never strayed far from the assembler's core knowledge base. While an assembler might not be familiar with the specifics of a part's design and manufacture, it understood the core technology. Assemblers were able to evaluate a supplier's work and determine whether the supplier's assessments of cost and quality were correct.

For years, Toyota left the development and manufacture of electrical and electronic parts to Denso, an arrangement advantageous to both sides so long as automotive electronics comprised relatively simple and stand-alone components. As electronics technology grew more complex and integral to automotive design and manufacturing, information asymmetries arose between Toyota and Denso. Denso understood electronics far better than Toyota, and Toyota found it increasingly difficult to evaluate what its key supplier was doing.

Indeed, a need for "parts evaluation capability" (*buhin hyouka noryoku*) by auto assemblers is the centerpiece explanation for the vertical integration of auto assemblers into electronics proposed by a recent MITI (Ministry of International Trade and Industry) Research Institute report (Ota et al. 1994):

"The choice and design of electronically controlled parts is closely bound up with the overall design of a motor vehicle and with differentiation of the end product. The motor manufacturers must for look not only to the quality and cost of electronically controlled parts but also to their own capacity to evaluate such parts in terms of their potential for future improvement and innovative development."

Toyota was candid in interviews with us and with the Japanese press that one factor in motivating its decision to manufacture electronics components was an interest in boosting bargaining

leverage over Denso with a firm grasp of Denso's real costs. Toyota was concerned that Denso might be withholding or otherwise managing its cost information in price negotiations. At the time of construction of the Hirose plant, a Toyota manager was quoted in the *Nikkei* as looking forward with anticipation to future negotiations with Denso: "Now we will really be able to push them to lower prices" (*Nikkei* 5/8/87).

Building absorptive capacity While the governance framework satisfactorily ties Toyota's decision to manufacture electronics components to changes in asset specificity and evaluation capability, it leaves some puzzling questions unanswered. Foremost is why Toyota did not simply buy Denso outright. Part of the answer is the continuing value Toyota saw in its long-standing *keiretsu* arrangement with Denso. Another part is the taboo on aggressive acquisition that prevailed in Japanese business 10-15 years ago when Toyota's electronics planning began. We provide more discussion of these points below. We maintain here, however, that the imperatives of learning figured centrally in Toyota's decision to "grow its own" electronics capability. Electronics technology is moving from stand-alone parts to systems that integrate all components of the automobile. In this respect, modern automotive electronics is an architectural innovation that is revolutionizing how the components of a car fit together and operate as a system, not to mention how problems are diagnosed and addressed (Henderson and Clark 1990). The disruptive effect on architectural innovations on organizations is well documented. Similar disruptions may be expected to occur when product development and manufacture occur within a tightly knit network of assembler and suppliers. As an assembler, Toyota's competitive advantage lay in its ability to coordinate suppliers in the development of new models. Without access to electronics technology, Toyota's principal source of advantage—its role as a coordinator of a tightly knit supplier network—threatened to slip away.

Learning a technology only distantly related to a firm's core capabilities is a nontrivial pursuit. As Toyota saw it, the acquisition of expertise in electronics could not be had simply by purchasing electronics know-how on the outside. In order to learn, apply its knowledge, and keep up with the rapid pace of change in automotive electronics, Toyota had to build absorptive capacity: a base of electronics knowledge from which rapid learning of leading-edge developments could proceed. Given the daunting task Toyota saw before it—the need to master an unfamiliar technology that was almost certain to be central to the automobile of the future—a massive program of learning by doing seemed the only possible course (Nonaka and Takeuchi 1995, Pisano 1996). Rather like the personal computer industry today, in which hardware has become cheap and commodified with software yielding the lion's share of value, the Toyota engineers we interviewed saw automotive electronics know-how becoming the core competency that would soon drive competitive success in the world auto industry.

The creation of such absorptive capacity was critical both to Toyota's ability to design and produce automotive electronics on its own and to manage effectively its alliances with Denso and other partners. Learning within an alliance structure is maximized when the parties maintain comparable levels of absorptive capacity (Lane and Lubatkin 1998). Investment in electronics learning, as a consequence, did not merely enable Toyota to remedy an imbalance of bargaining power with Denso and bring inside some control over a critical technology. It was also a strategy for preserving the Toyota-Denso partnership and deriving long-term maximum value from it. For example, Toyota engineers stated that the quality of Toyota's discussions with Denso about parts design and manufacturing had risen since Toyota's investment in electronics learning began. Before, they said, Toyota people sometimes asked silly or naïve questions in procurement negotiations with Denso. Now that Toyota was acquiring a solid knowledge base in the technology, the communication between the companies had improved.

But would it not have been simpler and faster for Toyota to take a controlling stake in Denso, thereby acquiring the assets, intellectual and material, that had made Denso a formidable global player in automotive electronics? Toyota, our interviews made clear, felt that only a top-to-bottom Japanese-style program of learning-by-doing could infuse its entire organization with the skills and values essential to making electronics a genuine "core competence." Our earliest interviews with Toyota around the electronics question-- conducted in 1994 with the headquarters human resource staff--highlighted Toyota's learning agenda. Much of the burden of that agenda fell on the HR function, which the company had charged with developing ambitious programs to recruit electrical engineers from top universities and retrain Toyota's extant engineering staff in electronics.

Moreover, the electronics capability Toyota sought, we were told by Toyota, was far in excess of what Denso at the time possessed.⁸ The long-term goal for the electronics learning campaign was to position Toyota for entry to an array of burgeoning electronics and telecommunications fields. Typical of Toyota strategy in particular and that of Japanese business more generally, Toyota was unlikely to have launched such an ambitious diversification effort were electronics to remain marginal to its core auto business. But with electronics occupying center stage in autos as well, it was rational for Toyota to leverage its new skills (and thereby amortize the cost of investment in learning them) across as many business opportunities as possible.

⁸Not too surprisingly, Denso managers took a somewhat different view of Toyota's prowess in electronics relative to their own. Toyota, they told us in July of 1996, was developing a capability in "today's" electronics, whereas Denso was building the electronics of tomorrow.

The benefits of hybrid organization

Moreover, both firms stood to reap further gains from continuing the *keiretsu* relationship in the procurement of a wide range of parts. Purchase of Denso outright might negate those benefits. Both Toyota and Denso were at pains to stress to us that their long association was still productive and by no means near an end. For many parts, Toyota's sourcing from Denso stands at historical levels, particularly in less complex electrical components. In these supply transactions, the considerable benefits to procurement from a trusted external source remain intact.

Indeed, Hirose plant engineers told us in 1997 that some of the in-house electronics operation might be scaled or shut down once Toyota had mastered the technology, since *keiretsu* procurement retained the edge in cost and flexibility.

“Toyota is continuing to spin off and outsource activities (press casting was mentioned as a recent example). If Toyota totally understands a process it will spin it off and outsource it.”

In our view, this statement, perhaps more than any other from our interviews, underscores the learning rationale behind Toyota's internal electronics venture.

