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Sustaining Competitiveness and Profitability Under Asymmetric Dependence: Supplier–Buyer Relationships in the Korean Automotive Industry

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Abstract: In this study, we examine the supplier–buyer relationship based on resource dependence theory. When suppliers are asymmetrically dependent on buyers because of the industry structure, the suppliers are subject to the opportunistic behaviors of the buyers. In this industry setting, suppliers have less opportunity to sustain their profitability. We theoretically and empirically examine the conditions under which suppliers may overcome such conditions. Suppliers' enhanced commitment to the asymmetric relationship can help them resolve problems associated with asymmetric dependence and thereby sustain profitability. This effect can be lessened when a buyer forms a new exchange relationship or magnified when a supplier forms a new exchange relationship. Suppliers' industrial diversification and technological capability also affect the dynamics. We collected data from Korean auto parts suppliers between 1998 and 2007. Using the feasible generalized least squares regression model, most of our hypotheses were supported, except for the moderating effect of technological capability. These empirical results are also confirmed by random-effects model and fixed-effects model panel regressions. This study makes three distinctive contributions to the current research, suggesting the enhancement of commitment (dependence) as a strategic solution under conditions of asymmetric dependence, applying a dynamic perspective to resource dependence theory, and emphasizing the role of firms' capability in circumstances characterized by asymmetric dependence.

Keywords: asymmetric dependence; sustaining profitability; resource dependence theory; supplier–buyer relationship; automotive industry; business sustainability

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1. Introduction

Firms' sustainable competitiveness and sustainable performance have been among the main research themes in the literature on strategic management published over the last four decades. Scholars have focused on how firms can overcome threats from various forces (competitors, suppliers, buyers, entrants, and substitutes) to sustain their competitiveness and profitability [1]. Scholars have also examined the roles of firms' resources [2], transactions between firms [3], and power relationships among firms [4] to explain how some firms outperform others or sustain their performance and competitiveness. Following this research trend, the current study examines how firms can sustain or enhance their competitiveness and performance under conditions of unfavorable industrial structure, such as when their dependence on their exchange partners results in asymmetric dependence. Given its structure, the automobile industry is a good example of such asymmetric dependency conditions, providing an appropriate environment to examine how firms sustain their competitiveness and performance despite structural difficulties. Relying on resource

dependence theory, we examine how auto parts suppliers sustain their competitiveness and thus, their profitability under conditions of asymmetric dependence [5].

In resource dependence theory, firms need to reduce their high dependence on external sources of critical resources [6,7]. In their review of previous research, Hillman et al. [7] categorized five strategic approaches to overcoming problems associated with resource dependency on external forces: board interlocks, mergers and acquisitions, interorganizational relationships like joint ventures, political strategies, and executive successions. Recent studies have also revealed similar attitudes towards dependence on external forces. For example, Jiang et al. [8] suggested that high dependence on a supplier may hinder recovery from a crisis. Abdurakhmonov et al. [9] also found that high dependence on government harms firms. Following the tradition of resource dependence theory, these studies emphasized the need for firms to reduce their high dependency on external forces.

However, some firms may be unable to overcome dependency on external sources. In particular, when dependence asymmetry is structurally embedded in an industry, a more dependent firm may encounter difficulties altering its dependence on its dominant transaction counterpart. For example, the automotive industry is characterized by asymmetric dependence between automakers and auto parts suppliers. By the nature of the industry, auto parts suppliers are especially vulnerable to reliance on transactions with automakers. Given these considerations, our research question emerges: How can these firms (e.g., auto parts suppliers in the automotive industry) sustain their competitiveness and profitability?

Asymmetric Dependence

The prior literature has shown that suppliers in the automobile industry have difficulties exercising their power. Among the main reasons are the differences in size and stature between such automakers and suppliers [10]. Prior studies have also pointed out that it is difficult to overcome the asymmetric dependence on automakers, because of the importance of resources, problems relating to substitutability, path dependence due to incremental innovation strategies, and differences in negotiation power [5–7,10–13]. Such asymmetric dependence may affect suppliers' sustainability. Specifically, this imbalance in dependence can negatively affect auto parts suppliers (more dependent firms) in two ways, i.e., higher likelihood of failure (business sustainability) and losses (performance/profit sustainability) due to the misappropriation of rents by automakers (the dominant firms) [7,14,15].

A more dependent firm can make strategic decisions to overcome problems caused by asymmetric dependence [4,6,7]. The prior literature shows that firms can overcome difficulties in acquiring resources relating to asymmetric dependence and the appropriation of profit between exchange partners in an asymmetric dependence relationship by finding new exchange partners, bridging with other firms (interlocking directorates, alliances, or merger and acquisition), and taking collective action (associations and government intervention) [4,6,7,10,16]. However, the efforts of more dependent firms to overcome problems arising from asymmetric dependence in the automotive industry may have only limited outcomes. In procurement relationships within the automotive industry, the supplier experiences more disadvantages and greater vulnerability because the buyer (automaker) has greater bargaining power associated with their position in the industry [4,10,17–19]. For example, mergers and acquisitions may not be a suitable solution for addressing an asymmetric relationship if there are significant gaps in size and capability in the relationship between automakers and their suppliers (the more dependent firms) [10,20,21]. As a result, more dependent firms (suppliers in the automobile industry) have to look for alternative ways to manage their asymmetric dependence on their counterparts. Prior studies on dependence relationships in the automotive industry have suggested several potential

solutions. These solutions are presented in Table 1, along with conventional solutions as categorized by Hillman et al. [7].

Table 1. Solutions from prior previous research.

References	Solutions Suggested	Dynamic Variable Used	Focus	Miscellaneous
Hillman et al. (2009) [7]	Merger and Acquisition	N/A	N/A	Review paper; conventional solutions in resource dependence theory
	Organizational relationships including joint ventures			
	Board Interlocks			
	Political action			
	Executive succession			
Chen and Lewis (2024) [22]	Relational norms, trust	No	Supplier	Automotive industry
Kang and Choe (2020) [12]	Geographical diversification, global knowledge sourcing	No	Supplier	Automotive industry
Gulati and Sytch (2007) [10]	Joint dependence, relational embeddedness	No	Both buyer and supplier	Automotive industry
Kim and Choi (2015) [11]	Strength of ties, resource complementarity	No	Both buyer and supplier	Automotive industry
Kalaitzi et al. (2019) [23]	Long-term relationship	No	Buyer	Automotive industry; electric car manufacturer
Wagner et al. (2021) [24]	Cooperation	No	Buyer	Automotive Industry; measured buyer's dependence on supplier

As shown in Table 1, prior resource dependence studies examining the automotive industry have suggested solutions different from the conventional approaches that have been followed in resource dependence theory. However, these studies continue to highlight the risk associated with high dependency and they rely on static measures. Moreover, the current study addresses the capabilities of more dependent firms that received relatively little attention from the studies listed in Table 1. This study extends beyond prior studies by introducing three distinctive elements: a counter-intuitive approach (the benefits of the supplier's increased commitment/dependence on the buyer), a dynamic perspective (using dynamic variables), and an emphasis on firms' capability.

First, we provide a counter-intuitive approach that complements prior research. Specifically, we argue by enhancing its dependency on a dominant counterpart, more dependent firms in asymmetric relationships can overcome difficulties arising from asymmetric dependence. This approach contrasts with the existing research on resource dependence, which has conventionally emphasized that firms need to reduce their dependence on external sources. Particularly, we suggest that a more dependent firm may be able to sustain competitiveness and profitability by increasing its commitment to its transaction partner by enhancing its dependence on that counterpart.

Second, from both theoretical and methodological standpoints, we aim to complement the static view of prior research by employing a dynamic approach. Rogan and Greve argue that prior research in resource dependence theory has overlooked dynamic perspectives [21]. Also, as revealed in the studies of the automotive industry listed in Table 1, dependence between firms tends to be measured using a static approach. Changes in dependence are less likely to be measured. Overlooking the dynamic approach to mea-

suring dependence thus fails to reflect firms' efforts to alter the asymmetric relationship. Taking a dynamic approach, we examine whether an increase in a more dependent firm's commitment to its counterpart can help overcome problems associated with asymmetric dependence and thus sustain or enhance the more dependent firm's competitiveness and performance.

Third, we pay attention to the capabilities of suppliers. Specifically, we examine the impacts of diversification and the technological capability of an auto parts supplier on changes in their levels of commitment, because diversification can bring operational flexibility, and technological capability can give a firm greater power [2,4,25]. Incorporating these two dimensions into our research model enriches this study by providing more clues about how firms can overcome difficulties arising from asymmetric dependence. A brief research outline is presented in Figure 1.

