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Genjiro Kosaka, Koichi Nakagawa, Seiji Manabe & Mizuki Kobayashi

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ORIGINAL ARTICLE

The vertical *keiretsu* advantage in the era of Westernization in the Japanese automobile industry: investigation from transaction cost economics and a resource-based view

Genjiro Kosaka[1] · **Koichi Nakagawa**[2] · **Seiji Manabe**[3] · **Mizuki Kobayashi**[4]

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Abstract

Vertical *keiretsu* are specific buyer–supplier relationships that define the structure of firms in the Japanese automotive industry. However, during Japan's economic recession, firms started restructuring their relationships, which raised the question of whether automakers maintained transactions with their *keiretsu* suppliers or pursued new transactions outside of *keiretsu*. Applying two fundamental theories, transaction cost economics and the resource-based view, we investigate parts transactions in the Japanese automobile industry, and show that *keiretsu* suppliers maintained business with their *keiretsu* automakers. Our results suggest long-term vertical corporate linkage endows suppliers with a competitive advantage, even when arm's length transactions prevail in the industry.

Keywords Vertical *keiretsu* · Buyer–supplier relationship · Transaction cost economics · Resource-based view · Automobile industry

✉ Genjiro Kosaka
g.kosaka@sophia.ac.jp

Koichi Nakagawa
allegro_assai@hotmail.com

Seiji Manabe
manabe-seiji-vx@ynu.ac.jp

Mizuki Kobayashi
k-mizuki@fc.ritsumei.ac.jp

[1] Faculty of Economics, Sophia University, 7-1 Kioi-cho, Chiyoda-ku, Tokyo 102-8554, Japan

[2] Graduate School of Economics, Osaka University, 1-7 Machikaneyama-cho, Toyonaka, Osaka 560-0043, Japan

[3] Faculty of International Social Sciences, Yokohama National University, 79-4 Tokiwadai, Hodogaya-ku, Yokohama, Kanagawa 240-8501, Japan

[4] College of Economics, Ritsumeikan University, 1-1-1, Noji-Higashi, Kusatsu, Shiga 525-8577, Japan

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Introduction

Our study addresses the current state of vertical *keiretsu* relationships in the Japanese automotive industry in the 2010s. We aim to capture why and how much of the *keiretsu* developed by Toyota, Nissan, Honda, and other automotive firms have survived following the Westernization of transaction mechanisms around the year 2000.

Keiretsu is a Japan-specific, interfirm relationship characterized by long-term orientation and strong group cohesiveness surrounding one central company (Aoki and Lennerfors 2013b; Brouthers et al. 2014; Morita and Nakahara 2004). Owing to Japan's collectivist and long-term-oriented culture (Hofstede et al. 2010), *keiretsu* relationships have long been maintained, even during the rapid economic development of the 20th century (Aoki and Dore 1994). However, since the 1990s, when Japanese companies began struggling to grow, this economic system has come under increased scrutiny (Ahmadjian and Lincoln 2001; Daidj 2016; Waldenberger 2016).

Vertical *keiretsu*, which is the focus of this study, is an important variation of this system (Brouthers et al. 2014; Chen et al. 2017; Todo et al. 2015). In vertical *keiretsu* relationships, one final-product assembler is positioned as the central company, to which several parts suppliers are subordinate. This system is typically seen in the Japanese automotive industry (e.g., Toyota *keiretsu*, Nissan *keiretsu*) and the electronics industry (e.g., Panasonic *keiretsu*, Hitachi *keiretsu*). Past studies have found that this long-term, vertical linkage of parts suppliers and assemblers offers several competitive advantages to all companies involved. Japanese automobile manufacturers have especially capitalized on this system, allowing them to produce higher-quality vehicles more efficiently (Dyer and Hatch 2006; Dyer and Nobeoka 2000; Kotabe et al. 2003).

During Japan's long economic recession in the 1990s and 2000s, however, automotive manufacturers began to restructure their relationships with suppliers. Scholars and journalists call this period the "*keiretsu* reformation" (Aoki and Lennerfors 2013a; McGuire and Dow 2009). Although some central companies (e.g., Toyota) recognized the merits of the existing system, they have nevertheless begun to develop what they posit as a better supplier system—one that reflects the Western style of parts transactions—that is, the market mechanism (Ahmadjian and Lincoln 2001; Holzhausen 2002). In this paper, we use the term, "Westernization," to refer to Western style parts transactions. Westernization of auto parts transactions was initiated by automotive manufacturers, and they began to source their parts beyond *keiretsu*. As a result of this change in the automakers' policies, suppliers had the opportunity to conduct business with many different automakers other than their *keirestu* central firms.

In this paper, we discuss the consequences of this attempt by addressing two questions: First, after reforming *keiretsu*, did Japanese automakers continue to work with their *keiretsu* suppliers? Second, have *keiretsu* suppliers sought new transactions beyond their *keiretsu* affiliations? Using a record of parts transactions in the Japanese automotive industry, we investigate this topic via two theories: transaction cost economics (TCE) and the resource-based view (RBV) (Demsetz 2000; Walker and Weber 1984; Williamson 1975).

Literature review

Overview of Japanese vertical *keiretsu*

Keiretsu can be classified into two types: horizontal and vertical. The former refers to a system in which companies have a cross-shareholding relationship with one Japanese bank, while the latter describes long-term relationships between manufacturers and suppliers, as typically seen in the automotive industry (Cusumano and Takeishi 1991; Motous and Todo 2015). During the globalization of Japan's banking system around the year 2000, horizontal *keiretsu* underwent significant transformation (Aoki and Lennerfors 2013b; Brouthers et al. 2014), whereas vertical *keiretsu* has been maintained due to its advantage of increasing Japanese automakers' competitiveness (Dyer and Nobeoka 2000; Kotabe et al. 2003).

According to Morita and Nakahara (2004), vertical *keiretsu* in the automotive industry are characterized by the "suppliers' willingness to make customized investments, their long-term relationships with manufacturers, and financial as well as personal ties between them" (p. 390). Within this system, suppliers build long-term and durable commercial relationships with specific customers (i.e., automotive assemblers) to produce high-quality and cost-competitive final products (Abegglen and Stalk 1985). Suppliers not only develop these relationships but also share the same culture with car manufacturers (Chen et al. 2017).

Many studies have highlighted the benefits of Japan's *keiretsu* system (Asanuma 1989; Dyer and Nobeoka 2000; Fujimoto 2001). The first advantage is its long-term, close, and recurring interactions between automakers and suppliers, which enable smooth cooperation (Ahmadjian and Lincoln 2001; Asanuma 1989; Liker et al. 1996). Second, the vertical *keiretsu* system is characterized by the "voice" type of supplier relationship developed between each company (Helper 1991), thereby improving coordination. If problems arise in an American supplier relationship, it is common for participants to exit the relationship; however, in Japan, participants prefer to discuss problems and will often continue the relationship. For co-developed parts, in particular, which automakers and suppliers design together, participants tend to resolve issues through mutual cooperation (Fujimoto 2001). Third, both automakers and suppliers share risk and information within a vertical *keiretsu* (Lamming 2000), and most Japanese automakers set up their own supplier associations with the intention of sharing information. In Toyota's supplier association, Kyohokai, the central company and its members collaborate in the creation of both tacit and explicit knowledge (Dyer and Nobeoka 2000). Finally, assemblers and parts suppliers attempt to avoid opportunism by building mutual trust within their *keiretsu* system (Dyer and Chu 2000; Solis 2003). This results in an increase in on-time deliveries and improved product quality, which, in turn, reduces concerns regarding potential misbehavior or incapability (Kotabe et al. 2003). Furthermore, based on their mutual trust, assemblers and parts suppliers can help each other even when the supply chain is compromised by disasters, such as fires or earthquakes (Nishiguchi and Beaudet 1998).