Other payoffs to continuing the partnership can be identified as well. Having Toyota as a guaranteed customer for a very large fraction of its output (even if the composition of that output was shifting toward the lower tech and value side) absorbed considerable uncertainty for Denso. Toyota also had a stake in preserving Denso's standing as an independently managed but closely affiliated company. Toyota managers told us that the maintenance of internal capacity to produce the same components that Toyota was sourcing from Denso was in line with Toyota's own long-standing rule of having two suppliers of every part sourced (Richardson 1993). Such competition was the ultimate source of the discipline Toyota imposed on its suppliers to achieve steep price and cost reductions over the life of a product or model. Toyota managers pointed out that, with its electronics division in place, Toyota had become its own second source for electronics.⁹ Another reason Toyota did not purchase Denso outright,

⁹Toyota engineering managers insisted to us in an interview that there was no other Japanese company that could really play “second source” to Denso. Skeptical, we suggested Hitachi. Their reply was: “Hitachi is in the Nissan group. We cannot source from them.” Indeed, Hitachi has recently moved to assist Nissan and its suppliers in developing advanced automotive electronics. As reported by the New York Times (Strom, 1998), Hitachi's assistance to Unisia Jecs Corporation, a Nissan parts affiliate: “would give Unisia Jecs much-needed financial

managers said, was that there were advantages to Toyota in Denso transacting with other car manufacturers. A Toyota manager interviewed in 1997 said:

"Since Denso has developed strong relationships with some other customers, it has a better picture of the whole automobile industry and will therefore be able to provide Toyota with innovative proposals...we have no plan to acquire a controlling equity stake because the other manufacturers would then be reluctant to deal with Denso." ¹⁰

TOYOTA AND DAIHATSU: FROM HYBRID TO HIERARCHY

Toyota radically altered another long-term relationship with its announcement in 1995 that it would boost its equity stake in Daihatsu, a manufacturer of small cars, from 16.8% to 33.4%, a controlling interest under Japanese commercial law.¹¹ While Toyota's move on Daihatsu was couched

support for research and development of intelligent transport systems, or 'smart cars,' at a time when the parts company's main backer, Nissan, is unable to finance such activities for itself, let alone for its affiliates. It would also be a big boon to Nissan, which has lagged behind its global competitors in developing technology that could one day create a car that could drive its owner home after an evening out on the town without human assistance. Hitachi would gain access to automotive know-how that could help position it as a leader in the young market for intelligent transport."

¹⁰ In late 1999, Toyota dispatched an executive to serve as a Denso vice president, the highest level personnel transfer to Denso Toyota had ever made. The Asahi news reported that this move was designed "to sever (Denso's) business ties with Honda Motor Co. and other assemblers as competition is expected to heat up in the industry" (www.asahi.com/english/enews 4/5/99). Cutting Denso's ties to Honda has several benefits for Toyota. It deprives Honda of Denso's leading edge expertise in automotive electronics. It also eliminates lucrative source of alternative business for Denso, thus decreasing its bargaining power vis a vis Toyota. Herein lies the weakness in hybrid governance of the *keiretsu* sort, particularly as the auto industry has grown increasingly competitive and global. When Denso's business with Toyota's competition was confined to Japan, Toyota was well-positioned to monitor those partnerships and intervene as need be. But with competitive pressures rising, and Denso developing close ties to other auto firms all around the globe, Toyota confidence in the efficacy of its traditional hybrid governance arrangements with Denso and other Toyota group firms declined, hence its course of increased hierarchical control reported in the two cases featured in this paper.

¹¹ A one-third equity stake offers de facto control as prevents a two-thirds majority that is needed for shareholder votes. Mitsuhiro Fukao (1995: 99), a leading expert on Japanese corporate governance writes: "The shareholders' meeting can vote only on the matters stipulated by the corporate law or the articles of incorporation. However, by

publicly by both companies in a language of cooperation, the Japanese business press portrayed it as a hostile takeover. When Toyota had in the past upped its equity stake in a supplier, the ostensible purpose was a rescue or restructuring. Indeed, Toyota's original equity investment in Daihatsu in the mid-1960's was designed to save the smaller company from bankruptcy (*Nikkei Sangyo* 9/21/95). This time around, Toyota's purchase of shares in Daihatsu could not be explained as a rescue package. Although Daihatsu had indeed gone through some financial distress in the early 1990's, the firm was recovering at the time of Toyota's intervention. Moreover, given the legal and symbolic significance of the 33.4% stake, the conclusion seems inescapable that Toyota's motive was direct and full control of Daihatsu.

Analysts trace the move to Daihatsu's contacts and expertise in the booming China market. Then in early 1998 Toyota upped its equity stakes in Daihatsu and Hino Motors Ltd. to more than 50%, thereby converting them to legal subsidiaries. By 1999, Daihatsu announced that it was dropping its leading own-name models to become a virtual division of Toyota. The *Nikkei* reported the event as follows:

“The move is aimed at solidifying the Toyota group in order to respond to a global trend realignment in the automotive industry, observers said. Enhanced group solidarity is likely to make it easier to resolve overlapping production of similar models. The step will also ‘allow Toyota to take more effective strategic steps’ for overseas operations, noted an analyst at the Financial Research Center of Nomura Securities Co. (8604). For instance, Toyota could turn Daihatsu's Chinese production bases into its own (*Nikkei Weekly*, May 28, 1998).”

Daihatsu has been an OEM producer of small automobiles marketed under Toyota's nameplate as well as a manufacturer of its own brand of small cars and trucks. An early entrant in the auto industry, Daihatsu went through a period of severe financial distress in 1967 and turned to Toyota for assistance. Toyota took a small equity position in Daihatsu and seconded several managers to its board. The two companies then began a close and stable partnership in which Daihatsu manufactured Toyota-vehicles on an *itaku* or consignment basis. This is a common arrangement between large and small assemblers in Japan, even between manufacturers and closely affiliated suppliers: Kanto Auto Works and Toyoda

amending the articles of incorporation with a two-thirds majority, a shareholders' meeting can vote on other matters, including ordinary business.” A two-thirds majority also allows shareholders to dismiss a director without cause. Not widely known is that Ford's equity stake in Mazda since 1996 is also exactly 33.4%, a level intentionally chosen to give Ford management control of Mazda.

Automatic Loom also assemble Toyota vehicles, and some of Nissan's best-known models (the Z, for example) are put together by affiliates such as Nissan Auto Body. The manufacturers rely on *itaku* to manage fluctuations in demand without building extra internal capacity and to leverage other manufacturers' competencies (Shioji 1995). Daihatsu's core competence was the manufacture of small (in particular, mini-) cars.

The association between Toyota and Daihatsu in many respects paralleled that of other large assemblers and suppliers. Toyota owned a large, if not controlling, block of Daihatsu shares, reciprocated by Daihatsu's own small stake in Toyota (Lincoln, Gerlach, and Takahashi 1992). Toyota dispatched executives to Daihatsu to serve as top managers: six board members, including the president and chairman of Daihatsu, are current or former Toyota employees. However, Daihatsu differed from other Toyota affiliates in several key respects. Daihatsu employees' pride in the company's long history as an independent firm and its engineering and manufacturing expertise in small cars at times made for a rancorous relationship with Toyota engineers and managers. Daihatsu's location in the city of Ikeda, a considerable distance from Toyota's home territory in Aichi Prefecture, also gave Daihatsu a distinct identity. Daihatsu maintained a main bank relationship with Sanwa and occupied a seat on the Sanwa *Sansui-kai* or presidents' council, in contrast to other Toyota affiliates who shared Toyota's principal banks of Mitsui and Tokai (Gerlach 1992a). Still, for many years the Toyota – Daihatsu partnership functioned much in the fashion of Toyota's other *keiretsu* relationships— with personal influence and reciprocal dependence supplementing partial equity ownership and dispatched directors as a framework for long term transactions.

The shift in the partnership between Toyota and Daihatsu followed changing demand conditions in the world auto industry. Markets in Southeast Asia and China were growing fast, whereas the mature and saturated markets of the US, Europe, and Japan where Toyota held a strong position were increasingly poor investment prospects. Leading growth in these markets was demand for smaller cars, a situation creating opportunity for specialist producers such as Daihatsu. Daihatsu was especially well positioned to take advantage of the China market because of its joint venture with Tianjin Motors to produce the Charade model. The considerable success of this venture had prompted Daihatsu's chairman to comment that: "There are more Daihatsu's in Tianjin than in [Daihatsu's headquarters city of] Ikeda" (*Nikkei* 10/16/95). Toyota, too, had been eyeing the China market, but to that point had not found a suitable venture partner in China. The Daihatsu-Tianjin operation offered Toyota a ready-made solution

to this problem, but Daihatsu was not keen to include Toyota in the venture.¹² In September 1995, following a certain amount of wrangling between the two firms, Toyota abruptly increased its equity stake to 33.4%, giving it effective control of Daihatsu and therefore unfettered access to Tianjin Motors.