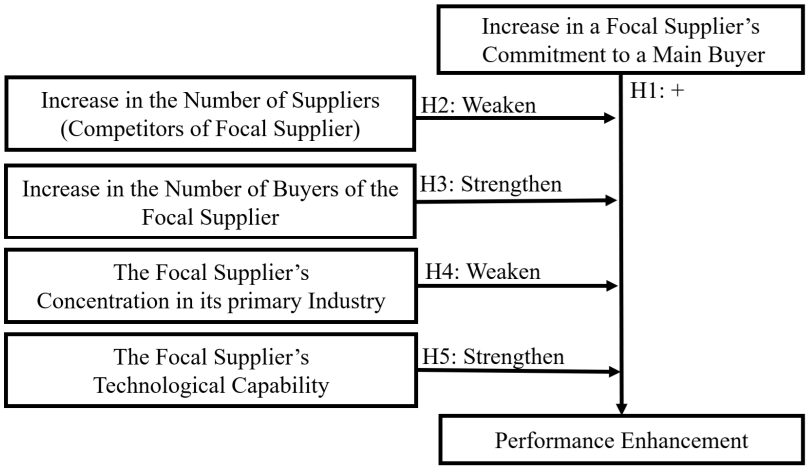

Figure 1. Brief research outline.

2. Theory and Hypotheses

2.1. Asymmetric Dependence Between Transaction Partners

Resource dependence theory is one of the most influential theories in management research, as it explains firms' behaviors in dealing with environmental constraints and uncertainties associated with their resource acquisition activities [4,7,21]. To access critical resources, firms have exchange relationships with other firms. Such relationships are the main sources of asymmetric interdependence and power imbalance between firms [4,6,10,21]. An exchange relationship between two firms can be more critical to one firm than the other. If one firm is more dependent on its counterpart than the counterpart is on the focal firm, their exchange relationship is therefore asymmetric. In this kind of exchange relationship, the less dependent party tends to have more autonomy and more power over its exchange partner. In this sense, there is a power imbalance between the two participants, in which the more dependent firm may need to tolerate disadvantages and uncertainties arising from the asymmetric relationship and pursue a strategy to balance the asymmetric interdependence [4,6,7,10,21].

However, the strategic choices of such a firm in an asymmetric relationship may be limited by a lack of firm capabilities, the counterpart's reactions, and structural restrictions. First, the more dependent firm in an exchange relationship may not have the capability to execute a balancing strategy. If the more dependent firm is much smaller than its exchange partner, this size difference can hamper the balancing efforts of the more dependent firm, because it may not have sufficient resources and capabilities to balance the relationship through means such as acquisition [10]. Second, the more dependent firm's attempts to alter its dependence on its exchange partner can trigger reactions from the dominant

exchange partner that can possibly offset the impact of the strategic choice made by the focal (more dependent) firm, because the dominant exchange partner does not want to lessen its advantage in the relationship [6,21]. Finally, the nature and structure of the industry can sometimes hamper individual firms' balancing attempts [6,10,17,26].

The automobile industry is a good example of such an industry, because the exchange relationship between automakers and their suppliers tends to be asymmetric, in such a way that automakers have greater power over suppliers and exploit this power asymmetry [10,17,26]. One of the main sources of such asymmetry is the difference in the availability of alternative exchange partners [12]. In general, there is only a limited number of automakers in one country, while there are numerous parts suppliers. As a result, parts suppliers have greater difficulty finding new exchange partners or switching to a new exchange partner compared with automakers. Moreover, there is a significant size difference between automakers and parts suppliers, which makes balancing the asymmetric relationship more difficult [23]. In addition, automakers can detect their suppliers' balancing attempts, which can reduce the effect of the latter's efforts [10].

2.2. Commitment to an Exchange Partner

Under such conditions, there seems to be less room for suppliers to sustain competitiveness and generate extra gains from the exchange with automakers. Moreover, conventional solutions [7] to reduce dependency according to resource dependence theory may not work properly in the automotive industry, as mentioned in the introduction section. If this is the case, there should not be a significant difference in performance among suppliers. However, there are clear performance differences among suppliers in the automobile industry. For example, in the Korean automobile industry, the ROA of Kyung Chang Industrial Co., Ltd., a parts supplier, was 10.14% in 2000, while that of INFAC was only 5.5%. The main products of both firms were cables, including control cables, and the main buyer for both was the Hyundai Motor Company. Additionally, both firms were highly concentrated on the automobile industry (100% and 97%, respectively). The main difference between those two suppliers was their commitment to their main buyer. Kyung Chang Industrial, Co. Ltd. sold 73.4% of its products to Hyundai, while INFAC sold only 60% of its products to Hyundai. Firms' choices regarding their commitment to an exchange relationship may explain the variation in performance among firms under conditions of asymmetric dependence.

The prior literature examining resource dependence in the automotive industry suggests that auto parts suppliers can still experience such performance variation, even if they have difficulties implementing the conventional solutions prescribed by resource dependence theory. In particular, trust [22], joint dependence [10,24], geographic diversification [12], and resource complementarity [11] were identified as potential solutions to reduce problems arising from the asymmetric dependence between auto parts suppliers and automakers. However, the findings from these prior studies still consider dependence primarily as a source of risk and uncertainty. Moreover, these prior studies operationalized their arguments using static measures. To address these limitations, we propose an alternative approach that involves increasing a supplier's dependence by enhancing its commitment to a dominant exchange partner.

When a more dependent firm has limited strategic alternatives to reduce asymmetric dependence, increasing its commitment to the exchange with its counterpart can be a solution that reduces the problems and uncertainties associated with asymmetric dependence. There are three reasons why this is the case. First, firms tend to avoid creating new uncertainties. If an automaker looks for a new auto parts supplier to switch its current exchange relationship to, it may reduce interdependence-associated uncertainties, but the

new exchange relationship can also be a new source of new uncertainty [4]. To avoid such new uncertainty, maintaining and improving a current exchange relationship can be a feasible solution for firms managing the uncertainties associated with an interdependent relationship.

If an auto parts supplier enhances its commitment to an exchange relationship, the counterpart (automaker) will also have a higher commitment to the exchange and be more interested in maintaining the current exchange relationship. This is because with higher commitment, switching to a new exchange relationship will be more costly for the counterpart, considering that it will lose the benefits from its current exchange relationship and have to tolerate new uncertainties from a new exchange relationship. To maintain current benefits and avoid new uncertainties, the exchange counterpart is likely to take action to retain the current relationship if that relationship involves a high level of commitment [4]. In short, increasing commitment to a specific exchange relationship can help an auto parts supplier (more dependent firm within the relationship) resolve the problems associated with asymmetric dependence.

Second, an auto parts supplier's higher commitment to an exchange relationship will facilitate coordination with the automaker in that exchange. When an automaker is aware of its supplier's commitment to their relationship, the automaker tends to show trust in that supplier [27,28]. Moreover, exchange partners with higher commitment are more likely to take joint action in a shared strategic direction that builds trust to prevent opportunistic behavior by an exchange partner and promote fair negotiation between exchange partners [3,10,18,29]. Also, they may understand their counterparts better, share the same goals, collaborate more efficiently, avoid potential conflicts, share risks, and hesitate to exercise their power over the other [10,25,30–36]. Therefore, pursuing higher commitment to an automaker can resolve an auto parts supplier's potential problems associated with asymmetric dependence and uncertainties [4].

Third, by increasing commitment, an auto parts supplier can make its exchange partner (automaker) less predatory. With higher commitment, participants in an exchange relationship tend to care more about the interests of their counterpart and become less likely to exercise their power over the exchange partner [30,37]. If an auto parts supplier sells more parts to an automaker, this exchange relationship becomes more important to both the supplier and the automaker; in other words, both exchange partners become more committed to the relationship. The supplier will rely more on the automaker for its sales and profits, while the automaker also has to rely more on the relationship to maintain seamless procurement. In this case, the stronger partner will not take action that potentially harms the relationship, including exercising its power in the asymmetric relationship [10,37]. Therefore, the increase in the more dependent firm's commitment to its exchange partner (automaker) can prevent potential loss from the uncertainty arising from asymmetric dependence and enhance the performance of that more dependent firm (i.e., the auto parts supplier).

In short, a firm can sustain its competitiveness and improve its performance even if it has an asymmetric dependence on an exchange partner. When a more dependent firm does not have many alternatives due to industry structure or its own capabilities, increasing its commitment to the exchange relationship can be a solution that improves the firm's performance. For example, in the automobile industry, automakers usually have more power if the buyer–supplier relationship is asymmetric [10]. However, by enhancing their commitment to automakers, suppliers can manage problems associated with asymmetric dependence and maintain their competitiveness and performance. In this context, we suggest the first hypothesis:

Hypothesis 1. *A focal supplier's performance will improve when it increases its commitment to an exchange with a buyer (automaker).*

2.3. New Exchange Relationships

When a firm has more competitors in the same industry, it is more likely to suffer from uncertainty and experience difficulties dealing with interdependence with exchange partners [4]. Therefore, it is natural that a buyer has greater bargaining power over its supplier if that buyer has more alternative suppliers. Given that a buyer may have more switching options in the exchange relationship, the potential benefits from the increase in the commitment of a supplier to the buyer may be limited because the supplier's power over the buyer will shrink [4,33]. In other words, when a supplier has more competitors, that supplier may have weaker bargaining power over the buyer.

