Pie sharing and pie expansion in buyer-supplier new product development partnerships

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Abstract: Firms seek new product development (NPD) partnerships to achieve competitive advantage by pooling interorganisational resources. Although such collaborations may expand the partnership's total value pie, sharing the pie often results in poisonous win-lose rivalry amongst partners. This study investigates how automotive suppliers may gain competitive advantage and increase their financial stake within NPD partnerships with OEMs. We analyse sources of pie expansion from a resource-based view (RBV) perspective and the mediating role of fairness in pie sharing. As NPD partnerships also induce dependencies between collaborating firms, we extend the RBV with arguments from resource dependence theory (RDT). We test our predictions on a sample of 147 NPD partnerships between tier-1 suppliers and OEMs. Our findings suggest that fairness in pie sharing significantly mediates pie expansion. Moreover, NPD partnerships enable suppliers to increase OEMs' dependency on their firm, which mediates suppliers' competitive advantage, resulting in a more equitable division of the value pie.

Keywords: pie sharing; pie expansion; fairness; new product development; NPD; buyer-supplier partnerships; automotive industry; resource-based view; RBV; resource dependence theory; RDT; competitive advantage; financial distribution.

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1 Introduction

Managerial practice shows that rivalry over the financial distribution of earnings ('pie sharing') exists not only among rivals, but increasingly within buyer-supplier partnerships (Cheung et al., 2011). Especially in the automotive industry, buyer-supplier partnerships are often out of line with traditionally taught supply chain management practices and are targets of intense rivalry among partners. One example is the conflict between Volkswagen (VW) and suppliers from Prevent Group, according to which a late cancellation of a $558 million contract by VW resulted in a dispute over $66 million in recovering payments for obsolete investments (Rauwald, 2016). To increase pressure, Prevent Group stopped parts supply of current series production for VW's Golf and Passat vehicles, causing a six-day shutdown of six German VW plants, idling 28,000 workers and costing VW an estimated $113 million in gross profit (Cremer, 2016). The Forbes headline was "VW supplier dispute might foreshadow deeper industry problems" (Winton, 2016).

This incident is just one in a series of conflicts caused by perceived unfairness among supply chain members (e.g., Wolde and Schwartz, 2015; Kelleher, 2014). The results of such incidents have been significant annual losses of gross profit, poisoned buyer-supplier partnerships and reduced supply chain competitiveness for partnering firms in the automotive industry (Samaha et al., 2011). Especially in new product development (NPD) partnerships, the perceived unfairness of outcome-sharing between OEMs and suppliers regarding the project's economic award is considered most challenging (Jap, 2001). Although crucial for a sustainable advantage of buyer-supplier partnerships, so far, no defined conclusions have been drawn about how to manage issues of perceived unfairness between partners (Nyaga et al., 2010). To achieve a sustainable advantage for both parties, we analysed interorganisational NDP from the perspective of four interrelated managerial concepts:

1 pie expansion

2 pie sharing

3 the resource-based view (RBV)

4 resource dependence theory (RDT).

First, buyer-supplier NDP partnerships are collaborative endeavours to increase the size of the partnership's pie, which cannot be generated separately by each respective partner

(Wagner and Lindemann, 2008; Jap, 1999). Second, fairness in sharing the partnership's pie serves as baseline for each partner's participation, since otherwise no incentives are given to commit resources to the collaborative endeavour of pie expansion (Poppo and Zhou, 2017). Third, complementary resources are voluntarily exchanged in buyer-supplier NDP partnerships by both autonomous partners to generate competitive advantages (Oh and Rhee, 2010; Lavie, 2006). The incorporation of external resources by engaging in partnerships enriches the firms' resource portfolio, which strengthens the ability to expand the pie (Hitt et al., 2016). Finally, derived from the RDT, insourcing NPD activities enable suppliers to make OEMs increasingly dependent on their firm's resources, shifting the balance of power in the partnership in the supplier's favour (Petersen et al., 2008).