Governance and learning in the Daihatsu takeover

The Daihatsu case parallels that of Denso in documenting a restructuring of governance in the Toyota supplier network from hybrid to hierarchy. Otherwise, however, Toyota's goals and strategy were quite different. Rather than develop small car capability in-house, Toyota bought a controlling stake in Daihatsu. A contrast between the governance and learning rationales for alliance illuminate the source of this divergence. Daihatsu's access to a critical resource—the China market—combined with diminishing global efficacy of Toyota's *keiretsu* governance led Toyota to mount a hostile takeover to reassert control. Unlike the case of Denso, the advantages to Toyota of maintaining the hybrid relationship with Daihatsu were few.

Global markets and the weakening of keiretsu. From the governance perspective, a change in how a transaction is organized or governed is prompted by an alteration in the underlying transaction or in the efficacy of the governance structure overlaying that transaction. We discussed in the Denso case how rising asset specificity and the need for evaluation and monitoring capability necessitated a more hierarchical form of governance. By contrast, Toyota acquired Daihatsu because Toyota's minority stake and board representation did not give Toyota the control it desired over Daihatsu. This, we argue, is related to the weakening of the influence that these stakes allowed Toyota, thanks in part to a broadening of Daihatsu's options.¹³

A small equity stake, one or more board seats, plus various less tangible *keiretsu* controls would have in the past guaranteed that Daihatsu would submit to Toyota's interests. Daihatsu's growing accumulation of critical resources—manufacturing capabilities, distribution channels, and name

¹² The Nikkei (10/16/95) described Toyota's experience in China, and designs on Daihatsu: "Toyota's China strategy had been one step forward, two steps back. The scenario of going through Daihatsu to open the China market for Toyota became more attractive by the day." The Nikkei Sangyo (9/21/95) reported Daihatsu's presumed response: "Tianjin is our area. Why should we be foot soldiers under Toyota?"

¹³ While Daihatsu's China business was generally acknowledged to be the most proximate cause of the takeover, Toyota managers also acknowledged that concern about Daihatsu's poor financial performance a perception that Daihatsu had been mismanaging its business in the increasingly important small car market also colored the decision to boost Toyota control.

recognition—made it easier for Daihatsu to resist Toyota and chart its own course. Daihatsu had been dependent on Toyota for lucrative contracts to produce vehicles that would round out Toyota’s car and truck offerings. Daihatsu’s venture in China offered manufacturing capability and a network of business partnerships that were independent the Toyota connection. As our interviews at Daihatsu on two occasions made clear, Daihatsu management was chafing under the Toyota yoke, more so, we suspect, than was true of other Toyota affiliates, owing to Daihatsu’s longer history of independence, its Sanwa ties, and so on. The expanding venture in China was likely viewed in Daihatsu management circles as a chance to loosen the tether to Toyota and take greater charge of Daihatsu’s destiny, in both its business in China, and worldwide. The balance of bargaining power between Daihatsu and Toyota had thus shifted some in the smaller firm’s favor.¹⁴

Toyota’s takeover of Daihatsu is symptomatic of a complex set of forces that today are bearing on Japanese corporate governance. Toyota’s change in ownership of Daihatsu was aggressive, done without the acquiescence of the smaller auto assembler. At an interview we conducted at Daihatsu shortly after the Toyota takeover, managers seemed bewildered at the unanticipated turn of events. Recent observers of Japanese economic trends point to changing attitudes toward corporate acquisition, particularly among the new breed of Westernized and authoritative CEO’s who have been taking the helms of companies such as Toyota, Sony, and Mitsubishi Corporation. Former Toyota President Shoichiro Toyoda was philosophically opposed to mergers and acquisitions, believing that such practices were at odds with Japanese business tradition. Toyota’s move on Daihatsu was one of the first major decisions of his younger and more aggressive successor, Hiroshi Okuda (*Wall Street Journal* 1995). Changing attitudes toward corporate governance are also apparent in the willingness of Daihatsu shareholders (chiefly large financial institutions) to sell their shares to Toyota.¹⁵ In the past, such large institutional shareholders usually sought to insulate their client firms from takeovers. (In a recent twist to this story, Okuda has been promoted up and out—to *Kaicho* (Chairman) of Toyota and to Chairman of

¹⁴ Globalization is not necessarily to the advantage of suppliers. Globalization (including the constraints of local content rules) have forced Japanese assemblers to look for local suppliers—and a strong yen and improved supplier capabilities have made some of these suppliers as attractive as their Japanese counterparts. In general, the bargaining power of Japanese auto parts suppliers has diminished as Japanese auto assemblers are able to select from a wider range of suppliers across the world. In the case of Daihatsu and Toyota, however, Daihatsu’s capabilities and connections in China introduced new asymmetry into the relationship in favor of Daihatsu. Daihatsu could now say no, and Toyota was forced to take more formal control.

¹⁵ Toyota declined to divulge the identities of the firms from which it had purchased Daihatsu shares.

Nikkeiren, The Japan Federation of Employers' Associations. Speculation has it that he was relieved of his operating position at Toyota in response both to concerns of suppliers that he was insufficiently supportive and to those of the Toyoda family about his aggressive Western-style decision-making (New York Times, April 14, 1999).

Limited benefits of hybrid organization Toyota's decision to integrate into electronics via the Hirose division was made in the mid-1980's, a period when the Toyota family's conservative management culture was still firmly in place. Had the timing of Toyota's concerns about electronics and Denso occurred ten years later, in a different economic climate and under the Okuda regime, is it likely that Denso would have succumbed to Daihatsu's fate?

We noted several reasons why Toyota did not take a controlling stake in Denso. Toyota needed to create absorptive capacity on its own both to deal with increased asymmetry of knowledge and bargaining power in its relationship with Denso and to better grasp and use a technology that was more and more critical to the auto design and production. In contrast, Daihatsu possessed capabilities that Toyota could not, and need not, develop on its own. At the time of the takeover of Daihatsu, Toyota had been frozen out of the China market through a series of ill-fated attempts at joint ventures. Even if Toyota could have single-handedly established a presence in China, there was little point in doing so itself as long as the option of taking a controlling stake in Daihatsu was available. In the Daihatsu case, Toyota's interest was in gaining access to Daihatsu's political capital, manufacturing capability and distribution channels in China. Learning was less the objective here than access to a scarce and lucrative resource—Daihatsu's China business.

RISING STANDARDIZATION OF PARTS: FROM HYBRID TO MARKET

Toyota's evolving relationships with Denso and Daihatsu are case studies in the transition of parts supply transactions from "hybrid" or "network" governance to full absorption under a corporate chain of command. Now we consider some developments in supply chain management that appear to be taking the Japanese auto industry in the opposite direction: toward greater standardization of parts and arms-length, market-based transactions. Japanese auto assemblers identify as critical current problems proliferation of parts types and over-customization of parts as costly problems. Press reports highlight programs to reduce the number of distinct parts, to standardize parts across both suppliers and assemblers, and to exploit economies of scale by sourcing from the *keiretsu* suppliers of other manufacturers.

Nissan, struggling to overcome a variety of performance and financial troubles and therefore acutely sensitive to component costs, has shown an interest in using parts designed for Toyota. In 1993, Nissan announced that it was sourcing automatic transmission components from Tokai Rika Denki, a supplier close to Toyota, and thereby reducing purchases from its own affiliated supplier, Fuji Kiko. Nissan opted to buy from the Toyota supplier since Tokai Rika Denki owned US production facilities and had lower costs because Toyota's large market share afforded greater scale economies. Toyota and Fuji Kiko did not exactly welcome Nissan's move. The *Nikkei* quotes a manager at Toyota, remarking half in jest, "This is like giving away our lifeblood to the enemy." A Fuji Kiko manager was quoted as saying: "Sure it hurts to have 10% of our business taken from us" (*Nikkei Sangyo* 6/5/93).

Nissan announced that it was procuring car batteries from a Toyota-Matsushita joint venture, despite having made a considerable investment in a project with Sony to develop its own batteries (*Nikkei* 10/16/96). Further of interest is the joint venture in the United States announced in 1995 by Toyota and Nissan-affiliated screw makers (*Nikkei* 12/21/95). That such collaboration between rival camps of makers of screws—seemingly the lowest tech and most easily standardized of parts—is big news underscores the extreme specialization by customer that existed to this point.