However, we may need to consider that not all suppliers manufacturing the same product are feasible switching options for a buyer. For example, if an automaker currently purchases a focal supplier's product from only three different auto parts suppliers, although there are ten suppliers in the industry, it may be that only these three suppliers are feasible switching options for that automaker. In other words, the other seven auto parts suppliers may not be competitors with the focal supplier when the focal supplier sells its product to the automaker. The reason for this is that buyers tend to avoid associating with new suppliers to minimize the increase in coordination costs and uncertainties of building a new relationship, even if such a decision can cause the potential erosion of their bargaining power [38,39].

In fact, finding a new supplier with which the buyer does not have an exchange relationship can be more costly and bring more uncertainties to the buyer than preserving the current supplier relationships [4]. On the contrary, adjusting the proportions of purchases among extant suppliers may not be costly or cause uncertainties. Therefore, adjusting the proportions of purchases among current suppliers may be a more feasible option than finding a new supplier. For a focal supplier, other suppliers that provide the same product to the buyer as the focal supplier can be considered actual competitors.

However, buyers sometimes add new suppliers. If an automaker adds new auto parts suppliers, the negative impact of this move on the performance of the existing auto parts suppliers will be significant because they will face more severe competition. Such changes would mitigate the relationship discussed in Hypothesis 1, which posits the positive impact on a focal auto parts supplier's performance accruing from an increase in the commitment to an automaker (In this study, 'the commitment to an automaker' is measured as the proportion of a supplier's sales made to that automaker. The operationalization of this concept in relation to Hypothesis 1 is further discussed in Section 3.4 on independent variables). After forming a new exchange relationship in addition to its existing exchange relationships, an automaker will have more switching options with fewer concerns about coordination costs or potential uncertainties, which are usually involved when finding a new exchange partner to create a new relationship [4,38].

In short, after a buyer adds a new exchange relationship, the extant supplier's benefits accruing from the increase in the commitment to the supplier will be offset.

Hypothesis 2. *When a buyer (automaker) forms a new exchange relationship with a new supplier to purchase products that a focal supplier provides, the positive impact of the increase in the focal supplier's commitment will decrease.*

Conversely, when an auto parts supplier forms a new exchange relationship with a new automaker, the supplier can benefit even more from its commitment to that automaker in an extant exchange relationship for two reasons. First, having a new exchange relationship

with a new automaker gives greater bargaining power to an auto parts supplier over the current buyer [33]. As discussed above, not all potential alternatives are feasible switching options, because forming a new exchange relationship is a source of new uncertainties and coordination costs [4,38]. However, once a new transaction relationship is added, an auto parts supplier will have more feasible switching options without these uncertainties and coordination costs. Therefore, by engaging in a new exchange relationship, a focal supplier gains greater bargaining power over its extant buyers, while these existing buyers now need to take into account the focal supplier's new buyer in this new exchange relationship [4]. In this case, the supplier will have greater autonomy and power, giving the supplier more opportunities to leverage benefits from the increase in commitment.

Second, as noted, a firm's commitment to another firm enhances trust between the two firms [27,28]. If firms maintain their exchange relationship under higher risks and uncertainties, the trust between the two firms will be consolidated [40]. As an automaker may perceive higher risks in the event that its parts supplier finds a new buyer, the supplier's efforts to maintain and commit to their exchange relationship are rewarded by more credit from the buyer in the form of trust. As a result, the supplier will enjoy more benefits from this enhanced commitment when it finds a new exchange partner [3,10,18,29].

In short, when an auto parts supplier engages in a new exchange relationship, the increase in commitment to an extant exchange relationship will be beneficial to the supplier.

Hypothesis 3. *When a focal supplier forms new exchange relationships with new buyers (automakers) to sell its products to, the positive impact of the increase in the focal supplier's commitment will be magnified.*

2.4. Diversification and Concentration

In the previous literature, diversification of a firm is considered as a method that can help organizations overcome problems associated with asymmetric dependence [4]. In particular, when a firm has limited alternatives to balance asymmetric dependence, it can adopt diversification as a solution that can replace other methods, such as vertical or horizontal mergers [4,41]. This is because a diversified firm can reduce its dependence on another organization that possesses greater power [41]. In prior research, diversifying the income sources of an organization reduced problems associated with high dependence on one income source and on other organizations possessing greater power [41,42].

In the context of our research on the structurally asymmetric supplier–buyer relationship, auto parts suppliers may not have abundant alternatives to overcome asymmetric dependence. In this case, whether an auto parts supplier has diversified products can be critical in overcoming problems and uncertainties associated with asymmetric dependence. Diversification does not simply mean that a firm has multiple products in one industry. If an auto parts supplier sells various parts to an automaker, the supplier will still be under asymmetric dependence and will not enjoy the benefits from the diversification. In contrast, if the supplier has products that can be sold in other industries, that supplier will enjoy the benefits from the diversification that reduced their dependence on automakers.

Conversely, if a firm concentrates on one industry, that firm will suffer more from the asymmetric relationship. In an industry that is structurally asymmetric like the automobile industry, a more dependent firm (supplier) will suffer due to high concentration on that industry, because that firm will not have a chance to enjoy the benefits of diversification that reduce dependence on a buyer. In this sense, a supplier with high concentration in one industry may not enjoy the advantages accruing from the increase in commitment to its buyer. This is because a buyer has less incentive to grant a favor for the supplier, while the supplier may lose the advantage gained from coordination with its buyer [10,27,28]. In

short, high concentration in one industry reduces the positive impact of the increase in a supplier's commitment.

Hypothesis 4. *If the composition of a focal supplier's sales is more concentrated in its primary industry, the positive impact of the increase in the focal supplier's commitment will decrease.*

2.5. Technological Capability

An auto parts supplier's technological capability also matters when the supplier attempts to commit more to an asymmetric relationship. The previous literature shows that firms with better technological capabilities tend to have at least two types of advantages. First, firms with better technological capabilities are more likely to have well-diversified products, which can reduce their dependence on other firms [4,43]. Second, from automobile industry data, it was empirically shown that suppliers with better technological capability tended to receive more favors in terms of risk-sharing activities with buyers, while buyers tends to avoid contracts with suppliers with low technological capability [44]. Therefore, if an auto parts supplier has abundant technological capability, it can leverage more of the benefits from an increase in commitment. In short, technological capability strengthens the impact of the increase in commitment.

Hypothesis 5. *If a focal supplier has more technological capability, the positive impact of the increase in the focal supplier's commitment will be magnified.*

3. Methodology

3.1. Korean Automobile Industry

As a late mover in the automobile industry, South Korea has a relatively short history compared with other developed countries that manufacture automobiles [45]. Although the first automobile was imported in 1901, the Korean automobile industry began manufacturing cars in the 1960s following a government-driven plan. In 1976, Hyundai started selling a new car model, the Pony, which was the first model designed by Korean automakers. Even after South Korean automakers became capable of designing and developing their own models, it took about 20 years for South Korean automakers and their suppliers to become competitive on the global market [46,47]. According to the Korea Auto Industries Cooperation Association (KAICA), the association of auto parts suppliers in South Korea, globalization of the Korean automobile industry began in 1998 [48].

Both automakers and suppliers in the South Korean automobile industry showed dramatic improvement during that period. Although, they lacked competitive technology until the mid-1990s [44], they became stronger in terms of technology and were capable of exporting more of their products abroad after 1997 [48]. Like automobile industries in other countries, there are a limited number of automakers in the South Korean automobile industry and many suppliers work with those automakers [49]. For example, in 2007, there were over 3000 suppliers providing their parts to five automakers in Korea; this represents a potential source of power asymmetry between automakers and suppliers. Another interesting characteristic is that one dominant automaker, Hyundai Motor Company, holds the greatest market power in the Korean automobile industry. For example, about 70% of the observations in our dataset indicated Hyundai Motor Company as their primary buyer. Given that Kia Motors Corporation is a subsidiary of Hyundai Motor Company, it seems clear that the asymmetric interdependence and power imbalance between automakers and suppliers is a given factor in the Korean automobile industry [50]. Additionally, the Korean automobile industry is a relatively closed market compared with automobile industries in other countries [49], which gives suppliers fewer overseas alternatives. Considering

these industry characteristics, the Korean automobile industry would seem to provide appropriate conditions for the testing of this study's hypotheses.