Buyer-supplier NDP partnerships operate within the managerial tension of the above intersecting concepts of pie expansion, pie sharing, RBV, and RDT. Despite research suggesting that these concepts can operate independently in partnerships, the literature has not analysed their interrelated causal effects to examine the power dynamics between firms. By analysing buyer-supplier NPD partnerships with juxtaposing these concepts, we enrich the automotive management's body of knowledge by applying managerial arguments from several perspectives, as recommended by Hitt et al. (2016). We thus contribute to the automotive management in three ways.

First, the literature considers concepts in isolation. The interplay between pie sharing and pie expansion in buyer-supplier NPD partnerships is underrepresented, although its methodological application offers significant economic advantages (Wagner et al., 2010). Whereas pie expansion is seen in managerial practice as a win-win scenario which leads to an increase in the size of the total partnership's pie, subsequent pie sharing becomes a win-lose rivalry, resulting in an intensive zero-sum game competition of maximising the firm's individual profit at the expense of the other partner (Cheung et al., 2011). However, expanding the pie and sharing it are two sides of the same coin.

Second, although engaged in joint NPD partnerships to generate pie expansion, both OEM and supplier strive to avoid dependence on the other firm's external resources while trying to make their partner more dependent on their own firm (Hitt et al., 2016). As the exchange of external resources in buyer-supplier NPD partnerships therefore has the potential to shift dependence and power between both partners, Hitt et al. (2016) recommended integrating the RDT with the RBV, as it offers an opportunity in automotive management for new insights into interorganisational resource endowments.

Third, previous research on buyer-supplier NDP partnerships concentrated their analysis to gain competitive advantage almost exclusively on the buyer's firm (e.g., Oh and Rhee, 2010; Koufteros et al., 2012). However, automotive suppliers might view the insourcing of OEMs' NPD activities as a business model for gaining competitive advantage and securing subsequent orders for their core business of parts supply. In this paper we therefore extend the research on isolated beneficiaries to a dyadic perspective by investigating the advantages of NPD partnerships for both suppliers and OEMs.

In this research we apply structural equation modelling to study the interrelated causal effects of pie expansion, pie sharing, RBV, and RDT. For empirical data, we surveyed 147 tier-1 suppliers on their NPD partnerships with OEMs to answer the following research question: How can suppliers gain competitive advantage and increase their firms' financial stake of pie sharing within buyer-supplier NPD partnerships, which also is of interest to OEMs, caused by the effect of mutual pie expansion?

The rest of the paper is organised as follows. In Section 2, we review the literature on RBV, RDT and pie expansion/sharing theory and develop our causal hypotheses. In Section 3, we describe the research methodology we use to evaluate our hypotheses, and then present the empirical results in Section 4. In Section 5 we discuss our findings and contributions for automotive scholars. We conclude in Section 6 with deriving managerial implications for automotive industry practice.

2 Theory

2.1 Definition and literature review

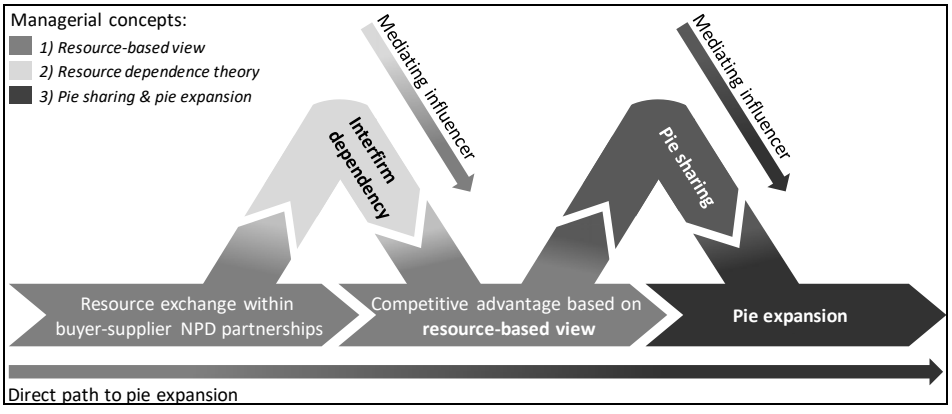
Partnerships are defined as voluntary collaborations between autonomous firms, which serve the exchange of resources, to increase firm's individual performance through mutually beneficial results (Lavie, 2006). According to the social exchange theory (SET), firms therefore engage in exchange partnerships motivated by the rewards they bring (Blau, 1964). Focusing on the exchange reward of buyer-supplier NPD partnerships in specific, autonomous firms voluntarily exchange complementary NPD resources to accomplish mutual development targets, which neither partner is able to generate on its own (Lavie, 2006). NPD partnerships therefore can be defined as collaborative endeavours, in which complementary development resources are combined and relation-specific assets are invested for mutual value creation (Hitt et al., 2016; Lambe et al., 2002). In order to focus our analysis on partnerships' value creation capacity through complementary resource exchange, we based the theoretical framework of this study upon the RBV.