Due to its positive impacts on the Japanese automotive industry, the vertical *keiretsu* system has been examined from various perspectives, including transaction cost theory (Dyer 1997; Hill 1995; Nagaoka et al. 2008), institutional theory (Aoki and Lennerfors 2013b; Yoshikawa and McGuire 2008), organizational and national culture (Chen et al. 2017), trust (Adler 2001; Handfield and Bechte 2002; Sako and Helper 1998), and learning (Ahmadjian and Lincoln 2001; Branstetter 2000; Dyer and Nobeoka 2000). International comparative studies have also been conducted, which offer empirical investigations of the supply system (e.g., Cusumano and Takeishi 1991; Dyer and Chu 2000; Fujimoto 2001).

Vertical *keiretsu* in recent years

While vertical *keiretsu* has been regarded as a significant contributing factor to the success of the Japanese automotive industry, automotive manufacturers began reforming the structure of their supplier relationships around the year 2000 (Aoki and Lennerfors 2013a; McGuire and Dow 2009). This reform was spurred by persistent low profitability in the decade following the burst of the Japanese economic bubble.

In 1999, Nissan Motors, led by Carlos Ghosn, took initiatives that aimed to drastically reduce manufacturing costs. Ghosn believed that Nissan's *keiretsu* was dysfunctional and thus sold off most of its shareholdings in its suppliers, instead aiming to purchase lower-cost parts from both inside and outside its *keiretsu* by introducing a system based on market competition. Other automakers similarly changed their conventional *keiretsu* (Aoki and Lennerfors 2013a). For example, Toyota started its Construction of Cost Competitiveness for the 21st Century (CCC21) program, which aimed to reduce costs by 30% over 3 years by selecting and purchasing parts from the most suitable suppliers around the world. Scholars conclude that these actions signal the Westernization of Japanese buyer–supplier relationships, which represent an attempt by Japanese automotive manufacturers to introduce the market mechanism and arm's length transactions into the industry (Ahmadjian and Lincoln 2001; Holzhausen 2002).

Research gap

In this paper, we examine the current state of *keiretsu* transactions in the Japanese automotive industry and assess their effectiveness. Intriguingly, most Japanese automotive manufacturers, except for Mitsubishi, have improved the quality of their vehicles and thus maintain a competitive advantage, whereas other industrial sectors in Japan, such as electronics, have lost their competitiveness (Chen et al. 2017; Kher et al. 2017). It therefore appears that Japanese automakers have succeeded in restructuring their supplier networks. However, the question remains: How have *keiretsu* suppliers performed in today's restructured, Westernized supply chain?

Several studies have described the current parts supply chain in the Japanese automotive industry. Aoki and Lennerfors (2013a) found that Toyota, Nissan, and Honda have developed hybrid mechanism that mix some of the characteristics of

conventional *keiretsu* relationships with arm's length relationships. Aoki and Lennerfors (2013b) further investigated Toyota's supplier system, revealing that while it has become more open, international, and cost-conscious, it has also built trust with its suppliers, which further enriches its cooperative efforts and knowledge-base. While these studies address some important aspects of the parts supply chain in the Japanese automotive industry, a research gap exists: very few studies have carried out a quantitative investigation on how buyer–supplier relationships have transformed as a result of changes in the procurement policies of Japanese automakers. Furthermore, the manner in which the *keiretsu* reformation has influenced parts transactions and the competitiveness of *keiretsu* suppliers has not yet been clarified. By examining these issues, we will be able to update our understanding of the current Japanese *keiretsu* system and contribute to the broader literature on vertical interorganizational relationships.

Hypotheses

Transaction cost economics (TCE) and the resource-based view (RBV) as perspectives for *keiretsu* analysis

Transactional relationships between buyers and suppliers have long been examined through TCE and the RBV. TCE focuses on transaction cost, which is affected by the risk of opportunistic behavior by trade partners and the necessary time and effort required for contract negotiations (Geyskens et al. 2006; Williamson 1975, 2017), whereas the RBV is related to production cost, which is determined by a firm's general or relationship-specific organizational capabilities (Dierickx and Cool 1989; Hitt et al. 2016; Schmidt and Keil 2013). Based on the assumption that transactions are carried out economically, the primary aim is to minimize total transaction and production costs (Walker and Weber 1984). In this paper, we use TCE and the RBV to examine the reformation of the *keiretsu* system, particularly whether the existing transactional relationships between a central firm and its suppliers have been sustained.

Continuity of *keiretsu* transactions

Extant research on TCE has discussed the factors that enable firms to invest in relationship-specific assets. These investments are crucial to automobile manufacturing because auto parts are highly interdependent, requiring close co-development and precise coordination between auto assemblers and suppliers (Clark and Fujimoto 1991; Ulrich 1995). Furthermore, assets specific to one business partner cannot be easily deployed to others and are thus vulnerable to opportunistic behavior. Research on TCE has also emphasized the importance of trust between buyers and suppliers in suppressing opportunism (Poppo et al. 2016; Sako and Helper 1998). Based on the continuity of *keiretsu* relationships, *keiretsu* central firms have established trust and engage in cooperative development with their suppliers.

Regarding the RBV, there is an indication that the *keiretsu* system increased the competitiveness of the Japanese automotive industry during the pre-reformation era. The system focused on improving organizational capabilities through close collaboration between buyers and suppliers. RBV scholars emphasize that a firm's competitive advantage is generated from its stockpile of valuable, rare, and costly-to-imitate resources and capabilities (Barney 1991; Dierickx and Cool 1989; Newbert 2007). Firms accumulate this stockpile by acquiring tacit and collective knowledge (Nonaka and Takeuchi 1995), as they are hard to trade in markets and time consuming to accumulate. Through close collaboration between buyers and suppliers, firms can acquire this knowledge, thus gaining a competitive advantage that is relationship specific. In the automotive industry, knowledge accumulation through close collaboration between businesses is considered critical to improving competitiveness (Asanuma 1989; Dyer 1996; Womack et al. 1990). Through stable, long-term transactional relationships, *keiretsu* suppliers gain better organizational capabilities, which are utilized only by the specific *keiretsu* central automaker rather than non-*keiretsu* firms.

However, based on the idea that Japanese automakers should take advantage of arm's length transactions, the *keiretsu* system has entered a period of reformation. Arm's length transactions have some merits, the most significant of which lies in their utilization of the market mechanism (Williamson 2017). When a firm is not at serious risk of opportunism (from the TCE viewpoint), and when there is no need for interfirm collaboration (from the RBV), it can enjoy the various benefits of the market mechanism. Under the pressure of a perfectly competitive market, parts suppliers must offer lower prices, make more effort to improve product quality, and shorten delivery speed if they want to obtain orders from buyers (Wacker et al. 2016). Thus, the buyer needs only to choose the best offer on the market without developing close relationships with suppliers. Because Japanese automotive manufacturers have recognized the benefits of arm's length transactions, they began reforming the *keiretsu* system in the late 1990s (Aoki and Lennerfors 2013a; Kato et al. 2016).