3.2. Data and Sample

We collected annual data on suppliers in the Korean automobile industry from 1998 to 2007 [51–61]. The first year in the dataset was associated with the development stage of the Korean automotive industry. Previous research and KAICA's yearbook assert that the Korean automobile industry became capable of competing on the global market after the mid-1990s [44,46–48]. Specifically, the KAICA suggests that 1998 marked the beginning of globalization of the Korean automobile industry. Additionally, 1998 was the year that South Korea started to restructure its economic system and industries in response to the Korean financial crisis. Therefore, there were fundamental differences before and after 1998. Using annual data since 1998 enabled a comprehensive examination of suppliers who may have maintained the appropriate capability to work with automakers since then. As some of the variables were subject to a one-year lag, we collected the data from 1997 onwards.

There were three reasons why we chose this specific time period ending in 2007. The first reason was the distortion caused by the global financial crisis in the automotive industry. The global financial crisis in the late 2000s adversely affected the automobile industry [62]. For example, the US automobile industry, the largest market for automobiles in the 2000s, suffered significantly during the financial crisis (Figures 2 and 3) (data source: https://www.statista.com (accessed on 30 June 2020)). Figure 2 indicates the impact of the global financial crisis on US automobile production. As shown in Figure 2, the number of cars manufactured in the USA dropped dramatically in 2008 and 2009 and started to recover in 2010. Figure 3 displays the growth rate of the automobile industry, calculated from automobile sales. Figure 3 shows that the industry experienced a dramatic downturn in 2008 and 2009, and this was especially severe in the US market. Automobile industries in other countries and the global automobile industry were also adversely affected during the financial crisis. For example, automobile production in South Korea dropped over 13% between 2007 and 2009. Due to this severe shock, it appears that the relationship between suppliers and automakers during that period was distorted. Therefore, we collected data until 2007, which was the last unaffected year before the financial crisis.

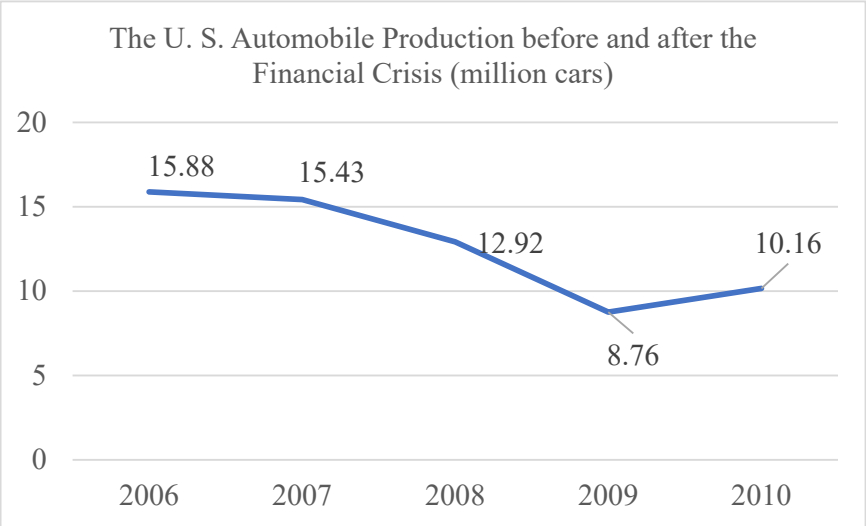

Figure 2. The US automobile industry before and after the financial crisis.

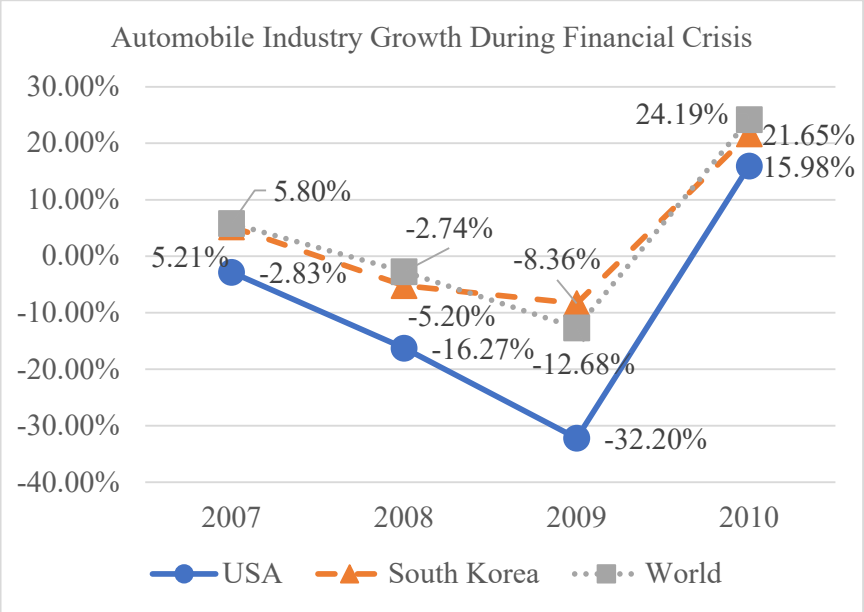

Figure 3. Automobile industry growth during the financial crisis.

A second reason for the choice of the current study duration was that after 2007, the Korean automotive industry stabilized in terms of the number of automakers. The number of automakers in Korea did not change until 2022 because there was no market entry, no mergers or acquisitions, and no split of automakers during this period. As a result, it is difficult to capture the dynamics within the industry at that time, making it particularly difficult to test Hypothesis 2.

The advent of electric cars is the third reason why we chose this specific period. In 2008, Tesla introduced their first electric car, the Roadster. Since the commercialization of this first electric vehicle, the entire automotive industry has experienced a fundamental shift towards electric vehicle manufacturing, fostering rapid adaptation to electric vehicles by both traditional automakers and their suppliers [63]. This fundamental change may have disrupted the automaker–supplier relationship that this research attempts to capture.

For these reasons, we chose this specific time period.

Our dataset consisted of two data sources: Kis-value (service discontinued) and KAICA. Kis-value was a database provided by Nice Information Service in Korea, and the variables and functions they provided were similar to those of WRDS Compustat. We gathered most of the financial data from Kis-value. We also collected supplier–buyer relationships data from KAICA's yearbooks (KAICA, 1997–2007) [51–61]. We included firms only if they met four criteria: (1) categorized as auto parts suppliers based on Korea Standard Industrial Classification, (2) public firms, (3) members of KAICA, and (4) first-order suppliers to automakers. Where information was missing, we obtained the information from Dart, a web service operated by the South Korean Financial Supervisory Service, and from suppliers' webpages. Dart provides financial information on South Korean firms. The final dataset included 193 observations from 34 first-order suppliers. A total of 7 observations were automatically excluded from the main analysis because the regression model corrected potential autocorrelation problems.

3.3. Dependent Variable

Change in ROA ($ROA_t - ROA_{t-1}$): ROA is widely used as a measure of firms' performance in terms of uncertain reduction activities in research on resource dependence [64,65]. Specifically, the difference between ROA in year t and ROA in year $t-1$ was calculated to capture improvement in performance after a change in commitment [66,67].

3.4. Independent Variable and Moderating Variables

As described in the theory and hypotheses section of the current paper, the nature of the automobile industry includes asymmetric dependence between automakers and auto parts suppliers. This industry-specific asymmetrical dependence applies within the South Korean automobile industry, as explained above (Section 3.1. Korean Automobile Industry). Asymmetric dependence refers to the relative imbalance of power between suppliers and automakers, characterized by the supplier's reliance on a particular automaker. In this study, we specifically measured changes in asymmetric dependence through one independent variable (change in commitment of a focal supplier to a primary buyer) and two moderators (change in the number of suppliers and change in the number of buyers). We calculated the change in commitment as the change in the proportion of a supplier's sales made to its primary automaker. More precisely, an increase in sales to the primary buyer indicates that the supplier is becoming more dependent on the primary buyer, thus increasing asymmetric dependence. Similarly, an increase in the number of alternative suppliers available to an automaker enhances the automaker's power, intensifying asymmetric dependence from the focal supplier's perspective. In contrast, an increase in the number of buyers (automakers) strengthens the focal supplier's potential negotiation power, thus reducing dependence asymmetry. In addition to these three variables indicating changes in asymmetric dependence, we added another variable as a control variable to measure the status of asymmetric dependence between a focal supplier and its primary automaker: primary buyer dependency (calculated as the proportion of a focal supplier's sales made to its primary buyer). We expected these four variables—including one control variable—to provide empirical support for the theoretical arguments of this study, because they explicitly capture both the level of dependency and changes in dependency between suppliers and automakers.

Furthermore, we included two more moderators (supplier's concentration on the automobile industry and technological capability) to test the moderating effects suggested in Hypotheses 4 and 5. All five independent and moderating variables are described in more detail below.