One of the most heavily publicized cases of sourcing across *keiretsu* boundaries was Mitsubishi Motors' decision to purchase drive shafts from Honda in 1993, a major blow to MMC's standing network of drivetrain suppliers (*Nikkei Sangyo* 10/30/93). Though parts-supply deals between major auto manufacturers have been proliferating in the trough of Japan's worst economic slump since the American Occupation years, this one drew particular attention for the clash of corporate cultures and the abandonment of vertical *keiretsu* commitments that it implied. "Like trying to mix oil and water" was the characterization of one manager quoted by the *Nikkei*. Mitsubishi Motors has in common with other Mitsubishi group companies a reputation for deep conservatism grounded in the strong cultural traditions of that most famous of the former *zaibatsu*. Honda (like Kyocera, Sony, and others) represents the new corporate Japan: a post-war, entrepreneurial company noted for its aggressive competitive strategy and innovative management style and whose business success was largely in Western markets. Yet some analysts also saw the collaboration between Mitsubishi and Honda as natural since the two companies shared a main bank, Mitsubishi, and were thus horizontal *keiretsu* "kindred," if distant ones since Honda is not a member of the Mitsubishi inner circle *Kinyo-kai* or presidents' council (Gerlach 1992a).

Efforts to standardize parts design and production among smaller and less competitive assemblers have also increased. In 1994, the Ministry of International Trade and Industry, with the cooperation of the six manufacturers of small automobiles, announced a list of 84 parts, which the agency recommended standardizing (*Nikkei Sangyo* 6/1/94). Impetus for standardization has also come

from suppliers: for example, the transmission supplier, Jatco, urged assemblers Fuji and Suzuki to standardize their automatic transmission parts so that Jatco could achieve greater economies of scale (*Nikkei* 6/11/94).

Table 2 about here

As shown in Table 2, the trend towards greater standardization began in the mid-1980's and was well underway by the early 1990's. Between 1984 and 1993, assemblers increased the number of suppliers from which they procured a given part. Similarly, suppliers increased their number of customers. Even more telling is an increase in the number of suppliers selling to arch-competitors Toyota and Nissan. These trends are mirrored in survey research by Helper and Sako (1995), who find a small, but distinct trend towards more arms length purchasing practices among Japanese auto assemblers.

Governance, learning and standardization

Governance theory predicts that a move from hybrid to market governance is likely to follow a decline in asset specificity. Yet it says little about how and why a transaction might decrease in asset specificity over time. A learning framework sheds light on the attributes of a transaction likely to change over time. These include the need for high customization of buyers' and suppliers' product specs and manufacturing processes and their investments in shared routines, procedures, and tacit knowledge.

The new willingness of Japanese carmakers to source from competitors' suppliers is explicable in governance terms. It implies that for some parts transactions, asset specificity has fallen. Over the post-war period, suppliers had made substantial customer-specific investments: in physical assets and in human capital (Nishiguchi 1994). Such co-specialization between customer and supplier, scholars argued, accounted for much of the Japanese competitive advantage in the world auto industry (Asanuma 1989, Dyer 1996). It made possible easy transfer of technology between customer and supplier and promoted the diffusion of best practice such as just-in-time, statistical quality control, and value engineering and value analysis. Highly specialized suppliers, organized in formal associations or *kyoryoku-kai* (Sako 1996), working closely with their customers allowed Japanese car companies to drive down costs and time from the earliest stages of product development throughout the manufacturing process.

Along with this system of supplier specialization, parts themselves had become highly customized. Banri Asanuma (1989), a particularly insightful student of the Japanese supply chain management, wrote:

"Core firms in [the auto industry] increasingly came to issue specifications even for items for which they had not acquired manufacturing capabilities and which have been thought by outside researchers to be marketed goods [purchased "off-the-shelf" from a supplier]. Thus, virtually all the parts supplied from outside firms can now be regarded as ordered goods [built to assembler specifications]. It is indeed very difficult to find, from among those items that are being supplied from suppliers on the first tier, parts that fall under the marketed goods category" (p. 11).

Co-specialization between assemblers and suppliers in the manufacture of automobiles and the trust and close cooperation it entails has in recent years been celebrated in numerous important studies as worldwide best practice (Clark and Fujimoto 1993, Nishiguchi 1994, Womack, Jones, and Roos 1990, Helper and Sako 1995). How, then, can we account for the current drift to greater parts standardization in the Japanese auto industry, the setting where such practices originated and were honed to near-perfection?

Misplaced asset specificity? One hypothesis is that prevailing levels of asset specificity were misplaced. Buyers and suppliers may have chosen to customize parts and processes and thus commit to one another at levels in excess of economic rationality. A reason sometimes noted is the power of Japanese engineering staffs, who, particularly in the 80's, had a taste for "fat designs," laden with "bells and whistles" (Fujimoto, 1999). Alternatively, customization might have taken on a life of its own over the course of a relationship spanning decades. If the vaunted system of co-specialization in the Japanese auto components market had in fact, promoted relationships in which asset- and relation-specificity exceeded that dictated by economic efficiency, what was necessary to bring the problem to the attention of auto assemblers and motivate them to address it?

Two powerful trends may be forcing assemblers to deal with over-cospecialization and a web of interlocking obligations grown more sticky and cumbersome than competitiveness and learning require. One is globalization, which has given Japanese auto manufacturers the opportunity to experiment with new partnerships and manage production at long distances from core suppliers' locales. While assemblers often have in tow much of their *keiretsu* supply chain when they move production abroad (Kenney and Florida 1993), they also forge new links with local parts makers and even transplant Japanese suppliers with whom they could not do business in Japan (Martin, Mitchell, and Swaminathan 1995). A striking example is the business between Denso's Battle Creek, Michigan facility and Nissan's Smyrna, Tennessee plant. The smooth unfolding of these new partnerships persuaded many assemblers that they might dispense with or at least scale down the drawn-out rituals of trust-building (years of golf

games and holiday parties) and mutual learning that in the past were essential parts of the Japanese procurement system.

Accumulated experience in managing production from afar has also spurred auto assemblers to rethink supplier relationships. Japanese producers, Toyota more than others, have been reluctant to move manufacturing out of a concentrated area. By confining parts makers and assembly plants to a limited region, automakers could foster supplier specialization and ensure close cooperation. With the expansion of production and supply chains overseas, this system grew less useful. Although suppliers do follow assemblers abroad, their facilities are rarely situated as close to the assembly plants as they typically are in Japan. Also, the foreign-based assemblers still source numerous critical parts from Japan. An extreme example is the NUMMI plant in Fremont, California, the bulk of whose inputs are either shipped from Japan or transferred by rail from Midwestern parts suppliers. Foreign production taught Japanese auto assemblers two lessons: first, it was possible to conduct business with suppliers situated at a considerable distance. And second, it was possible to develop relationships with local suppliers without the benefit of decades of shared experience (though, as Martin et al.'s [1995] work shows, some preference for the familiar remained).

A side effect of the expansion of Japanese auto manufacturers into North American markets has been the transfer of production operations to Japan's *terra incognita*—the island of Kyushu with its abundant labor and lower wage and land costs. Growing familiarity with global management has emboldened Japanese assemblers to set up operations at the other end of the Japanese archipelago, typically far from their established supplier base. In 1992, both Toyota and Nissan set up factories in Kyushu, and while several suppliers did follow them there, both companies continued to source from their traditional supplier network in the vicinity of headquarters. When the outlying assembly facilities do buy from local vendors, the reason is transportation costs, rather than any need for cheek-by-jowl collaboration in design and manufacture (*Nikkei* 4/2/96).