Considering *keiretsu* transactions throughout the 1990s–2010s, we should take account of the advantages of both relational and arm's length transactions. According to TCE, we can hypothesize that there have been few risks of opportunism in the automotive industry during this period, as the current automotive parts supply chain has a repeated-game structure involving a small number of buyers (automakers) and suppliers, in which the betrayal of one firm will cause critical damage to its own business (Axelrod 1984; Fujimoto 1999). Hence, during this era, the advantages of relational transactions between *keiretsu* buyers and suppliers have decreased, from the TCE point of view.

When examining this period from the RBV, the circumstances are different. While, to some extent, product modularization proceeded, automobiles must still be assembled from customized or interrelated parts to ensure product differentiation (Fujimoto 2001; Jacobides et al. 2016); thus, to develop these parts, *keiretsu* suppliers are likely to push for interfirm collaboration with the central company (Aoki and Lennerfors 2013a; Daidj 2014). Furthermore, the pursuit of competitiveness and supply chain efficiency by Japanese automotive companies also requires relationship-specific assets provided by parts suppliers (Dyer 1996; Fujimoto 1999).

Considering both perspectives, automobile assemblers are likely to engage in transactional relationships with *keiretsu* suppliers to obtain most of the auto parts that require close collaboration, while they approach non-*keiretsu* suppliers, and the other *keiretsu* suppliers, to obtain the rest of the parts they need. Hence, if we look at the situation as a whole, we can hypothesize that *keiretsu* suppliers are likely to continue to engage in transactions with *keiretsu* central companies:

H1 In 2016, when the Japanese automotive industry experienced *keiretsu* reformation, *keiretsu* suppliers were more likely to engage in transactions with their *keiretsu* central firm than the suppliers that did not belong to that *keiretsu*.

Winning transactions outside of *keiretsu* relationships

For our second and third hypotheses, we considered how being in *keiretsu* affects the expansion of business beyond *keiretsu* affiliations. In the case of beyond *keiretsu* transactions, we can assume that trading will be carried out under the same conditions as arm's length transactions by independent suppliers. The lowered transaction costs and increased organizational capabilities of *keiretsu* transactions can only be utilized in specific transactional relationships. Although *keiretsu* suppliers can foster trust with one specific buyer, it takes a long time to develop a trust relationship with another buyer (Zhong et al. 2017). Except for those of the *keiretsu* central automaker, the transaction costs of *keiretsu* suppliers tend to be the same as those of non-*keiretsu* suppliers. Also, relationship-specific organizational capabilities are seldom deployed for other transactional partners (Mesquita et al. 2008); that is, *keiretsu* central firms can fully enjoy the relationship-specific investments of *keiretsu* suppliers, but other buyers find this challenging.

Therefore, the advantage of *keiretsu* can only be utilized in a specific transactional relationship between *keiretsu* suppliers and *keiretsu* central firm, and it does not help to engage in new transactions outside of the *keiretsu*. It should be noted, however, that this is not applicable to the Toyota *keiretsu*, as will be discussed later. We present the following hypothesis:

H2 From 1996 to 2016 in the Japanese automobile industry, *keiretsu* suppliers, except for Toyota *keiretsu* suppliers, did not expand transactions with automakers other than their *keiretsu* central firm.

Although *keiretsu*, in general, does not help parts suppliers obtain customers other than *keiretsu* central companies, it can be achieved under specific conditions. Again, the two theories of TCE and the RBV offer support for this assumption. First, the reputation of *keiretsu* affiliations sometimes decreases the transaction costs of beyond *keiretsu* transactions. By serving top-rank *keiretsu* buyers (e.g., Toyota, Nissan, and Honda), parts suppliers achieve better status in the market, thus obtaining new business from and easing transactional relationships with other buyers (Podolny 1993; Stuart 2000). When suppliers expect positive spillover effects from a relationship with a specific customer, they might be motivated to further invest in that

relationship (Kang et al. 2009). Hence, when there are positive spillover effects from *keiretsu* relationships, relation-specific investments might lead to expanding transactions outside of *keiretsu*.

Second, from the RBV, we can observe that Japanese automakers have chosen their parts suppliers based on overall organizational capability, as automakers have been competitively managing their transactional counterparts since the 1990s. Organizational capability not only refers to relationship-specific capabilities but also to general competitive abilities, such as cost competitiveness, manufacturing ability, and technological level (Asanuma 1989). When evaluating beyond *keiretsu* transactions, it is necessary to determine whether the general competitive capabilities of a *keiretsu* supplier is higher than that of a non-*keiretsu* (arm's length) supplier.

Parts suppliers can cultivate general, non-relationship-specific capabilities not only within the free competition system but also within their *keiretsu* relationships (Nishiguchi 1994). On the one hand, suppliers dealing in arm's length transactions strengthen these competitive abilities to survive serious competition. On the other hand, with mutual effort from the *keiretsu* central firm, suppliers may even acquire general manufacturing or technological competencies (Mesquita et al. 2008; Yeniyurt et al. 2014; Zhang et al. 2015). While we cannot confirm which path will most successfully contribute to competitiveness, if a *keiretsu* supplier is engaged in transactions under high competitive pressure but does so with the support of the *keiretsu* central firm, that is to say, a hybrid system of competition and cooperation, we can assume that the *keiretsu* supplier will cultivate greater competitive capabilities than suppliers outside of *keiretsu*.

Among the automotive *keiretsu* systems in Japan, since the 1980s, only the Toyota *keiretsu* system is a hybrid (Ahmadjian and Lincoln 2001; Fujimoto 1999; Takeishi 2002; Wilhelm and Kohlbacher 2011). Toyota strictly evaluates its suppliers' capabilities based on quality, cost, and time of delivery. Although transactions between Toyota and its suppliers have occurred on a long-term basis, the company has implemented severe competitive mechanisms for selecting suppliers (Ahmadjian and Lincoln 2001; Wilhelm and Kohlbacher 2011). While forcing suppliers to engage in strong competition, Toyota has, simultaneously, intended to increase its *keiretsu* suppliers' competitive advantages. It instructs its *keiretsu* suppliers to build non-relationship-specific competitiveness, such as product technology, production efficiency, and managerial skills (Aoki and Wilhelm 2017). To support its suppliers' competitive capabilities, Toyota organized a suppliers' network for information sharing (Wilhelm 2011). Furthermore, because Toyota wants its suppliers to achieve economies of scale based on a large customer scope (Lincoln et al. 1998; Nobeoka et al. 2002), it has encouraged its *keiretsu* suppliers to actively expand their customer base outside the *keiretsu*; this improved financial conditions by eventually creating a stable supply of quality parts for Toyota (Nikkei Sangyo Shinbun 2017).