Change in commitment ($Sales\ Portion_{i,j,t} - Sales\ Portion_{i,j,t-1}$): The previous literature shows that the higher the proportion of sales a supplier makes to a buyer, the more committed is the relationship between the two firms [34]. To examine changes in commitment, we considered the difference in the proportion of sales from supplier i to automaker j between year t and year $t - 1$. We particularly examined the change in the proportion of sales from suppliers to their primary buyers. Using the change in sales portion to an automaker as a measure of the change in commitment has three advantages. First, it effectively indicates changes in asymmetric dependence between suppliers and automakers, although it may not capture all dimensions of asymmetric dependence. Specifically, if a supplier's sales portion to a specific automaker increases, the focal supplier is likely to become more dependent on the relationship with that automaker, thus statistically capturing changes in their asymmetric dependence. Second, this measure accurately reflects a supplier's strategic choice. Potential alternative measures such as the duration of a contractual relationship might also capture commitment but may fail to reflect short-term strategic adjustments. Maintaining a long-term contract, for example, can represent a long-term strategic decision, but it does not effectively capture short-term dynamics and the immediate strategic choice made by the supplier. However, the current measure, change in sales portion, can effectively reflect short-term strategic changes. Third, using change in sales portion ensures consistency and observability when measuring changes in commitment. For example, participation in joint R&D projects with automakers could be used as an alternative measure of commitment. However, the absence of joint R&D project participation does not necessarily indicate low

commitment, because opportunities for joint R&D projects may not always exist, which may reduce consistency in measuring commitment. Moreover, some R&D projects are conducted without public announcement, making them difficult to observe or verify for research purposes.

Change in the number of suppliers ($\frac{number\ of\ suppliers_t - number\ of\ suppliers_{t-1}}{number\ of\ suppliers_{t-1}}$): We counted the number of suppliers selling the focal supplier's primary product to the focal supplier's primary buyer, to address how many feasible switching options the focal supplier's primary buyer had [38,39,68]. To examine the change in the feasible switching options, we considered the difference in the number of feasible switching options between two years ($t-1$ and t) and divided the difference by the number of feasible switching options in year mboxempht -1. The reason for dividing the number is that the change from 1 option to 2 options and the change from 3 options to 4 options may have different impacts.

Change in the number of suppliers can affect the asymmetric dependence between an auto parts supplier and an automaker. When the number of suppliers increases, an automaker can enhance its negotiation power over a supplier, which makes suppliers more vulnerable in that relationship. On the other hand, if the number of suppliers decreases, a supplier can enhance its negotiation power. Therefore, the asymmetric dependence between suppliers and automakers decreases.

Change in the number of buyers ($\frac{number\ of\ buyers_t - number\ of\ buyers_{t-1}}{number\ of\ buyers_{t-1}}$): Similar to Change in the number of suppliers, we quantified the number of buyers who bought the focal supplier's primary product from the focal supplier. We divided the difference between the values of year t and year $t-1$ by the value of year $t-1$. Similar to the change in the number of suppliers, this variable can also affect the asymmetric relationship between suppliers and buyers, in such a way that an increase in the number of buyers (automakers) can enhance the negotiation power of suppliers.

Supplier's concentration on automobile industry ($\frac{Sales\ in\ the\ Automobile\ Industry_t}{Total\ Sales_t}$): To address the extent of suppliers' concentration on one industry and how well diversified the suppliers' products were, we calculated the suppliers' concentration on the automobile industry. Similar to previous research that used sales weight to measure diversification, we used each supplier's sales weight to calculate their concentration measure [69–71]. We divided each supplier's sales from the automobile industry by the total sales recorded for that supplier.

Technological capability ($\frac{Accumulated\ R\&D\ Outcome_t}{Total\ Asset_t}$): For this variable, we examined suppliers' orientation towards technology. In particular, we used the accumulated R&D outcomes, reported as intangible assets in the financial statements. Previous research has demonstrated that accumulated intangible R&D assets contribute to firms' performance and they are comparable to flow-based variables (e.g., R&D investment in a current period) [72]. We divided the accumulated R&D outcome by the value of total assets.

3.5. Control Variables

To address other supplier-specific factors and year-specific factors that may affect the performance of suppliers, we controlled for eight variables and the years. We first controlled for supplier's age, being the difference between the fiscal year and the supplier's foundation year. We took the natural logarithm for this variable. A supplier's operational history may be associated with its industry credibility and capability, which can positively affect its performance by demonstrating its ability to sustain business over time. We also controlled for firms' size and growth based on the total assets of the supplier. To examine the size variable, we calculated the variable as a natural logarithm. A bigger supplier is more likely to have greater negotiation power, which in turn positively influences its performance. The growth variable was calculated by taking the difference in assets between

two years (t and $t-1$) and dividing the difference by the assets for year $t-1$. This asset growth can indicate both expansion and contraction of assets; therefore, this variable can have both positive and negative impacts on a supplier's performance, depending on the efficiency of new asset investments as well as the redeployment and restructuring of existing assets. We examined financial distress using the debt ratio of the supplier, because excessive debt and its associated interest expenses can adversely affect firms' performance. We used two dummy variables in this research, the quality flag and the export flag. The KAICA's yearbooks include information on awards that auto parts suppliers receive from the Korean government or automakers for the high quality of their automobile components. Using this record, we coded 1 for the quality flag if a supplier had received such an award within the last three years; otherwise, this quality flag dummy was coded 0. When a supplier produces high quality components, the firm is more likely to enjoy extra profits and suffer less from asymmetric dependence within the automotive industry. The KAICA's yearbooks also detail the proportions of exports among the total sales by auto parts suppliers. Using this information, we generated an export flag. Specifically, we coded 1 for the export flag if a supplier had been exporting its product, because this connection to the global market can bring operational flexibility to the supplier, which can mitigate potential difficulties associated with asymmetric dependence on domestic automakers and may result in better performance [73,74]. If a supplier did not engage in export activity, we coded 0 for this variable. We additionally controlled for the main product weight and primary buyer weight (primary buyer dependency) based on the supplier's sales portion because these two variables may affect the supplier's dependence and bargaining power. Primary buyer dependency was particularly important in this study, explicitly measuring the extent of focal suppliers' asymmetric dependence on the primary buyers (automakers). This variable was measured by the sales portion to the primary automaker. In Table 2, the average value of primary buyer dependency is listed as 0.58, meaning that, on average, 58% of a supplier's total sales are made to its primary buyer. This high dependency level strongly indicates significant asymmetric dependence within the Korean automotive industry. This variable effectively captured the extent of variation in asymmetric dependence among suppliers based on their dependence on primary buyers. We expected that this control variable would reinforce our theoretical argument regarding asymmetric dependence, as it explicitly and directly measures the dependency relationship between suppliers and buyers. Finally, we controlled for the year-specific effects using year dummy variables. We expected these year dummies to account for macro-economic changes or policy changes, such as the enactment of free trade agreements.

3.6. Empirical Model

Before analyzing the dataset, we ran tests to determine which regression model to use in this research. Our dataset had a panel structure, and the F-test showed that neither the fixed-effect nor the random-effect regression model fitted ($p > 0.1$). This meant that the pooled ordinary least squares model was a more appropriate model to use with this data structure. Our dataset also had a potential autocorrelation problem (Wooldridge test, $p < 0.05$), while heteroskedasticity was not a significant problem (LR test, $p > 0.1$). Therefore, we used the feasible generalized least squares (FGLS) model to handle autocorrelation [75].

Table 2. Descriptive statistics.

Variables	Obs.	Mean	Std. Dev.	Min	Max
(1) Change in ROA	193	0.00	0.18	−1.25	1.71
(2) Age (log)	193	3.41	0.37	1.95	4.13
(3) Size (asset log)	193	11.42	0.98	7.84	14.46
(4) Growth (asset growth)	193	0.10	0.22	−0.40	1.97
(5) Debt Ratio	193	0.59	0.24	0.20	2.35
(6) Quality Flag	193	0.78	0.42	0.00	1.00
(7) Export Flag	193	0.76	0.43	0.00	1.00
(8) Main Product Weight	193	0.57	0.23	0.20	1.00
(9) Primary Buyer Dependency	193	0.58	0.23	0.16	0.99
(10) Change in Commitment	193	−0.02	0.07	−0.45	0.16
(11) Change in the Number of Suppliers (%)	193	0.15	0.63	−0.83	5.00
(12) Change in the Number of Buyers (%)	193	−0.01	0.25	−0.67	1.00
(13) Supplier's Concentration on Auto. Industry	193	0.90	0.16	0.39	1.00
(14) Technological Capability (%)	193	0.01	0.02	0.00	0.11

4. Results

4.1. Main Analysis

Descriptive statistics and pairwise correlation coefficients are reported in Tables 2 and 3. There was no correlation coefficient over 0.5 among all 14 variables.