Also driving change in customer-supplier partnerships is the Japanese' current widespread sense of economic gloom. Japan has long been given to "hand-wringing rhetoric," as Hugh Patrick (1995) puts it, about the looming breakdown of the Japanese system; e.g., the weakening of commitments of employers to employees, suppliers to customers, banks to clients, etc. Warnings of large-scale layoffs and sympathetic tales of small firms struggling to survive in the new and harshly competitive global environment fill the business press. Commentary by managers and analysts routinely alludes to an emerging individualism in Japan, and a purging of culturally based obligations and commitments from business practice. Typical is a quote in the *Nikkei Sangyo Shimbun* of an auto industry analyst at the Mitsubishi Research Institute: "From now on, *keiretsu* membership won't matter—only [auto parts

suppliers] that are internationally competitive will be selected" (*Nikkei Sangyo* 6/5/93). This rhetoric of crisis has made it easier for firms to diverge from long-held norms of business practice, and begin to sever ties with suppliers and employees.

The acquisitions of controlling stakes in Mazda and Nissan by Ford and Renault, respectively, point to further change in purchasing policies. Mazda and Ford (*Nikkei* 4/6/97) announced that the two firms would consolidate parts purchasing by 2002. Similar announcements by Renault and Nissan of streamlining of parts purchasing indicate that foreign ownership is increasingly causing auto assemblers to rethink purchasing relationships in which the benefits from *keiretsu* are outweighed by cost-savings from scale economies.

Falling asset specificity? While misplaced asset specificity may be a real problem (Masten 1993), firms as skilled at supply chain management as the leading Japanese auto assemblers ought not to make frequent errors of this sort. A more likely explanation for rising standardization is falling (versus misplaced) asset specificity: what were once the "right" levels of specific investment are no longer. While governance theory may well account for misplaced cospecialization, it is less helpful on why asset specificity might diminish with time. A learning approach considers the degree and quality of knowledge sharing between buyer and supplier and how it changes over time. As the technology of a sourced part becomes more certain and as the knowledge base behind it shifts from small and tacit to large and well codified, the gains to co-specialization evaporate. A purchasing manager of a medium-sized auto assembler we interviewed attributed the decline in specialization to supplier learning, particularly in Japan. In the past, he said, tightly knit, highly specialized supply networks did create significant competitive advantage for assemblers such as Toyota. Today, such close and specialized bonds matter less and (with globalization, etc.) are harder to sustain. In his words:

"10 years ago, we considered quality, delivery time, and stable supply as well as cost in making purchasing decisions. Today, we consider primarily cost. These days, Japanese suppliers are all pretty much the same level in terms of reliability and quality—so we take such things for granted."

He went on to say that this generalization did not apply abroad—suppliers in the U. S. and elsewhere still fall short of Japanese domestic standards, so that customization and cospecialization are essential to manufacturing success.

A drop in the learning requirements is probably behind the trend to scale down proliferation of parts types and promote standardization and cross purchasing across assembler groups. As practices such

as *kanban*, value analysis, value engineering, and statistical quality control diffused from assemblers to suppliers, the know-how and sophistication of Japanese parts makers has correspondingly grown. Specialized routines, dense informal interpersonal networks, and close proximity became less critical for parts development and production. From a transaction cost perspective, the gains to co-specialization have diminished, and governance is shifting from hybrid to market forms.

Inertial forces Of course, just because an alliance *should* be restructured, there is no guarantee that it *will* be. The economic rationality of a new and superior governance mode is no guarantee that it will prevail over existing alternatives, at least in the short run. Even in the United States, where supply relations are generally more arms-length than in Japan, stable partnerships persist despite significant change in environmental conditions and economic rationales. People get to know each other and become accustomed to one another's way of doing business. Severing a long-standing tie between two corporate partners may be tantamount to the abandonment of a friend or relative.

The social and economic infrastructure in which Japanese supply networks are embedded makes abrupt termination of stable partnerships difficult. Ties between assemblers and their key suppliers have in many cases been in place for thirty years or more (Japan FTC 1993). "Lifetime" employment and low levels (by Japanese norms) of job rotation within purchasing departments enable purchasing managers to develop strong personal bonds with their suppliers' representatives. A high level purchasing manager at a major assembler described to us how the discussions between his purchasing agents and his suppliers' managers generally went well beyond negotiations around the purchase of auto parts-- to family and other personal concerns. Customers and suppliers are bound by common norms of legitimate behavior; e.g., a conviction on both sides that a customer simply does not let a supplier go without cause (Lincoln and Nakata 1997). Even when grounds for switching exist, there is wide agreement that suppliers deserve ample warning, even assistance in locating other business.

Thus, customers are hesitant to cut off major suppliers for fear of reputation costs—becoming known as a big corporation that mistreats its smaller partners (Sako 1992). Managers we interviewed echoed this concern about negative public perception if they did anything that threatened jobs—whether of their own employees or of their suppliers. A company that laid off workers or forced a supplier out of business might become the target, they said, of picketing from its union or the supplier's union, to critical newspaper coverage, and even to consumer boycotts. In one of our interviews, a purchasing manager confided his belief that tax officials paid increased scrutiny to firms known to mistreat their suppliers (see also *Nikkei Weekly* 1995).

Besides fears that an infraction of the norms governing the treatment of suppliers might invoke real sanctions, our interviews turned up some strong taken-for-granted assumptions about dealings with

suppliers. Purchasing managers described the lengths to which they went to keep their suppliers in business—bringing them new products to manufacture, finding them new customers, even orchestrating mergers with other firms. When there were no alternatives to terminating the relationship, a customer might give the supplier a year or two of notice in order to ease the transition. Customers thus extricated themselves slowly from commitments to suppliers, not just from fear of sanctions but because, they said, this was "the way things are done" in Japan, and it would not be right (i.e., moral or legitimate) to do otherwise.

Also making long-term supply relationships difficult to end is the risk in starting new ones. The just-in-time system, designed to keep inventory to a minimum, can inflate even small supply chain problems into system-wide catastrophe, bringing production to a standstill. All these constraints on quick and clean terminations of a supply relation are amplified by what our informants referred to as a general risk-aversion and avoidance of aggressiveness in Japanese management culture. The wrong decision by a purchasing manager in switching to a new supplier could be a career-breaker, whereas cultivation of a successful new partnership might have little upside in the presence of a reward system favoring equity and age over individual achievement.

A purchasing manager described how his firm made the decision to end procurement of automatic transmissions from a long-standing supplier and bring manufacture in-house. (He stressed that they were not terminating but rather scaling down the relationship):

"Even though [the supplier] is closer to [Toyota] than to us, it was tough to cut them off. After all, we have been a large chunk of their business. Our purchasing managers broke the news to them, and our top management went to explain it to them as well. We decided to cut orders slowly and even after cuts are made, we still purchase 10% of this type of transmission from them. Why? Because this is Japan. They have been supplying transmissions to us since we began to make passenger cars—and it is difficult to sever a relationship with so much history behind it."

DISCUSSION

In this paper, we demonstrate with three case studies how shifts in markets and technologies are reconfiguring transactions between Japanese auto assemblers and suppliers. These cases testify to a drift from once dominant "hybrid" or *keiretsu* governance modes toward the extremes of arms-length

contracting and administrative control. Macroeconomic crisis and business uncertainty are eroding the cultural supports for *keiretsu* governance, giving greater legitimacy to new forms and new partnerships. Moreover, while change is widespread, even dramatic in some instances, many relationships continue as in the past. While many auto assemblers and suppliers are indeed reordering purchase-supply arrangements, elsewhere *keiretsu* remains a viable form.

Our conceptual lenses are those of governance and learning, and we conclude that both are useful in grasping what is going on. Our empirical cases highlight some important complementarities between these models of alliance. Used in conjunction, they enable a richer assessment of evolving supply relations than either provides alone.