Nissan, in contrast, shifted to market-oriented transactions; however, it has not had the same system of continuous support and capability building as Toyota (Aoki and Lennerfors 2013a). In 1999, Nissan established the Nissan Revivals Plan (NRP) and abolished its non-competitive supplier system, subsequently switching to free competition. In 2016, Nissan announced that it will sell its shares in Kinugawa Rubber Industrial, AESC, and Calsonic Kansei, the largest parts manufacturer in the

Nissan *keiretsu*. Even if a supplier was a member of the Nissan *keiretsu*, the company eliminated the capital relationship it had with it if the supplier was no longer competitive. This indicates that Nissan *keiretsu* suppliers were being pressured to be competitive, while receiving minimal supplier development support from Nissan.

Other automakers have similarly failed to measure up to the Toyota *keiretsu*'s hybrid mechanisms of competition and cooperation (Miwa and Ramseyer 2006; Sako 1996). For example, Honda initiated its arm's length procurement strategy for both overseas and domestic suppliers before 1997, much earlier than Toyota's CCC 21 and Nissan's NRP (Aoki and Lennerfors 2013a). We can thus assume that Honda did not have any intentions to develop the overall organizational capabilities of its *keiretsu* suppliers. As such, we present the following hypothesis:

H3 From 1996 to 2016 in the Japanese automobile industry, Toyota *keiretsu* suppliers were most likely to engage in new transactions with automakers other than Toyota.

Research method

Sample and data collection

We examine transaction relationships between Japanese automakers and parts suppliers. We focus on those relationships for passenger cars that are assembled in Japan. There are eight Japanese automotive manufacturers currently in operation: Toyota, Nissan, Mitsubishi, Honda, Mazda, Suzuki, Daihatsu, and Subaru. In this study, we examine the structural changes that have occurred within the parts supply chain in Japan. Although we excluded transactional relationships in foreign countries and the export of Japanese-made parts to overseas facilities, we did include imports from overseas parts manufacturers to the domestic facilities of Japanese automakers.

Data were collected from two sources. First, to examine actual auto part shipment trends in Japan from 1996 to 2016, we used the *Jidousha buhin nihyaku hinmoku no seisan ryuutsuu chousa* ("The survey concerning the production and sales of 200 automotive parts") database published by IRC. This dataset includes information on the number of transactions between automakers and suppliers in Japan involving 200 types of auto parts, such as pistons, driveshafts, and suspensions. The survey was performed nine times during the study period. Its dataset is one of the most trusted sources of the Japanese automotive industry and has been used in many previous studies on this topic (Ahmadjian and Lincoln 2001; Manabe et al. 2005; Nagaoka et al. 2008). The list of 200 auto parts is reviewed prior to each survey, and most have remained on the list since the beginning. A total of 164 part types were included in all the surveys conducted during the period under study, and we have included these parts in our sample. Because our sample does not include auto parts that have been added to the database after 1996, we did not examine the newer types of parts, such as those used in hybrid or electric vehicles. However, the 164 parts selected from the dataset represent the most important auto parts from 1996 to

2016; thus, the dataset fits the purpose of this research, which is to test the stability of *keiretsu* transactions over the past 20 years.

Second, to gather information on *keiretsu* relationships during this period, we consulted the *Nihon jidousha buhin sangyo no jittai* 1997 ("The survey concerning the Japanese automotive parts industry 1997"), which was also published by IRC. The dataset provides an overview of the Japanese automotive industry and has been updated every 5 years. Instead of shipment volume data, the dataset describes the business operations of the auto parts industry, such as technological progress, *keiretsu* restructuring, and overseas expansion. Within the dataset is a list of all *keiretsu* suppliers for each Japanese automobile manufacturer. We used the 1997 dataset because it includes the *keiretsu* supplier list of 1996, when *keiretsu* restructuring had not yet begun. By highlighting the connections between the 1996 *keiretsu* affiliations to the changes in parts shipments over the 1996–2016 period, we can estimate the influence of former *keiretsu* relationships on business performance after the reformation.

Data analysis

We investigated the effects of the *keiretsu* system through two analyses. First, we observed the real business conditions of *keiretsu* suppliers by observing the changes in actual shipment volume occurring between 1996 and 2016. From this analysis, we captured an overview of the changes in parts transactions in the Japanese automotive industry. Second, drawing on this overview, we estimated the effects of *keiretsu* affiliations on business transactions through several regression models, which offer a more rigorous testing method. We also controlled for important factors that might affect the business conditions of parts suppliers. Through these analyses, we present both an overview of Japanese auto parts transactions (Analysis 1) as well as a precise evaluation of the *keiretsu* effect on business performance (Analysis 2).

In Analysis 1, we used auto parts as our unit of analysis and collected the shipment volume of every *keiretsu*, every non-*keiretsu* company, and the internal supply of all eight Japanese automobile manufacturers during the 1996–2016 period. It should be noted that "non-*keiretsu*" in this dataset includes not only domestic parts suppliers but also foreign suppliers and new entrants from other industries, such as electronics. Through this method, we obtained the parts shipment volume of each *keiretsu* for 164 auto parts.

In Analysis 2, we used supplier-part pairs as our unit of analysis; because there are multiple suppliers for each of the 164 parts, we identified which company supplied each part (e.g., "Denso-cooling fan" or "Aisin-automatic transmission"). By establishing supplier-part pairs as our unit of analysis, we were able to estimate the impact of *keiretsu* relationships on business performance while controlling for the conditions specific to each supplier, such as their internal resources and competitive environments. Our dataset contains 1,508 supplier-part pairs, an overview of which is shown in Table 1.

To evaluate the impact of *keiretsu* correctly, we considered several regression specifications. First, we estimated the impact on the transactional relationships

Table 1 Overview of the sample

Company profile (Analyses 1 and 2)		Parts profile (Analyses 1 and 2)	
Number of companies	528	Types of parts	164
Keiretsu companies	248	Engine mechanical parts	52
Toyota *keiretsu*	55	Chassis mechanical parts	51
Nissan *keiretsu*	28	Interior and exterior parts	34
Mitsubishi *keiretsu*	41	Electronics	27
Honda *keiretsu*	39		
Mazda *keiretsu*	34		
Suzuki *keiretsu*	17		
Daihatsu *keiretsu*	16		
Subaru *keiretsu*	18		
Analytical unit for Analysis 2 (i.e., the "supplier–parts" profile, $n = 1{,}508$)			
Number of transactions that have a *keiretsu* affiliation		Number of transactions involving each part type	
All *keiretsu*	834	Engine mechanical parts	561
Toyota *keiretsu*	260	Chassis mechanical parts	439
Nissan *keiretsu*	98	Interior and exterior parts	395
Mitsubishi *keiretsu*	106	Electronics	183
Honda *keiretsu*	128		
Mazda *keiretsu*	92		
Suzuki *keiretsu*	52		
Daihatsu *keiretsu*	49		
Subaru	49		

between *keiretsu* suppliers and the *keiretsu* central firm. We examined eight datasets containing the 2016 transaction records of each automaker to determine whether a transactional relationship existed during that year, assigning a value of 1 for yes and 0 for no. We call this variable *business relation*. In this stage, we obtained eight subsamples consisting of parts suppliers that had business relations in 2016 with Toyota ($n = 334$, mean = 0.73), Nissan ($n = 300$, mean = 0.69), Mitsubishi ($n = 378$, mean = 0.66), Honda ($n = 257$, mean = 0.77), Mazda ($n = 305$, mean = 0.61), Suzuki ($n = 281$, mean = 0.73), Daihatsu ($n = 249$, mean = 0.67), and Subaru ($n = 257$, mean = 0.62). We then conducted a logistic regression analysis of each subsample, thereby estimating the influence of *keiretsu* affiliations on the transactional relationships between each automaker and their suppliers.