Table 3. Pairwise correlation coefficients.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Change in ROA	1.00						
(2) Age (log)	−0.04	1.00					
(3) Size (asset log)	−0.02	0.41 ***	1.00				
(4) Growth (asset growth)	0.12	−0.19 **	−0.02	1.00			
(5) Debt Ratio	−0.02	−0.09	0.20 **	−0.10	1.00		
(6) Quality Flag	0.04	−0.13	−0.14	0.03	−0.16 *	1.00	
(7) Export Flag	−0.02	0.37 ***	0.11	−0.06	0.10	−0.22 **	1.00
(8) Main Product Weight	0.02	−0.03	0.04	0.13 †	0.10	0.05	−0.12
(9) Primary Buyer Dependency	0.09	−0.24 ***	−0.08	0.04	0.07	0.00	−0.27
(10) Change in Commitment	0.21 **	0.00	0.05	0.05	0.05	−0.09	−0.06
(11) Change in the No. of Suppliers (%)	−0.03	−0.16 *	−0.09	−0.08	0.11	−0.05	−0.05
(12) Change in the No. of Buyers (%)	0.07	0.07	0.07	−0.01	0.20 **	0.00	0.10
(13) Supplier's Concent. on Auto. Ind.	−0.04	−0.34 ***	−0.41 ***	0.12 †	−0.33 ***	0.12 †	−0.20
(14) Technological Capability (%)	0.03	0.03	−0.09	0.01	0.03	0.05	0.12
Variables	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**
(8) Main Product Weight	1.00						
(9) Primary Buyer Dependency	0.15 *	1.00					
(10) Change in Commitment	−0.08	0.12 †	1.00				
(11) Change in the No. of Suppliers (%)	0.01	0.05	0.05	1.00			
(12) Change in the No. of Buyers (%)	0.03	0.01	0.05	−0.04	1.00		
(13) Supplier's Concent. on Auto. Ind.	0.08	0.11	0.04	0.02	−0.06	1.00	
(14) Technological Capability (%)	−0.06	−0.14 *	−0.11	−0.06	0.01	0.03	1.00

Note: † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, respectively.

In Table 4, we provide the main empirical results that support the main idea of this study, obtained using the FGLS model. We tested seven models. The results displayed in Table 4 generally support our hypotheses, except for Hypothesis 5. Model 1 included only control variables to establish the baseline. Model 2 tested Hypothesis 1, which was the baseline hypothesis in this study. Model 3 through Model 6 tested Hypotheses 2 through 5, relating to the moderating effect of changes in the number of suppliers, changes in the number of buyers, the supplier's concentration on the automotive industry, and

the supplier's technological capability. Model 7 was a full comprehensive model that tested all the hypotheses in one model. The empirical results are presented hypothesis by hypothesis. In addition to the FGLS model reported in Table 4, we also ran other models to test robustness; the results of these robustness tests are presented in Section 4.2.

Table 4. Empirical results—feasible generalized least squares model.

DV: Change in ROA	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Year Dummy				(Included)			
Age (log)	0.0144 (0.0369)	0.0071 (0.0377)	0.0062 (0.0362)	−0.0003 (0.0368)	−0.0111 (0.0355)	0.0086 (0.0379)	−0.0108 (0.0325)
Size (asset log)	0.0043 (0.0131)	0.0026 (0.0134)	0.0009 (0.0129)	0.0021 (0.0131)	−0.0002 (0.0128)	0.0035 (0.0137)	0.0000 (0.0118)
Growth (asset growth)	−0.0043 (0.0699)	−0.0172 (0.0698)	0.0051 (0.0694)	−0.0286 (0.0689)	0.0197 (0.0631)	−0.0204 (0.0698)	0.0180 (0.0611)
Debt Ratio	0.0042 (0.0512)	−0.0016 (0.0519)	−0.0001 (0.0503)	−0.0348 (0.0532)	−0.1024 * (0.0508)	−0.0110 (0.0526)	−0.1386 ** (0.0491)
Quality Flag	0.0159 (0.0290)	0.0255 (0.0293)	0.0247 (0.0286)	0.0232 (0.0287)	0.0323 (0.0265)	0.0254 (0.0295)	0.0304 (0.0246)
Export Flag	0.0093 (0.0286)	0.0165 (0.0292)	0.0236 (0.0284)	0.0140 (0.0284)	0.0231 (0.0267)	0.0141 (0.0294)	0.0266 (0.0249)
Main Product Weight	−0.0109 (0.0472)	0.0021 (0.0483)	0.0205 (0.0476)	0.0160 (0.0478)	0.0153 (0.0446)	0.0067 (0.0487)	0.0489 (0.0417)
Primary Buyer Dependency	0.0286 (0.0503)	0.0203 (0.0514)	−0.0007 (0.0505)	0.0131 (0.0502)	0.0377 (0.0472)	0.0267 (0.0521)	0.0121 (0.0445)
(1) Change in Commitment (H1)		0.4157 * (0.1636)	0.5117 ** (0.1694)	0.5317 *** (0.1741)	4.5055 *** (0.6000)	0.3691 * (0.1763)	5.4106 *** (0.6096)
(2) Change in the Number of Suppliers (%)			−0.0023 (0.0262)				0.0138 (0.0225)
(1) × (2) (H2)			−0.9179 * (0.4691)				−0.9077 † (0.4772)
(3) Change in the Number of Buyers (%)				0.0707 (0.0632)			0.0327 (0.0541)
(1) × (3) (H3)				2.0484 * (0.9674)			2.6767 ** (0.9941)
(4) Supplier's Cocent. on Auto. Ind.					−0.2583 *** (0.0779)		−0.2241 ** (0.0714)
(1) × (4) (H4)					−5.0201 *** (0.7189)		−5.9098 *** (0.7134)
(5) Technological Capability (%)						1.0440 (0.9245)	0.7594 (0.7711)
(1) × (5) (H5)						10.2692 (11.3469)	12.7905 (9.7559)
Constant	−0.1484 (0.1747)	−0.1127 (0.1783)	−0.0943 (0.1722)	−0.0648 (0.1749)	0.2467 (0.2226)	−0.1338 (0.1811)	0.2192 (0.2039)
Observations Wald X^2	186 23.88	186 30.89	186 35.37	186 37.73	186 89.88	186 32.47	186 125.39

Note: Standard errors are shown in parentheses. † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, respectively.

Hypothesis 1 suggests that a supplier's commitment changes (change in sales portion made to an automaker) to an automaker are positively associated with improvement in the supplier's performance (change in ROA). This hypothesis is a baseline hypothesis on which the other four hypotheses regarding moderating effects rely. We first tested Hypothesis 1 alone in Model 2. The results of Model 2 support Hypothesis 1, as the coefficient was positive and significant ($\beta = 0.4157$, $p < 0.05$). These results were consistent

with Model 3 through Model 6, which also examined moderating effects. The main result appeared stronger and statistically more significant in Model 7 ($\beta = 5.4106$, $p < 0.001$), the fully comprehensive model. This result indicates that auto parts suppliers can enhance their financial performance by increasing their commitments to their primary buyers. In other words, allocating a larger proportion of sales to a primary buyer will increase a supplier's ROA.

Hypothesis 2 predicts that the positive impact of the supplier's enhanced commitment on the change in the supplier's performance is weakened by an increase in the number of suppliers that provide the focal supplier's primary product to the focal supplier's primary buyer (automaker). In Model 3, we examined this moderating effect and found support for Hypothesis 2, as the regression coefficient was negative and significant ($\beta = -0.9179$, $p < 0.05$). This result was consistent with the full model (Model 7; $\beta = -0.9077$, $p < 0.1$). These results indicate that if a buyer who buys from a focal supplier adds new suppliers to its supply chain, the positive effect described in Hypothesis 1—an increase in the focal supplier's commitment to the primary buyer leads to performance improvements for that supplier—is diminished.

In Model 4, we tested Hypothesis 3, which predicts the moderating effect of the change in the number of automakers that buy the focal supplier's primary product. If the number of automakers increases, the impact of the focal supplier's change in commitment to the primary buyer on that focal supplier's enhanced performance will be weakened. The regression coefficient in Model 3 appeared positive and significant ($\beta = 2.0484$, $p < 0.05$), and this result was consistent with Model 7 ($\beta = 2.6767$, $p < 0.01$) as well. Therefore, Hypothesis 3 is supported. These results suggest that an increase in the number of buyers magnifies the positive relationship between an increase in a focal supplier's commitment to a primary buyer and a supplier's performance improvements (Hypothesis 1).

Model 5 examines the moderating effect of a focal supplier's concentration on the automobile industry. The regression coefficient was significant, as expected ($\beta = -5.0201$, $p < 0.001$), and this result was consistent with Model 7 ($\beta = -5.9098$, $p < 0.001$). Therefore, Hypothesis 4, which predicts that a supplier's concentration on the automobile industry weakens the main effect described in Hypothesis 1, is supported.

Finally, we tested Hypothesis 5 via Model 6. Hypothesis 5, suggesting a positive moderating effect of technological capability, was not supported by Model 6. The direction of the regression coefficient was as expected ($\beta = 11.3469$) but it was statistically not significant ($p > 0.1$). This result was consistent with Model 7 ($\beta = 12.7905$, $p > 0.1$). This unsupported result is further discussed below, in the section on current study's limitations and future research directions.