The RBV is a strategic management concept that analyses firms' internal resource positioning for generating inimitable value creation by combining and safeguarding valuable resources, allowing firms to achieve competitive advantage (Wernerfelt, 1984). The competitive advantage of a firm is defined by Li et al. (2006, p.111) as "the extent to which an organisation is able to create a defensible position over its competitors." According to Peteraf (1993), firms are able to achieve competitive advantage based on four RBV pillars: the heterogeneity of a resource offers potential for a firm to generate monopolistic or Ricardian rents; the imperfect mobility of a resource hinders competition from resource acquisition; ex ante resource barriers guarantee that the resource is limited and in exclusive possession to the resource owner; ex post resource barriers guarantee that resource-based achievements of competitive advantage are sustainable.

From an RBV perspective, focal firms voluntarily enter partnerships to exchange interorganisational resources which otherwise would not be at their disposal (Oh and Rhee, 2010). The use of competitive advantage is therefore not limited to the resource owner, but can be transferred to firms as part of an interfirm endeavour (Lavie, 2006). Despite partnerships' advantage to create a unique network of complementary resource combinations, allowing them to generate an inimitable value creation and competitive advantage, both partners need to consider induced consequences of interfirm dependencies. In order to acknowledge these consequences of interfirm dependencies, we based this study also upon the RDT. The RDT is derived from the RBV and focuses on resource dependencies between independent firms (Pfeffer and Salancik, 1978). While the RBV mostly concentrates on firms' internal resource positioning, the RDT puts attention on the external environment and their dependency relationship. If a firm is in

possession of a resource that is needed by its partner to a given quantity and quality at a given time, power relationships can turn through the selective use of this coveted resource (Reimann and Ketchen, 2017). This especially is true for buyer-supplier NPD partnerships, in which interfirm dependencies can significantly affect power dynamics between firms, as described by Gadde and Snehota (2000, p.315): "Supplier relationships are, for a [focal firm], both the impulse to development and the cage that imprisons it." This study therefore uses the RBV to investigate how automotive suppliers can gain competitive advantage from entering buyer-supplier NPD partnerships and which consequences it has to partnerships' ability of value creation. As NPD partnerships also induce dependencies between firms, we extend the RBV with arguments from the RDT to analyse changes in power dynamics and consequences on how fair the value is distributed amongst both partners. As a metaphor to illustrate these dynamics for how value is distributed and how value is created respectively, we deliberately use the more intuitively to grasp terms of pie sharing and pie expansion.

Figure 1 Interrelated management perspectives of buyer-supplier NPD partnerships



The concept of fairness in buyer-supplier partnerships has been analysed in the literature based on three perspectives, which are distributive fairness, procedural fairness and interactional fairness (e.g., Poppo and Zhou, 2014; Kumar et al., 1995). Distributive fairness is the firm's perception of fairness of outcomes deserved in comparison to the actual outcomes received within a partnership (Kumar et al., 1995). Congruent to Jap's (2001, p.88) definition of fairness in pie sharing: "the organisation's perception that it has received a fair share of the divided pie of outcomes, benefits, and gains from the collaboration", both methodologies measure a firm's perception of fairness by evaluating a firm's own output received within a partnership against the partner's stake. The foundation of these definitions can be seen in Adams (1963) equity theory, according to which equity is assessed mainly by comparing the input and output ratios of both partnering firms. Yet, an increase in the partnership's total pie will be viewed only as advantageous by each firm, if the total increase corresponds with an individual increase in income for their own firm (Wagner et al., 2010). Fairness therefore is defined in the eye of the beholder and does not necessarily correspond to objective reality (Adams, 1963). Conclusively, pie expansion in NPD partnerships is defined by Jap (1999, p.461) as a "collaborative process of creating mutually beneficial strategic outcomes between