Following this stage, we created two variables to capture each supplier's degree of business expansion into the Japanese automotive industry: *customer scope* and *Δ market share*. For *customer scope*, we assigned a value of 1 when the supplier-part pair experienced an increased customer base from 1996 to 2016 ($n = 610$), 0 when it remained unchanged ($n = 439$), and −1 when it decreased ($n = 459$). For example, because Denso sold cooling fans to two automakers in

1996 and six automakers in 2016, we assigned the "Denso-cooling fan" pair with a *customer scope* of 1. For *Δ market share*, we measured the change in total market share from 1996 to 2016, which was calculated as shipment share in 2016 minus shipment share in 1996. For example, because the shipment share of Denso cooling fans was 12.0% in 1996 and 46.4% in 2016, the *Δ market share* of Denso-cooling fan is 34.4. Using these two variables, we evaluated the change in business performance of each supplier-part pair from 1996 to 2016.

For Analysis 2, we introduced some control variables. According to competitive strategy theory (Barney 1991; Porter 1980), it is important to control for differences in the industrial environment and each firm's resource base, since these factors are considered the fundamental determinants of a firm's competitive advantage. To control for these factors, we determined the "business severity" of each competitive environment by measuring the average number of competitors (*# of competitors*) from 1996 to 1999. We examined this shorter period so that the data would reflect the original state of the competitive environment before the *keiretsu* reformation. We also controlled for the customer's pressure to vertically integrate by introducing a variable called *automaker's internal supply* (i.e., the share of parts supplied internally). Additionally, we introduced a dummy variable for electronic parts (*electronics*), as the speed of technological change in this type differs from that of other automotive parts. To control for each firm's resources, we used the average *market share* of parts during the 1996–1999 period to represent the level of economies of scale, and the number of parts (*# of parts*) the supplier provided during that period to represent the level of economies of scope (Teece, 1980). While its effect on *Δ market share* is most likely to be positive, because Japanese automobile manufacturers tried to decrease their reliance on single suppliers when purchasing certain parts during the 2000s (Konno, 2004), it is also possible that this variable may be negative.

Table 2 shows the mean values, standard deviations, and correlation coefficients among the independent variables in Analysis 2. There does not appear to be any serious risk of multicollinearity among the variables. The largest variance inflation factor (VIF) can be found for *# of competitors*, with a value of 1.173.

Results

Analysis 1

First, we will provide an overview of the changes in relationships between Japanese automobile manufacturers and their suppliers from 1996 to 2016. Table 3 contains a buyer–supplier matrix showing the shipment share and the change in shipment share during the period under study. The upper number in each cell represents a supplier's shipment share to the given automaker in 2016. This value was calculated by averaging the shipment shares of all 164 parts, which is represented by $\frac{1}{164}\sum_{i}^{164} Si$, where Si is the total share of that supplier group (horizontal axis) in parts i shipment to the given automaker (vertical axis). The lower number in each cell, preceded by a plus or minus sign, corresponds to the change in shipment share from 1996 to 2016. For example, when viewing the column for the Toyota *keiretsu*, we

Table 2 Descriptive statistics and correlations between independent variables in Analysis 2

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1. Toyota *keiretsu*	0.172	0.377	1.000											
2. Nissan *keiretsu*	0.064	0.246	−0.120	1.000										
3. Mitsubishi *keiretsu*	0.070	0.255	−0.125	−0.072	1.000									
4. Honda *keiretsu*	0.084	0.278	−0.139	−0.080	−0.083	1.000								
5. Mazda *keiretsu*	0.061	0.239	−0.116	−0.067	−0.070	−0.077	1.000							
6. Suzuki *keiretsu*	0.034	0.182	−0.862	−0.498	−0.051	−0.057	−0.048	1.000						
7. Daihatsu *keiretsu*	0.032	0.177	−0.836	−0.483	−0.050	−0.055	−0.046	−0.034	1.000					
8. Subaru *keiretsu*	0.032	0.177	−0.836	−0.483	−0.050	−0.055	−0.046	−0.034	−0.033	1.000				
9. Market share	8.472	12.188	0.273	−0.021	−0.108	−0.005	−0.096	−0.073	−0.077	−0.085	1.000			
10. # of parts	8.033	8.467	0.303	0.053	−0.076	−0.068	−0.049	−0.077	−0.066	−0.060	0.201	1.000		
11. # of suppliers	9.832	5.106	−0.031	0.019	0.115	0.036	0.119	0.140	0.100	0.070	−0.233	−0.159	1.000	
12. Internal sourcing	0.344	0.475	−0.038	0.041	0.079	0.029	−0.009	0.008	0.056	0.016	−0.167	−0.070	0.196	1.000
13. Electronics	0.121	0.326	−0.002	0.009	−0.086	−0.033	−0.077	−0.025	−0.056	−0.022	0.112	0.166	−0.238	−0.179

$n = 1508$

Table 3 Analysis 1: Transactional matrix between automakers and parts suppliers

	Keiretsu								All *Keiretsu*	Internal supply	Non-*Keiretsu*
	Toyota	Nissan	Mitsubishi	Honda	Mazda	Suzuki	Daihatsu	Subaru			
Automaker											
Toyota	*64.63*	0.48	0.05	0.27	0.07	0.00	0.19	0.00	65.68	9.24	25.07
	*+11.51***	−0.14	−0.22	−0.03	+0.07	0.00	+0.16	0.00	+12.91**	−3.99†	−7.36*
Nissan	5.78	*22.40*	0.31	2.67	0.00	0.00	0.00	0.03	31.21	4.81	63.97
	+5.18***	*−3.02*	0.16	+1.38	0.00	0.00	0.00	+0.03	3.73	−2.85	−0.88
Mitsubishi	16.29	3.28	*19.16*	2.01	0.19	0.00	0.19	0.01	41.13	4.05	54.82
	+3.26	+2.62**	*−2.59*	+0.92	+0.19	0.00	+0.19	0.01	+4.61	+0.05	−4.66
Honda	9.24	2.42	0.54	*32.83*	1.70	0.00	0.00	0.01	46.74	7.65	45.60
	+4.10*	+1.86*	+0.54†	*−8.68**	+1.70*	0.00	0.00	+0.01	−0.46	+0.58	−0.11
Mazda	14.29	0.45	0.49	1.41	*21.37*	0.00	0.00	0.00	38.01	6.90	55.08
	+7.49**	−0.79†	−0.13	+0.48	*−5.91*†	0.00	−0.12	−0.12	+0.91	+0.74	−1.64
Suzuki	20.66	2.98	0.78	1.96	0.31	*15.99*	0.00	0.09	42.79	4.99	52.21
	+3.53	+1.06	+0.20	−0.22	+0.07	*+4.09*	0.00	+0.09	+8.84*	−3.61†	−5.22
Daihatsu	35.29	1.49	0.75	1.08	1.33	0.56	*14.31*	0.72	55.54	10.05	34.40
	+5.04	+0.16	+0.20	−0.08	+1.04†	+0.56†	*+1.54*	+0.71*	+9.19*	−2.29	−6.89†
Subaru	11.95	3.69	0.00	1.47	0.08	0.00	0.00	*16.47*	33.67	3.71	62.63
	+4.87*	−2.02	−0.49†	−0.10	+0.08†	0.00	0.00	*−0.09*	+2.22†	−0.81	−1.40
All automakers	31.46	3.54	1.82	4.41	2.95	1.58	1.91	1.51	49.20	7.22	43.56
	+7.89***	+1.87*	−1.32**	−0.60	+0.76†	+0.52†	+1.25***	+0.77**	+7.31*	−1.75	−5.57*