We visualized the moderating effect estimated from the fully comprehensive model (Model 7) reported in Table 4, using the *marginsplot* command in STATA 16. The visualized figures are displayed in Figure 4. Figure 4 illustrates the moderating effects predicted in Hypothesis 2 through Hypothesis 5. To examine the moderating effect of each variable and to generate the figure, we used the median value of each moderating variable in Hypotheses 2–5 and split these variables using the moderating variables. In Figure 4a, the moderating effect of the change in the number of suppliers is illustrated with two lines representing the values above and below the median change in the number of suppliers. The slope of the graph below the median value is steeper than that above the median value; in other words, the figure indicates that this change in the number of suppliers has a negative moderating effect on the main hypothesis. The same method was applied to draw the graphs in Figure 4b–d using the median values for the moderators. Figure 4b shows that the slope of the graph is steeper when the change in the number of buyers is above the median value, indicating the positive moderating effect discussed in Hypothesis 3

and detailed for Models 4 and 7 in Table 4. Figure 4c also clearly displays the negative moderating effect of the supplier's concentration on the automobile industry, as the graph for the above-median value of the supplier's concentration on the automotive industry shows a positive and steeper slope, while the graph for the below-median value has a negative slope. In Figure 4d, the supplier's technological capability is shown to have a positive moderating effect, although this effect was not statistically significant in Model 6 or Model 7 (Table 4).

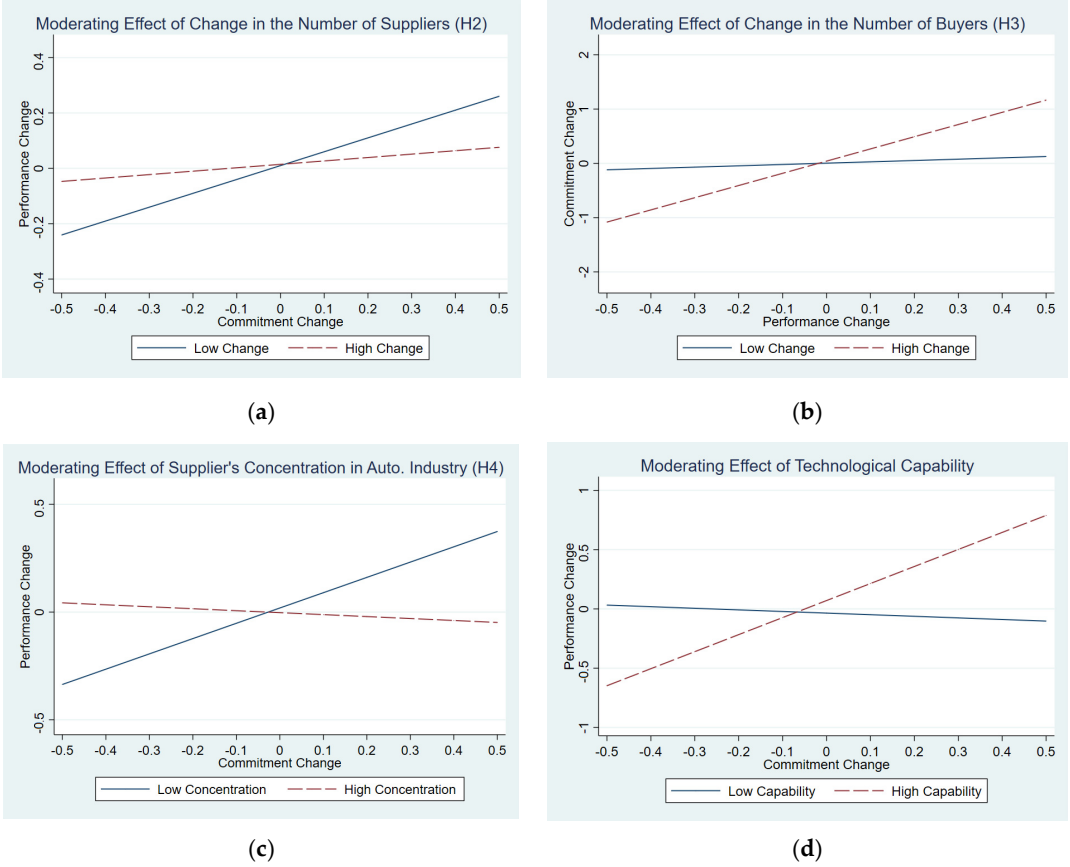

Figure 4. Moderating effects from the FGLS model described in Table 4: (**a**) change in the number of suppliers; (**b**) change in the number of buyers; (**c**) supplier's concentration on automobile industry; (**d**) supplier's technological capability.

4.2. Robustness Check

In addition to the main analysis using the FGLS model, we ran three regression models to check for robustness. The results are reported in Table 5. Although we used the FGLS model to address the potential autocorrelation problem, other types of panel regression models may be better able to handle our dataset by accounting for firm-specific heterogeneity. We conducted the Hausman test, which indicated that the random-effect model was applicable for our dataset ($p > 0.1$). We first ran a random-effect panel regression model (Model 1) and then a fixed-effect panel regression model (Model 2), as fixed-effect models can better address firm-specific effects and reduce endogeneity-related problems. In both models, the results were consistent with the main analysis in Table 4, supporting Hypotheses 1–4 but not supporting Hypothesis 5.

Table 5. Robustness checks.

	Model 1	**Model 2**	**Model 3**
Empirical Model	Random Effect	Fixed Effect	FGLS
Dependent Variable	Change in ROA	Change in ROA	ROA
Year Dummy		(Included)	
Age (log)	−0.0276 (0.0373)	−0.1713 (0.4462)	−0.0642 * (0.0301)
Size (asset log)	−0.0036 (0.0133)	0.0252 (0.0814)	0.0211 † (0.0109)
Growth (asset growth)	0.0875 (0.0543)	0.0605 (0.0827)	0.1067 * (0.0435)
Debt Ratio	−0.1651 ** (0.0563)	−0.2816 ** (0.0929)	−0.3729 *** (0.0413)
Quality Flag	0.0343 (0.0276)	0.0437 (0.0351)	0.0487 * (0.0192)
Export Flag	0.0317 (0.0287)	0.0402 (0.0631)	0.0507 * (0.0221)
Main Product Weight	0.0559 (0.0485)	−0.0257 (0.1908)	0.0660 † (0.0383)
Primary Buyer Dependency	0.0140 (0.0519)	0.3597 * (0.1562)	−0.0040 (0.0407)
(1) Change in Commitment (H1)	5.6016 *** (0.6496)	5.9166 *** (0.7212)	1.9905 *** (0.4098)
(2) Change in the Number of Suppliers (%)	0.0085 (0.0180)	0.0118 (0.0272)	0.0077 (0.0148)
(1) × (2) (H2)	−1.2093 * (0.5242)	−1.2833 * (0.6046)	−1.2127 *** (0.3442)
(3) Change in the Number of Buyers (%)	0.0500 (0.0482)	0.0602 (0.0638)	0.0285 (0.0355)
(1) × (3) (H3)	1.6464 † (0.9649)	2.9081 * (1.2109)	−0.4859 (0.6925)
(4) Supplier's Cocent. on Auto. Ind.	−0.2720 ** (0.0834)	−0.5387* (0.2573)	−0.2137 *** (0.0641)
(1) × (4) (H4)	−6.1783 *** (0.7680)	−6.6383 *** (0.8656)	−2.2338 *** (0.4798)
(5) Technological Capability (%)	0.7493 (0.8973)	1.5089 (1.5845)	0.6553 (0.6501)
(1) × (5) (H5)	13.8344 (10.7711)	10.4058 (12.1716)	4.4342 (7.0401)
Constant	0.3613 (0.2272)	0.6970 (1.7645)	0.2820 (0.1854)
Observations	193	193	186
overall R^2	0.4164	0.2742	
within R^2	0.4356	0.4668	
between R^2	0.4209	0.3164	
Wald x^2	118.44		177.14
F		4.48	
Supported Hypotheses	H1, H2, H3, H4	H1, H2, H3, H4	H1, H2, H4

Note: Standard errors are shown in parentheses. † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, respectively.

Finally, we ran another regression model using a new dependent variable. Instead of the change in ROA used in the main analysis reported in Table 4, we used a profitability ratio, i.e., return on assets (ROA). The results of this third robustness test are reported

as Model 3 in Table 5. According to this FGLS model with the new dependent variable, the results for Hypotheses 1, 2, 4, and 5 are consistent with the main analysis. However, Hypothesis 3, which was supported in the main analysis described in Table 4 and Models 1–2 in Table 5, is not supported.