We first examined the role played by automotive technology in Toyota's pursuit of an internal design and production capability in electronics. Toyota's decision to scale back its reliance on Denso and bring some of its higher-end electronics procurement in-house was based in part on governance concerns. Toyota's purchases from Denso had shifted over time from fairly standardized and "bolt-on" electrical parts such as starters, alternators, and air conditioners to more complex electronic parts such as fuel injection, antilock brake, and other computerized electronic systems that were more complex, costly, and integrated with the mechanical side of the car. Thus, Toyota's transactions with Denso had become more asset-specific, uncertain, and critical. The standard transaction cost prescription in such a case is more hierarchical governance, and that is what took place: Toyota vertically integrated into electronics. Yet the TCE account needs fleshing out. Toyota neither acquired Denso nor was the Hirose Plant designed to meet most of Toyota's electronic procurement needs. Toyota's purpose was to lay the foundation—create the absorptive capacity—for a massive program of learning. Modern automotive electronics is an architectural innovation, one far afield from Toyota's extant repertoire of competencies. Given its increasingly black-box dependence on Denso for an unfamiliar technology, Toyota felt itself at some risk of opportunistic hold-up. These concerns were heightened by Toyota's lack of a viable "second source" of electronics, plus Denso's growing independence from Toyota due its expanding global customer base. Toyota's interest was in shoring up a *keiretsu* governance structure that had tilted too far in Denso's favor. Full-scale vertical integration, whether accomplished by acquisition of Denso or ground-up construction of inside capacity, was never the agenda.

The story of Toyota's takeover of Daihatsu is similarly one of managing dependence on a critical resource, but here the resource was not knowledge or skill. Toyota had an interest in Daihatsu's new international sales channels and expanded manufacturing and marketing capabilities. Toyota was also troubled by signs that Daihatsu—formerly a self-sufficient auto assembler in its own right— was leveraging (as was Denso) its overseas business to reduce its dependence on Toyota. Had Daihatsu stuck

to its historical role of subordinate and compliant *keiretsu* firm—and had Toyota not put at its own helm an aggressive chief executive with an unprecedented taste for acquisition and diversification—hybrid governance of the Daihatsu - Toyota alliance might well have remained intact. As it was, Toyota moved abruptly and unilaterally to put Daihatsu under greater control.

The case of increased standardization in Japanese auto parts supply also demonstrates how attention to learning can flesh out a transaction cost explanation. Japanese suppliers frequently make heavy investments in buyer-specific assets (Kojima 1998, Nishiguchi 1994, Dyer 1996). Such investments are thought to favor flexibility, efficiency, and speed in parts transactions, owing to the cooperation and trust they foster between assembler and supplier. The industry-wide shift to greater standardization invites the speculation that the economic rationale behind such specific investments was either flawed to begin with or eroded over time. Our conjecture is that relation-specific investments have the greatest value early in an industry's life cycle when the learning curve is steepest and levels of (e.g., technological and supply chain) uncertainty are high. As know-how is routinized and diffused, processes standardize, investments in nonspecific assets rise, and bilateral commitments and cooperation decline.

The standardization case shows that when organizations economize on learning, stable alliances with trusted partners can be casualties. Learning is costly, and in lean and competitive times organizations seek to reduce it. As the localized and tacit knowledge needed to make custom parts for one assembler gives way to the shared and explicit knowledge used in making standard parts for many, bilateral ties between buyer and supplier decay. Again, a focus on the changing composition of knowledge and learning enriches the governance perspective.

Change and persistence The cases discussed in this paper identify significant discontinuities in the evolution of Japanese automotive supply chain organization. Yet for many assemblers and suppliers, close partnerships are still the norm. Cultural and institutional obstacles to severing long-term business ties are important, but these forces of inertia are not the whole issue. There remain real advantages of hybrid organization in flexibility, cost, and speed. The takeover of Daihatsu contrasts with Toyota's strategy toward other affiliates. For many parts, the *keiretsu* supply partnership with Denso persists, despite Toyota having brought in-house a share of its electronics development and production. Toyota's long-standing relationship with Toyoda Automatic Loom Works, for example, is intact. As noted, the (now-canceled) semiconductor venture with Texas Instruments featured Toyoda Automatic Loom Works, not Toyota Motor, as partner. The same is true of the alliance with Sony in liquid crystal displays.

Even so, there have been some new signs that the governance of the Toyota *keiretsu* is taking a more hierarchical form. In 1998, Toyota hiked its equity stakes in its closest affiliates—by 1% in Denso but substantially in Daihatsu and Hino, thus converting them to full subsidiaries (50% owned). Toyota's

closest affiliate, former parent Toyoda Automatic Loom, also increased its ownership of Denso and Aisin Seiki (Nikkei Online, May 13, 1999). Then in the summer of 1999, Toyota dispatched a new round of executives to top *keiretsu* firms, thus ratcheting up its monitoring and control of their management teams. Toyota officials have also publicly discussed the option of bringing the principal members of the Toyota Group into a holding company, a form banned by the U. S. Occupation until its legalization in December of 1997. Toyota's rationale is that tighter coordination of Toyota Group companies is essential for success in the more harshly competitive environment of today's world auto industry. A high-level Toyota executive we interviewed said, however, that Toyota was hiking its stakes in *keiretsu* companies chiefly as a bulwark against takeovers, now a much more serious concern than in the past (see also Shirouzu, 8/3/99). It also appears, however, that Toyota is seeking to put some limits on the freedom of its closest suppliers to serve the competition. The executive Toyota dispatched to Denso has the post of vice president, the highest-ranking placement in Denso that Toyota ever made. The Asahi news reported that the transfer was designed "to sever (Denso's) business ties with Honda Motor Co. and other assemblers as competition is expected to heat up in the industry" (www.asahi.com/english/enews 4/5/99).

Yet in other industries—consumer electronics, for example—the new economic environment is promoting a drift toward more *keiretsu*-like forms. The make-buy decision there was in the past more stark than in autos in the sense that manufacturers both produced more parts in-house *and* sourced more inputs in an arms-length fashion from a large supplier base (Asanuma 1989, Lincoln and Ahmadjian 1999). Electronics firms faced the problems of maturing products, a strong yen, and "hollowing out" due to overseas production earlier than did the auto industry. In response, they have moved to sharpen the contrast between close affiliate and arms-length supplier. Matsushita, for example, has been winnowing out suppliers—selecting an elite subset and assisting them in upgrading their production capabilities and technological knowledge while pressuring them to withhold specialized knowledge from competitors (Lincoln, Ahmadjian, and Mason 1998). Suppliers that do not make the cut are dropped, often in favor of foreign sources offering standard products at lower prices.

Thus, the Japanese economy is witnessing a rising variety of corporate governance and alliance forms. *Keiretsu* supply networks are reconfiguring but relationships with a handful of close, trusted (and safely dependent) suppliers persist. The jury is still out on whether the network organization of the Japanese economy is changing on a large scale in fundamental ways or even that it should. Our perspective on the current mix of change and stability in the Japanese economy charts a middle course between the apocalyptic rhetoric of the Japanese business press and the laments of Western journalists and managers that the Japanese will never change their ways.

Perhaps what is most striking in the adaptation of the Japanese automotive industry to change is the ability of auto assemblers to reconfigure supplier relationships selectively. The will to dissolve partnerships that have outlived their usefulness and the skill to do so with finesse may become a critical strategic advantage (perhaps the flip side of “relational advantage”). It is arguably no coincidence that two of the biggest recent stories of *keiretsu* change feature Toyota. Toyota is perhaps the only Japanese assembler with the means to invest on its own in significant absorptive capability in electronics, plus being the only auto assembler with the determination and resources to mount a quasi-hostile takeover. A little-publicized aspect of Toyota’s renowned flair for supply chain management may be the company’s track record at effectively restructuring its alliances when circumstances warrant. Skills of this sort may well play a considerable role in determining competitive advantage in the world auto industry of 21st Century.

REFERENCES

Alchian, A., H. Demsetz. 1972. Production, information costs, and economic organization. *American Economic Review*. **62** 777-795.

Asanuma, B. 1989. Manufacturer-supplier relationships in Japan and the concept of relation-specific skill. *Journal of the Japanese and International Economies*. **3** 1-30.

Baker, W. E. 1992. The network organization in theory and practice. *Networks and Organizations*. N. Nohria, R. G. Eccles, eds. Harvard Business School Press, Boston.

Barzel, Y. 1982. Measurement cost and the organization of markets. *Journal of Law and Economics*. **18** 1-24.

Chinworth, M. 1998. Toyota Prius comes to US. *Automotive Engineering International* **106** 74.