$n = 164$

Italicized values indicate transactions between *keiretsu* suppliers and the central automaker

All calculations made via a one-tailed test

***$p < 0.001$

**$p < 0.01$

*$p < 0.05$

$^{\dagger}p < 0.1$

can see that the total parts share between Toyota and its *keiretsu* suppliers increased by 11.51%, and this change was statistically significant at the 0.01 level. In addition, Toyota's *keiretsu* suppliers significantly increased their shares of shipments to Nissan (+5.18%), Honda (+4.10%), Mazda (+7.49%), and Subaru (+4.87%). Overall, the Toyota *keiretsu* increased its share in all Japanese automotive markets by 7.89%, which indicates that Toyota's *keiretsu* suppliers not only strengthened their business relations with Toyota but also expanded its business to other automakers.

The *keiretsu* suppliers for Nissan, Suzuki, Daihatsu, and Subaru also showed increases in total shipment share, although the increases were smaller for these companies than for Toyota. While these four *keiretsu* suppliers obtained additional business from other automakers, no significant changes in shipment share were found with each central firm. In contrast, the Honda *keiretsu* decreased its share of shipments to the central firm by 8.68%; however, because of its small gain in shipments to other companies, the Honda *keiretsu*'s overall share of the Japanese automotive industry did not change significantly. The Mitsubishi *keiretsu*, on the other hand, showed a significant decrease in total shipment share (1.32%). Finally, looking at "non-*keiretsu* supply" in Table 3—which not only includes incumbent parts suppliers but also overseas parts manufacturers (e.g., Bosch) and new domestic entrants—we can see that all of the values in this column have decreased, especially those for Toyota.

Overall, only the Toyota *keiretsu* suppliers appear to have good market share performance, both with their central firm and with other automakers. While the remaining *keiretsu* have mixed results, we found no evidence of loss of competitiveness from 1996 to 2016. Rather, *keiretsu* suppliers increased their total share of the Japanese market by 7.31%. In contrast, the non-*keiretsu* suppliers significantly lost shares in the Japanese automotive industry by −5.57%. Consequently, we can infer that *keiretsu* suppliers, as a whole, have shown a better market share performance than non-*keiretsu* suppliers.

Analysis 2

In this stage, we conducted regression analyses to examine whether *keiretsu* relationships help suppliers earn business in the Japanese automotive industry. First, we performed several ordinal logistic regressions using the 2016 data, setting the *business relation* with each automotive manufacturer as the dependent variable, and *keiretsu* affiliations and some control variables as independent variables. Table 4 shows the results of these analyses.

In this table, we estimated the impact of being in *keiretsu* on *business relation* with a given automaker compared to non-*keiretsu* (the status quo of the model). From this table, we can see that each *keiretsu* affiliate is significantly more likely to maintain business relations with the *keiretsu* central firm, than non-*keiretsu* suppliers do. Interestingly, the positive influence on the relationships between Toyota and its *keiretsu* is not so strong ($p < 0.1$), whereas the relationships between the suppliers and central firm of other *keiretsu* are statistically significant ($p < 0.05$). Toyota also shows the lowest estimated improvement of the odds ratio, indicating that Toyota

Table 4 Analysis 2–1: ordinal logistic regression for *business relation* with each automotive manufacturer

	Toyota ($n=334$) yes (1) = 242 no (0) = 92	Nissan ($n=300$) yes (1) = 206 no (0) = 94	Mitsubishi ($n=378$) yes (1) = 248 no (0) = 130	Honda ($n=257$) yes (1) = 199 no (0) = 58
Focal keiretsu	0.585 (0.321)†	0.707 (0.337)*	0.672 (0.298)*	1.248 (0.380)**
Other keiretsu	−0.191 (0.767)	−0.562 (0.556)	−0.396 (0.372)	0.623 (0.655)
Electronics	0.916 (0.483)*	−0.236 (0.419)	0.072 (0.384)	1.100 (0.531)*
# of products	−0.024 (0.014)	0.078 (0.020)***	−0.022 (0.016)	0.011 (0.029)
# of competitors	0.036 (0.033)	0.054 (0.033)	0.022 (0.029)	−0.004 (0.041)
Market share	0.074 (0.012)***	0.065 (0.013)***	0.078 (0.012)***	0.076 (0.018)***
Internal sourcing	−0.049 (0.296)	0.385 (0.313)	0.097 (0.255)	0.063 (0.353)
Model statistics				
McFadden's R^2	0.143	0.134	0.123	0.138
AIC	348.23	339.56	442.28	253.38
ΔAIC	−0.79	−0.24	−1.35	−7.49

	Mazda ($n=305$) yes (1) = 186, no (0) = 119	Suzuki ($n=281$) yes (1) = 204, no (0) = 77	Daihatsu ($n=249$) yes (1) = 166, no (0) = 83	Subaru ($n=257$) yes (1) = 159, no (0) = 98
Focal keiretsu	1.207 (0.350)***	1.608 (0.545)**	1.633 (0.501)**	0.990 (0.428)*
Other keiretsu	−0.130 (0.386)	0.233 (0.347)	0.290 (0.382)	−0.744 (0.378)*
Electronics	0.691 (0.391) †	1.166 (0.538)*	0.636 (0.480)	1.242 (0.434)**
# of products	0.001 (0.016)	−0.035 (0.017)*	−0.051 (0.020)*	0.022 (0.016)
# of competitors	−0.041 (0.036)	−0.059 (0040)	0.062 (0.043)	0.078 (0.042) †
Market share	0.048 (0.011)***	0.059 (0.013)***	0.088 (0.015)***	0.055 (0.012)***
Internal sourcing	0102 (0.283)	0.066 (0.320)	−0.829 (0.358)*	0.001 (0.312)
Model statistics				
McFadden's R^2	0.098	0.145	0.202	0.117
AIC	384.69	298.23	268.10	316.45
ΔAIC	−9.27	−10.37	−6.82	−13.86

The numbers in parentheses are standard errors

ΔAIC is compared to the base model, which only introduced the control variables

All calculations made via a two-tailed test

***$p<0.001$

**$p<0.01$

*$p<0.05$

$^{\dagger}p<0.1$

did not assure its *keiretsu* suppliers of a continuing business relationship to the same degree as other automotive manufacturers in Japan. Despite this, *keiretsu* affiliations appear to have a generally positive effect on the maintenance of business relations between *keiretsu* suppliers and the central firm. We therefore conclude that our results support H1.