This result (Model 3) finding Hypothesis 3 to be unsupported by the robustness test indicates that the impact of changes in the number of buyers is sensitive to how firms' performance is operationalized. Specifically, measuring performance using change in ROA can capture short-term or dynamic responses, whereas ROA levels may better reflect longer-term or static changes. Using ROA in this study might have impeded capture of the immediate impact of changes in the number of buyers. These findings emphasize the importance of using dynamic measures, such as change in ROA, to better capture the effects hypothesized in this study.

5. Discussion

5.1. Contributions

This study contributes to the existing literature on resource dependence theory by examining how firms can sustain/enhance their competitiveness and performance despite asymmetric dependence on their dominant exchange partners. Conventionally, it has generally been assumed that the more dependent firm within an asymmetric relationship struggles to sustain its competitiveness and profitability [6,7]. However, via examining auto parts suppliers in asymmetric relationships with automakers, the current research demonstrates the conditions under which these dependent firms can sustain competitiveness and profitability under conditions of asymmetric dependence. Building on this insight, our study extends prior research by highlighting three distinctive research contributions as well as practical implications.

First, this study describes a counter-intuitive approach by which a supplier can sustain or enhance performance and profitability by increasing its commitment to an asymmetric exchange relationship. Traditionally, the literature on resource dependence has argued that asymmetric dependence is a source of uncertainty and vulnerability due to power imbalance [4]. However, although the more dependent focal firm may choose a strategy to balance its asymmetric dependence, such attempts may result in only limited outcomes because the exchange partner can react to offset the focal firm's efforts. Moreover, if the industry is structured unfavorably, the focal firm may not have enough alternatives. By demonstrating greater commitment to the asymmetric exchange, the focal firm can cooperate better with the partner, gain the partner's trust, and consequently sustain its competitiveness and profitability. This solution is counter-intuitive because previous research has generally suggested reducing dependence on exchange partners, considering high dependence as a source of significant risks [7,10–12,22–24]. In contrast, the current study identifies conditions under which increasing dependence on a dominant exchange partner in the automotive industry can yield beneficial outcomes.

Second, we contribute to the literature on resource dependence by adopting a dynamic perspective. As noted by Rogan and Greve [21] and in studies listed in Table 1 [7,10–12,22–24], most resource dependence research has adopted a static context, overlooking dynamic interactions. Therefore, findings obtained from adopting a dynamic perspective of interorganizational context can extend the current literature into a broader area. Our research explicitly measured changes in commitment, the dependence structure (number of suppliers and number of buyers), and subsequent performance. The findings clearly illustrate that increasing a focal firm's commitment to its dominant counterpart is a rational choice because exchange partners respond positively to the increase in the focal firm's commitment, resulting in enhancement of the focal firm's sustained competitive-

ness and profitability. Without adapting a dynamic perspective, the focal firm's strategic choice might appear irrational or ineffective. In short, employing a dynamic perspective provides a better understanding of firms' behaviors and deeper insights into asymmetric dependence, significantly contributing to existing resource dependence theory.

Third, we also highlight the importance of firms' capabilities to overcome difficulties associated with asymmetric dependence. Specifically, we argue that a firm's capability can magnify performance improvements resulting from strategic action by the more dependent firm in an asymmetric relationship. We argue that a supplier with diversified product portfolios and superior technological capabilities can gain greater benefits from increasing its commitment to a dominant transaction partner. Although the empirical testing indicated limited significance of the impact of technological capability, the empirical results clearly indicate that diversified suppliers should tolerate disadvantages when they choose commitment to their exchange partners. The marginal effects described in Figure 4d support the positive moderating role of technological capability, consistent with the theoretical expectation. Thus, to sustain firms' competitiveness and profitability within an asymmetric inter-organizational relationship, we emphasize the importance of firms' capability, such as a diversified product portfolio and technological capability, which have received little attention from the previous studies listed in Table 1 [7,10–12,22–24].

Finally, this study also has practical implications. According to the findings of this study, if a firm suffers from asymmetric dependence with its transaction counterpart and has difficulties overcoming such asymmetric dependence, higher commitment to that transaction partner may be a solution. Enhancing that firm's capability, such as through diversification of products or improved technological capability, may also reduce the problems associated with asymmetric dependence. These findings can help managers working for firms under asymmetric dependence by suggesting feasible solutions for managing the difficulties that arise from asymmetric dependence.

5.2. Limitations and Future Research Directions

This study has limitations that can be examined in future research. Here, we note five limitations and suggest future research directions. First, it may be necessary to examine relationships between first-order suppliers and second-order suppliers. In this research, our main focus was on the relationships between buyers (automakers) and first-order suppliers without considering second-order suppliers. However, when a first-order supplier has more bargaining power than a second-order supplier in an exchange relationship, the losses from the asymmetric exchange relationship between the buyer and the first-order supplier can be transferred to the second-order supplier. In this case, the first-order supplier has more flexibility when determining strategic action to address the difficulties associated with power asymmetry in the relationship with its buyer. Therefore, concurrently examining the interdependence among buyers, first-order suppliers, and second-order suppliers will make important contributions to the current research on resource dependence.

Second, although we have limited our research scope to the domestic supplier–buyer relationship, future research may consider a more international context. A firm's international operations, such as overseas facilities and exports, can bring considerable benefits [73,74]. With overseas facilities and exports, suppliers may have more opportunities to form exchange relationships with buyers abroad. Therefore, even if the structure of domestic industry produces an asymmetric relationship between buyers and suppliers, suppliers can enjoy considerable profits from globalization. Moreover, suppliers engaging in international operations and exports tend to have better capabilities than other suppliers, which can lead to greater flexibility, more autonomy, and greater bargaining power [3,4,25,73,74,76]. Therefore, a supplier connected to overseas markets may have

more opportunities to minimize the problems associated with asymmetric dependency on the buyer. If future research can reflect suppliers' international operations and exports, it could provide more insightful results contributing to the management literature.

The third limitation and related future research directions are associated with suppliers' exchange-specific assets. In the automobile industry, automakers tend to develop new car models together with their suppliers because launching a new car is very costly and time-consuming [77]. If a supplier is highly involved in such a process, it is more likely that they will have the capabilities and resources required for the automaker's specific model. This specificity may affect the interdependence between supplier and buyer [78]. Both supplier and buyer may experience higher switching costs when the supplier's assets are highly specific to their relationship. This is because it is difficult for the supplier to redeploy such assets and it is time-consuming for the buyer to build a new exchange relationship that can replace the current exchange relationship [3,25,78]. By considering the potential impact of specificity on the interdependency between suppliers and buyers, future research can combine resource dependence theory and transaction cost economics to examine these relationships.

Fourth, Hypothesis 5, which posits a positive moderating role of suppliers' technological capability on changes in supplier commitment, was supported in neither the main analysis nor the robustness tests. This lack of support may be attributable to the data structure. As noted in the methods section, all observations used in this study were obtained from public firms and first-order suppliers. These firms tend to be large and possess superior technological capabilities. Therefore, they are already sufficiently qualified for transactions with automakers in terms of technological capabilities, which means there is limited variation in technological capabilities among these suppliers. Future research should consider the inclusion of small private firms and second-order suppliers, who are generally less advanced in technology than public first-order suppliers, to examine how the differences in technological capabilities may affect the relationship between auto parts suppliers and automakers.

Finally, future research could explore longer time frames and a broader context. Given that the advent of electric vehicles could fundamentally alter the relationship between automakers and auto parts suppliers, research examining a longer time frame, particularly including before and after the advent of electric cars, may reveal novel ideas related to the shift towards the electric car era. In addition, future research could benefit from gathering more observations by including a wider range of suppliers. For example, while this study focuses only on public and first-order auto parts suppliers, analyzing data from both public and private auto parts suppliers and second-order suppliers (suppliers of suppliers) might reveal additional insights and dynamics in the automotive industry. Gathering more data will enrich our understanding of supplier–buyer dynamics and enable us to apply more diverse theoretical lenses, such as population ecology that investigates organizational survival and adaptation.

6. Conclusions

In conclusion, this research shows the benefits that accrue from increased commitment in the exchange relationship. When a focal firm has enough options to balance its asymmetric dependence on its exchange partner, a show of higher commitment can be a solution to the problems associated with asymmetric dependence and can help the focal firm sustain its profitability. If the focal firm forms a new exchange relationship with a new transaction partner, the focal firm's gain from the higher commitment is positively affected. In contrast, if the exchange partner forms a new exchange relationship, the focal firm's gain from the higher commitment is adversely affected. Finally, the focal firm's industrial diversification

and technological capability may magnify the impact of higher commitment. This study is distinctive from prior research in three ways; it suggests counter-intuitive solutions for managing asymmetric dependence, employing dynamic measurement, and emphasizing the importance of the capabilities of more dependent firms.

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Abbreviations

The following abbreviations are used in this manuscript:

KAICA	Korea Auto Industries Cooperation Association
FLGS	Feasible generalized least squares
ROA	Return on asset

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