Clark, K. B. 1991. *Product Development Performance: Strategy, Organization, and Management in the World Auto Industry*. Harvard Business School Press, Boston.

Dore, R. 1983. Goodwill and the spirit of market capitalism. *The British Journal of Sociology*. **34** 459-82.

Dyer, J. 1996. Does governance matter? *Keiretsu* alliances and asset specificity as sources of Japanese competitive advantage. *Organization Science* **7** 649-666.

Dyer, J. H. 1997. Effective interfirm collaboration: How firms minimize transaction costs and maximize transaction value. *Strategic Management Journal* **18** 535-556.

Dyer, J. H., H. Singh 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review* **23** 660-679.

Fujimoto, Takahiro 1999. *The Evolution of Manufacturing Systems at Toyota*. New York: Oxford University Press.

Fukao, M. 1995. *Financial Integration, Corporate Governance, and the Performance of Multinational Companies*. The Brookings Institution, Washington, DC.

Gerlach, M. L. 1992a. *Alliance Capitalism*. University of California Press, Berkeley, CA.

----- 1992b. Twilight of the *keiretsu*? A critical assessment. *Journal of Japanese Studies*. **18** 79-118.

Gerlach, M. L., J. R. Lincoln (forthcoming). Economic organization and innovation in Japan: Networks, spinoffs, and the creation of enterprise. *Comparative Perspectives on Knowledge Management* (tentative title), G. von Krogh, ed. Macmillan, London.

Ghoshal, S., P. Moran. 1996. Bad for practice: A critique of the transaction cost theory. *Academy of Management Review* **21** 13-47.

Helper, S. R., M. Sako. 1995. Supplier relations in Japan and the United States: Are they converging? *Sloan Management Review*. Spring 77-84.

Henderson, R. M., K.B. Clark. 1990. Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly*. **35** 9-30.

IRC. 1993. Jidosha Buhin no 200 Hinmei no Seisan Ryutsu Chosa [A Survey of Manufacture and Distribution of 200 Auto Parts]. Nagoya, Japan.

Japan Fair Trade Commission [Kosei Torihiki Inkai] 1993. *Jidosha Buhin Torihiki ni Kansuru Jittai Chosa* [A Survey of Transactions of Auto Parts]. Tokyo.

Kenney, M., R. Florida. 1993. *Beyond Mass Production: The Japanese System and its Transfer to the U.S.* Oxford University Press, New York.

Kojima, K. 1998. Japanese supplier relations: A comparative perspective. Research Institute for Economics and Business Administration, Kobe University. Discussion Paper Series No. 98.

Kurozawa, S. 1997. Hiyorimi teki kinyu seisaku de Nichi-Be no mei-an. *Ekkonomisto*. 2/4/97 pp. 54-55.

Lammers, D. 1997. Hybrid gas/electric Toyota hits the road. *Electronic Engineering Times*, n980 Nov. 10 1-2.

Lane, P. J., M. Lubatkin. 1998. Relative absorptive capacity and interorganizational learning. *Strategic Management Journal* **19** 461-477.

Lincoln, J. R., C. Ahmadjian (forthcoming). *Shukko* (employee transfers) and tacit knowledge exchange in Japanese supply networks: The electronics industry case. *Knowledge Emergence: Social, Technical, and Evolutionary Dimensions of Knowledge Creation*. I. Nonaka, T. Nishiguchi, eds. Oxford University Press, New York.

Lincoln, J R., C L. Ahmadjian, E. Mason. 1998. Organizational Learning and Purchase-supply Relations in Japan: Hitachi, Matsushita, and Toyota Compared. *California Management Review*. **24** 241-264.

Lincoln, J. R., M. L. Gerlach, C. L. Ahmadjian. 1998. Evolving patterns of *keiretsu* organization and action in Japan. *Research in Organizational Behavior*. B. M. Staw, L. L. Cummings eds. volume 20. JAI Press, 1998. Greenwood, NJ.

Lincoln, J. R., M. L. Gerlach, P. K. Takahashi. 1992. *Keiretsu* networks in the Japanese economy. *American Sociological Review*. **57** 561-585.

Lincoln, J. R., Y. Nakata. 1997. The transformation of the Japanese employment system: Nature, depth, and origins. *Work and Occupations*. **24** 33-55.

Martin, X., W. Mitchell, A. Swaminathan. 1995. Recreating and extending Japanese automobile buyer-supplier links in North America. *Strategic Management Journal*. **16** 589-619.

Macaulay, S. 1963. Non-contractual relations in business: a preliminary study. *American Sociological Review*. **28** 55-70.

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

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

Mowery, D. C., J. E. Oxley, B. Silverman. 1996. Strategic alliances and interfirm knowledge transfer. *Strategic Management Journal* **17** 77-91.

Nihon Keizai Shimbun [Japan Economic Journal]. 1987. Za Toyota chubu de no jitsuzo (2) [Real image of Toyota] . 5/8/87, p. 7.

Nihon Keizai Shimbun [Japan Economic Journal]. 1994. Buhin meka ga shudo, Fuji to Suzuki, jidohensokki o kyotsuka [With parts maker leading, Fuji and Suzuki standardize automatic transmission]. 6/11/94, p. 10.

Nihon Keizai Shimbun [Japan Economic Journal]. 1995. Daihatsu Kogyo—Toyota ga keieiken o shutoku [Toyota takes control of daihatsu] 10/16/95, p. 45.

Nihon Keizai Shimbun [Japan Economic Journal] 1995. Toyota-kei ni Nissan-kei ga shusshi [Nissan group member invests in Toyota group] 12/21/95, p. 13.

Nihon Keizai Shimbun [Japan Economic Journal]. 1996. Dai sanbu tenki no kigyo jyoka-machi (4) [The Third Phase of The Industrial Castle-Town (4)] 4/2/96, p. 14.

Nihon Keizai Shimbun [Japan Economic Journal]. 1996. Toyota, TI gappei, handotai kakusha ni kyoi [Toyota and TI joint venture, threatens the semi-conductor manufacturers] 8/8/96.

Nihon Keizai Shimbun [Japan Economic Journal]. 1996. Nissan, Denki Jidosha yo no denchi chotatsu, Toyota-Matsushita-kei kara [Nissan to procure batteries for electric car from Toyota Matsushita group]. 10/16/96,p. 1.

Nihon Keizai Shimbun [Japan Economic Journal]. 1997. Mazda Ford buhin kobai o ippon-ka [Mazda and Ford to consolidate parts purchasing]. 4/6/97, p. 1.

Nikkei Kinyu Shimbun [*Nikkei* Financial News]. 1994, Buhin kyotsuka [Parts becoming interchangeable]. 3/14/94, p. 18.

Nikkei Online, 1998. Toyota Motor Raises Stakes In Group Companies. 6/11/98.

Nikkei Online. 1998. Fuyo restructuring keys on Fuji Bank: Group considers forming financial holding company as part of broad strategy to improve efficiency. 7/8/98.

Nikkei Online 1999. Toyota to beef up group ties by transferring execs. 5/13/99.

Nikkei Sangyo Shimbun [*Nikkei* Industry News]. 1993. Nissan, Toyota-kei kara buhin chotatsu [Nissan procures parts from the Toyota Group]. 6/5/93, p. 1.

Nikkei Sangyo Shimbun [*Nikkei* Industry News]. 1993. Honda, Mitsubishi Jidosha ni kikan buhin [Honda supplies major part to Mitsubishi Motors]. 11/30/93, p.1.

Nikkei Sangyo Shimbun [*Nikkei* Industry News]. 1994. Tsusansho, kei buhin kyotsuka risuto kohyo [MITI announces a list of light auto parts to be standardized]. 6/1/94, p. 11.

Nikkei Sangyo Shimbun [*Nikkei Industry News*]. 1995. Hashiri o sasaeru (7) Zuno to naru kanabi [Supporting driving 7, Car navigation, the brains]. 1/25/95, p.11.

Nikkei Sangyo Shimbun [*Nikkei Industry News*]. 1995. Toyota, Daihatsu keiei-ken nigiru [Toyota takes control of Daihatsu]. 9/21/95, p. 1.