This case is substantially different from that of the Japanese electronics industry, which has almost completely eradicated its domestic *keiretsu* system (Aoyama 2000; Lincoln et al. 1998). However, while *keiretsu* relationships in the Japanese automotive industry may benefit the suppliers, our results do not directly indicate whether these relationships are as stable as they used to be. This is primarily because there are no previous studies with benchmarks that are comparable to ours.

We did not find that *keiretsu* affiliation had a positive influence on the *business relation* with *other keiretsu* central firms. Checking the beta of *other keiretsu*, the analysis only showed that *keiretsu* affiliation had a significant influence for the case of Subaru. For Subaru, being in the *other keiretsu* category had a negative impact on its *business relation*. Therefore, from this analysis, we did not find any evidence that *keiretsu* affiliation, in general, facilitates new business transactions with other *keiretsu* central firms. However, there is a possibility that individual *keiretsu* contributes to business expansion toward other automakers. Therefore, we proceed to the next step of analyzing the effect that being in each *keiretsu* has on business expansion.

We will now discuss the regression models in Table 5 that show the results for *customer scope* and *Δ market share*. Ordinal logistic regression was used to examine the impact on *customer scope*, which has three discrete variables: "Increase," "Unchanged," and "Decrease or withdrawal," coded 1, 0, and −1, respectively. In this analysis, the significant positive coefficient means that its variable improves the possibility of customer scope expansion and diminishes the possibility of a decrease in customer scope. Moreover, we used ordinary least square regression to examine the impact on *Δ market share* because that analysis takes a continuous value.

From the information presented in Table 5, it is clear that only the Toyota *keiretsu* had a positive influence on both variables. From 1996 to 2016, suppliers in the Toyota *keiretsu* generally increased their market share by about 5.9%, and it increased the odds ratio of improving customer scope expansion by 0.352 in comparison to non-*keiretsu* suppliers. The results of the previous analysis, which examined the *business relation* variable, revealed that Toyota's *keiretsu* suppliers were not given strong assurance that their business with Toyota would continue; nevertheless, it appears that these suppliers were able to expand their business and obtain new customers. Thus, our results also support H3.

Turning now to the *keiretsu* of other automakers in Japan, *keiretsu* suppliers for Nissan, Mitsubishi, and Honda lost between 2 and 4% of market share from 1996 to 2016. Both the Nissan and Honda *keiretsu* show no evidence of any difference in the possibility of an increase/decrease in *customer scope*, whereas the Mitsubishi *keiretsu* experienced a significant decrease in *customer scope*. That is, the odds ratio of improving the customer scope of Mitsubishi *keiretsu* changed by −1.074 in comparison to non-*keiretsu* suppliers. While a negative impact on *customer scope* was found in both the Mazda and Subaru *keiretsu* (−0.784 and −0.875, respectively), no significant effect was found on their *Δ market share*. Thus, it appears that these *keiretsu* suppliers maintained their share of the automotive market by continuing to engage in business transactions with their central firms. Finally, both the Suzuki and Daihatsu *keiretsu* had no significant impact on either *customer scope* or *Δ market share.* To summarize, for nearly all the *keiretsu* under study (except Toyota's), we

Table 5 Analysis 2–2: regression analyses of parts suppliers' business expansion

	Statistical method			
	Ordinal logistic regression	Ordinary least squares regression		
Dependent variable	*Customer scope* 1: increase = 610 0: unchanged = 439 − 1: decrease or withdrawal = 459	*Δ Market share*		
			(Intercept)	1.066 (0.007)***
Keiretsu			*Keiretsu*	
Toyota	0.352 (0.170)*		Toyota	0.059 (0.008)***
Nissan	− 0.219 (0.234)		Nissan	− 0.027 (0.011)*
Mitsubishi	− 1.074 (0.261)***		Mitsubishi	− 0.023 (0.011)*
Honda	− 0.099 (0.207)		Honda	− 0.034 (0.010)***
Mazda	− 0.784 (0.262)**		Mazda	0.001 (0.012)
Suzuki	0.068 (0.309)		Suzuki	0.001 (0.016)
Daihatsu	− 0.163 (0.319)		Daihatsu	0.003 (0.016)
Subaru	− 0.875 (0.350)*		Subaru	0.005 (0.016)
Electronics	− 0.175 (0.178)		Electronics	0.004 (0.009)
# of products	0.022 (0.007)**		# of products	0.000 (0.000)
# of competitors	− 0.106 (0.012)***		# of competitors	− 0.003 (0.001)***
Market share	− 0.046 (0.005)***		Market share	− 0.003 (0.000)***
Internal sourcing	− 0.046 (0.122)		Internal sourcing	0.000 (0.005)
Model statistics				
McFadden's R^2	0.097		R^2	0.131
AIC	1861.13		*p* of *F* value	0.000
ΔAIC	− 26.84			

$n = 1508$; the numbers in parentheses are standard errors

ΔAIC is compared to the base model, which only introduced the control variables

All calculations made via a two-tailed test

***$p < 0.001$

**$p < 0.01$

*$p < 0.05$

$^{\dagger}p < 0.1$

did not find any evidence that *keiretsu* affiliations had helped suppliers expand their business to new customers. Thus, we can conclude that H2 is supported.

In assessing the overall effects of *keiretsu* affiliations, while we did observe a positive impact on the maintenance of business relations between *keiretsu* suppliers and the central firm, neither positive nor negative effects were found on the expansion of business to new customers, with the exception of the Toyota *keiretsu*. Furthermore,

Toyota's *keiretsu* suppliers achieved greater expansion despite not having strong assurance of their business relations with Toyota. Although their advantages differ between companies, it appears that *keiretsu* relationships do offer some kind of advantage to auto parts suppliers in the era of Westernization.

Finally, regarding our control variables, the results were mostly consistent with our assumptions, which were based on competitive strategy theory. The number of competing companies (*# of competitors*) had a significantly negative impact on both *customer scope* and Δ *market share*, whereas the degree of economies of scope (*# of products*) had a significantly positive influence on both variables. The dummy variable for electronic parts (*electronics*) showed no statistically significant impacts, and the same was observed for the automakers' *internal sourcing*. The 1996 *market shares* show a significantly negative association with both *customer scope* and *Δ market share*. It indicates that the management policy of the Japanese automotive supply chain leans toward a decreased dependency on one strong supplier for the purchasing of certain parts.

Discussion

Evaluations of our results

The results indicate that our hypotheses are mostly supported. During the *keiretsu* reformation era, all *keiretsu* suppliers, except for the Mitsubishi *keiretsu*, were likely to maintain their business relations with their central automaker. In particular, suppliers of the Toyota *keiretsu* not only maintained their transactional relationships with Toyota, they also expanded their customer base to include other automotive manufacturers, including Nissan, Honda, Mazda, and Subaru.