Nikkei Weekly. 1995. Blue-chip firms tighten hiring, shift workers to subsidiaries. 6/12/95.

Nishiguchi, T. 1994. *Strategic Industrial Sourcing: The Japanese Advantage*. Oxford University Press, New York.

Nohria, N. (1992). Is a network perspective a useful way of studying organizations? In N. Nohria and R. G. Eccles (eds.), *Networks and Organizations: Structure, Form, and Action*.. Boston, Harvard Business School Press.

Nonaka, Ikujiro, Hirotaka Takeuchi. 1995. *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford University Press, New York.

Odaka, K., K. Ono, F. Adachi. 1988. *The Automobile Industry in Japan: A Study of Ancillary Firm Development*. Kinokuniya, Tokyo.

Ota, F., H. Nakanishi, K. Katsuya, T. Otani. 1994. Jidosha no erekutoronikusuka to bungyo seisan taisei no henka [Electrification of automobiles and changes in the specialized production system]. MITI Research Institute [Tsususho Sangyo Kenkyusho].

Oxley, J. 1999. Learning versus hazard mitigation in inter-firm alliances: A false dichotomy? Working paper. University of Michigan Business School.

Patrick, H. 1995. Crumbling or transforming? Japan's economic success and its postwar economic institutions. Center on Japanese Economy and Business. Columbia Business School. Working paper no. 98.

Pisano, G. P. 1996. Learning-before-doing in the development of new process technology. *Research Policy*. **25** 1097-1119.

Powell, W. W. 1990. Neither market nor hierarchy: Network forms of organization. *Research in Organizational Behavior*. **12** 295-336.

Reitman, Valerie. 1995. Added horsepower: Toyota names a chief likely to shape up global auto business. *Wall Street Journal* 8/11/95 A1 Eastern Edition.

Richardson, J. 1993. Parallel sourcing and supplier performance in the Japanese automobile industry. *Strategic Management Journal*. **14** 339-350.

Ring, P. S., A. H. Van de Ven. 1992. Structuring cooperative relationships between organizations. *Strategic Management Journal*. **13** 483-498.

Sabel, C. 1994. Learning by monitoring: The institutions of economic development. *The Handbook of Economic Sociology*. N. J. Smelser, R. Swedberg, eds. Princeton University Press, Princeton, N.J.

Piore, M. J. and C. F. Sabel 1984. *The Second Industrial Divide: Possibilities for Prosperity*. New York, Basic Books.

Sako, M. 1992. *Prices, Quality and Trust*. Cambridge University Press, Cambridge, UK.

Sako, M. 1996. Suppliers' associations in the Japanese automobile industry: Collective action for technology diffusion. *Cambridge Journal of Economics*. **20** 651-671.

Saxenian, A. 1990. Regional networks and the resurgence of Silicon Valley. *California Management Review*. Fall: 89-112.

Shioji, H. 1995. 'Itaku' automotive production: An aspect of the development of full-line and wide-selection production by Toyota in the 1960's. *The Kyoto University Economic Review*. LXVI.

Shirouzu, Norihiko 1999. Toyota is tightening control of key suppliers in bid to block encroachment by foreign firms. *Wall Street Journal*. 8/3/99, p. A18.

Smitka, M. J. 1991. *Competitive Ties: Subcontracting in the Japanese Automotive Industry*. Columbia University Press, New York.

Sobrero, M., E. B. Roberts. 1996. The trade-off between efficiency and learning in inter-organizational relationships. working paper, MIT Sloan School of Management.

Strom, S. 1998. A Japan collaboration on car technology. *New York Times*. 12/ 8/98 p 2.

Strom, S. 1999. Toyota picks aide to founding family as president. *New York Times* 4/14/99.

Toyo Keizai [Oriental Economist]. 1999. *Kigyo Keiretsu Soran*. Toyo Keizai. Ltd. Tokyo.

Uzzi, B. 1996. Embeddedness and economic performance: The network effect. *American Sociological Review*. **61** 674-698.

Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management Journal* **5** 171-180.

Williamson, O. E. 1985. *The Economic Institutions of Capitalism*. The Free Press. New York.

Williamson, O. E. 1991. Comparative economic organization: the analysis of discrete structural alternatives. *Administrative Science Quarterly* **36** 269-296.

Williamson, O.E. 1994. Transaction cost economics and organization theory. *The Handbook of Economic Sociology*. N. J. Smelser and R. Swedberg, eds. Princeton University Press, Princeton, NJ.

Womack J. P , D.T. Jones, D. Roos.1990. *The Machine that Changed the World*. Rawson Associates. New York.

Yamamura, K. 1997. The Japanese political economy after the bubble: Plus ca change? *Journal of Japanese Studies*. **23** 291-331.

Zajac, E. J., C. P. Olsen. 1993. From transaction cost to transactional value analysis: Implications for the study of interorganizational strategies. *The Journal of Management Studies* **30** 131-146.

Table 1. Denso's share of Toyota's total inputs of selected electronic parts by year

Part Name	1984	1987	1990	1993
electronic fuel injection	100	100	100	100
injector	.	60	60	52
diesel fuel injection	100	100	100	100
oxygen sensor	.	100	100	98
nitrous oxide sensor	.	50	38	42
alternator	100	100	100	100
starter	100	100	100	100
distributor	100	100	100	100
voltage regulator	.	.	100	100
igniter	.	100	100	95
ignition coil	.	100	100	100
spark plug	65	60	60	50
glow plug	.	100	100	90.3
cruise control system	.	.	.	70.6
traction control system	.	.	67	56
anti lock brake system	.	100	71	47.9
speedometer	80	68	61	61.3
power relay	90	70	70	70
keyless entry system	.	.	.	65
corner sensor	.	.	.	77
air conditioner	100	100	100	100
clock	0	0	0	4.8
navigation system	.	.	.	26.3
flasher	100	100	100	100
horn	45	45	45	50

Source: IRC Co. Ltd. (Industry Research & Consulting).
Empty cells indicate that data are not available.

Table 2. Increase towards standardization and multiple relationships

variable	1984	1987	1990	1993
assemblers per supplier	4.81 (3.21)	5.01 (3.15)	5.17 (3.22)	5.44 (3.23)
suppliers per assembler	2.16 (1.18)	2.28 (1.11)	2.44 (1.19)	2.59 (1.14)
% of suppliers that supply to both Toyota and Nissan	.26 (.44)	.26 (.44)	.29 (.46)	.32 (.47)

Source: IRC Co. Ltd. (Industry Research & Consulting).

Note: The IRC report lists buyers and suppliers and transaction volumes for 200 major auto parts. These parts range from electronic fuel injection systems, to brakes, to ashtrays. This table presents descriptive statistics for the 100 listed suppliers that reported transactions in all 4 years.
(standard deviation in parentheses)

APPENDIX

Our research methodology combined on-site interviews and analysis of article in the business media.

Our interviews were conducted between 1994 and 1997 in Japan. In the course of carrying out interviews with Japanese companies, we found that assuring confidentiality to our respondents improved considerably the quality of information received. The issue of severing long-term relationships with suppliers is highly charged, and respondents were much more likely to go beyond widely publicized facts when they were assured of confidentiality. Therefore, we do not report the names of our contacts or dates of our interviews.

Each interview lasted approximately 2-3 hours, and in most cases was with senior managers in the purchasing group. There are several exceptions—we spoke to people in public relations in several companies. In most of these cases, however, at least one of the public relations officials had prior purchasing experience. Interviews were open-ended, though we asked managers to confirm press accounts and add extra information.

We also surveyed the Japanese business press, using the Nikkei Telecom English and Japanese online services. Our search focused upon articles surrounding the Daihatsu acquisition, automotive electronics and Denso, and words related to parts standardization.

Firms interviewed

- Toyota: 3 sets of interviews at headquarters, 2 sets of interviews with Toyota labor union officials
- Nissan
- Honda
- Mitsubishi Motors
- Mazda
- Daihatsu: 2 sets of interviews
- Nissan Auto Body: 2 sets of interviews
- Denso
- Takata