The main departure from our hypotheses lies in current state of the Mitsubishi *keiretsu*, as we were unable to find any significant impact of the *keiretsu* affiliation on the suppliers' maintenance of business relations or expansion to new customers. We believe this is due to the business crisis of the central firm, Mitsubishi Motors, which lost its reputation and nearly went bankrupt after their fraudulent actions and similar crimes in the 2000s were exposed. Along with this crisis, Mitsubishi's *keiretsu* suppliers also experienced a severe slump during this period, losing orders from Mitsubishi which lost a large share of the automotive market in Japan. In addition, Mitsubishi's *keiretsu* suppliers faced many challenges in expanding their business, as other automakers were reluctant to purchase parts from Mitsubishi's *keiretsu* suppliers, fearing they would be of poor quality (Nikkei Business et al. 2016).

Implications

Our results imply that arm's length transactions have not yet become dominant in Japan, even 20 years after the adoption of the market mechanism. While it is also true that non-*keiretsu* transactions have been increasing slightly (Ahmadjian and Lincoln 2001), traditional business transactions through *keiretsu* relationships have

not yet disappeared. Our study shows that the Westernization of auto parts transactions does not simply mean that the competitiveness of *keiretsu* suppliers has declined nor that these suppliers have lost their transactions with their central firms. In the era of Westernization, both arm's length transactions and *keiretsu* transactions offer advantages. On the one hand, the risk of opportunism is limited in auto parts transactions due to the smaller number of buyers and suppliers involved, and arm's length transactions can be cost-effective; on the other hand, automobiles still require customized parts (Fujimoto 2001; Jacobides et al. 2016), and the relationship-specific capabilities of *keiretsu* suppliers are beneficial to automakers. Comparing these two conflicting ideas, our results suggest that the latter effects are predominant; therefore, transactions between firms with accumulated capabilities are highly unlikely to be terminated (Chatain 2011).

Our results further reveal that Toyota's *keiretsu* suppliers were able to expand their business and obtain new customers. This finding supports two notions related to TCE and the RBV. First, the reputation of the central automaker in the *keiretsu* affects the transaction costs of its suppliers. Suppliers of top-tier buyers increase their reputation through their commitment to the buyer, and thus have a better chance of gaining new customers (Kang et al. 2009). Second, there is a difference in supplier capabilities between each *keiretsu*. The more competitive the buyer, the more deeply their suppliers will commit to them, and buyers are reciprocally involved in their suppliers' development efforts (Lin et al. 2017; Yeniyurt et al. 2014; Zhang et al. 2015). For example, compared to other *keiretsu*, the Toyota *keiretsu* can best enhance the reputations of its suppliers and improve their versatile, redeployable capabilities as well as relationship-specific ones. These findings indicate that "*keiretsu* reformation" does not mean transitioning from closed, exclusive transactions to open, market-oriented ones; rather, it calls for a more nuanced understanding of business transactions in the Japanese automotive industry.

Nevertheless, we should note that our findings are not permanent, as we cannot say whether *keiretsu* transactions will remain a fixture of the Japanese automotive industry in the future. Our analysis does not deny that the *keiretsu* system is moving toward complete dismantlement (Ahmadjian and Lincoln 2001; Holzhausen 2002; McGuire and Dow 2009); rather, the results only indicate that *keiretsu* relationships still play a substantial role in auto parts transactions in Japan, even though 20 years have passed since the beginning of their Westernization. We also cannot say whether the market mechanism will completely dominate the industry. Our analysis and theoretical discussions simply shed some light on the transition process, suggesting that it will not proceed quickly and linearly and that the two conflicting systems will coevolve and eventually coexist. Although past studies indicate that the introduction of the market mechanism to long-term relationships based on mutual trust has created a shift "toward the extremes of arms-length contracting and top-down administration" (Ahmadjian and Lincoln 2001, p. 683), we suggest that a different path is revealed: long-term, trustful relationships will become refined to survive under the pressure of market competition. In other words, the introduction of the market mechanism has "revived and reinvented *keiretsu*" (Aoki and Lennerfors 2013b, p. 109). Some recent studies report a hybridization of transaction policies in *keiretsu* (Aoki and Lennerfors 2013a),

a paradoxical tension of simultaneous competition and cooperation in supplier networks (Wilhelm and Sydow 2018), and ambidextrous governance modes for suppliers (Aoki and Wilhelm 2017). As a result of these phenomena, "the level of mutual commitment and assistance is perhaps even greater than in the 1980s" (Aoki and Lennerfors 2013b, p. 110). In summary, our study provides empirical support for the notion that, under the condition that the market mechanism prevails, arm's length transactions will not necessarily replace long-term relationships; rather, market pressure will sustain long-term relationships and allow them to evolve.

Academic contributions and research limitations

Our study contributes to the body of research on the theoretical mechanisms of vertical supplier-customer relationships (Whipple et al. 2015). Except for our findings on the Mitsubishi *keiretsu*, our results indicate that the current state of the Japanese automotive industry is mostly consistent with our predictions, which were derived from TCE and the RBV. Our results show that long-term vertical linkages have endowed suppliers with a competitive advantage, even in an industry where arm's length transactions have prevailed. We also show that the Japanese *keiretsu* system and its reformation can be explained by the basic theories of vertical corporate relationships: TCE (Brouthers 2013; Langlois 1992; O'Brien et al. 2014; Williamson 1975, 2017) and the RBV (Conner and Prahalad 1996; McIvor 2013). The universality of these fundamental theories is thus enhanced by our study. Recently, scholars have also tried to apply TCE and the RBV to analyses of unstructured and emerging markets (Khanna and Palepu 2000; Meyer et al. 2009), open innovation between heterogeneous corporations (Remneland-Wikhamn and Knights 2012), and even immigrant-owned businesses (Yang et al. 2012). Our study helps confirm the theoretical robustness and predictive power of TCE and the RBV.

Despite its contributions, our study does have some limitations. First, we focus on the quantitative aspects of Japanese automotive *keiretsu*, using published datasets and annual reports. A more detailed, qualitative understanding of this phenomenon is still needed. For example, what led to the *keiretsu* restructuring: globalization, Japanese economic stagnation, or another factor? Which competencies obtained from *keiretsu* relationships have especially contributed to business development? In addition, the advantages endowed by the Toyota *keiretsu* could be an interesting subject for a case study. We also have yet to establish the external validity of our findings regarding the effects of long-term vertical relationships in a market economy.

Our analysis is also limited by the datasets used. Because we only focused on changes in the business relations of the Japanese automotive industry for 20 years, starting from 1996, our dataset does not include transactions involving new types of auto parts, such as semiconductors for hybrid systems or electric energy as well as parts that have multiple or complex functions. There have been increased shipments of new entrants to both the domestic and overseas automotive markets (Bartnik et al. 2018); thus, the decrease of *keiretsu* transactions may

be more extensive than indicated in our research. Future analyses should examine these new types of auto parts as well.

Conclusion

Our study demonstrates the robustness of the *keiretsu* system in the Japanese automotive industry. Although Japanese automobile manufacturers started to restructure their supply chains in the 2000s, in most cases, these manufacturers have maintained their transactional relationships with their traditional *keiretsu* suppliers. Parts suppliers who create long-term relationships with their customers are likely to gain a competitive advantage, regardless of market conditions. Furthermore, as seen in the case of Toyota, the *keiretsu* system sometimes generates non-relationship-specific capabilities. While a company must constantly review whether the long-term relationships they maintain are truly contributing to their efficiency and cost effectiveness (Grayson and Ambler 1999), we should take their substantial merit into account, even in today's competitive, arm's length market.

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Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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