buyers and suppliers. These collaborations are designed to expand the size of the joint benefit 'pie' and give each party a share of an incrementally greater pie that could not be generated by either firm in isolation." Figure 1 depicts our conceptual causal chain model. By investigating our research question, we make a distinction between the direct path to pie expansion and the mediating influencers. We hypothesise that factors of the RBV directly lead to pie expansion, whereas factors of RDT and pie sharing are significant mediators.

2.2 Hypothesis development

2.2.1 Resource-based view

Regarding the RBV in buyer-supplier NPD partnerships, we derive two hypotheses. First, caused by intense technological diversity and increased innovation complexity in each field of industry, OEMs can concentrate core competencies in only a few defined NPD areas that promote the division of labour within partnerships (Koufteros et al., 2007). While OMEs' core competencies increasingly concentrate on technical system-integration, suppliers broaden their business model in NPD with industry-specific development resources (Koufteros et al., 2007). Following the notion of the RBV, buyer-supplier NPD partnerships therefore provide OEMs access to relevant and otherwise inaccessible resources of their respective NPD partner (Das and Teng, 2000). In case the supplier is in possession of highly specialised NPD resources in its field of industry, the OEM is able to use these resources to a greater extent complementary to its own. As a consequence, suppliers with heterogeneous and immobile resources, which despite the desire to control them are not available to other firms, are more likely to be involved in buyer-supplier partnerships (Das and Teng, 2000). Following this causality, we hypothesise that the more specialised suppliers' NPD resources are in their field of industry, the more NPD responsibility will be allocated to the supplier by the OEM for achieving partnership development goals:

Hypothesis 1 A supplier's component-specific knowledge is positively related to that supplier's NPD responsibility within a buyer-supplier partnership.

Second, in contrast to parts supply, in which multiple sourcing strategies are adopted to minimise supply risks, buyer-supplier NPD activities are almost always pursued with only one preferred supplier (Friedl and Wagner, 2012). As a result, buyer-supplier NPD partnerships strongly promote the power of the supplier, since the partnering OEM simultaneously represents the customer of the mutually developed product (Eisenhardt and Schoonhoven, 1996). By focusing NPD activities on single suppliers, the integrated supplier highly benefits with gaining partnership specific NPD knowledge and increasing information asymmetries towards competition (Wagner and Friedl, 2007). As a consequence, the supplier who is engaged in a buyer-supplier NPD partnership is able to expand its completive advantage towards its competing suppliers. As time passes in a partnership, the supplier's knowledge of the OEMs organisation and NPD activities become increasingly difficult for competing suppliers to replace (Petersen et al., 2008), leading us to the following hypothesis:

Hypothesis 2 Supplier's NPD responsibility within a buyer-supplier partnership is positively related to that supplier's competitive advantage.

2.2.2 Resource dependence theory

In terms of interfirm dependency in buyer-supplier NPD partnerships, we derive two hypotheses. First, dependencies exist in any social system in which one single player does not fully control all resources and conditions necessary to create the desired output (Pfeffer and Salancik, 1978). OEMs increasingly outsource and rely on NPD activities, executed by suppliers (Wynstra et al., 2012). Suppliers who engage in buyer-supplier partnerships and who take responsibility for OEMs NPD activities can further deepen their resource competencies in their field of industry, whereas the OEMs' competencies tend to erode (Ciravegna and Maielli, 2011). As a result, the increase of supplier NPD responsibilities increasingly undermines the OEMs ability to carry out product innovation (PI) independently (Koufteros et al., 2005). With a decrease in the value-adding contributions by OEMs to NPD projects, OEMs become more dependent upon their suppliers, as has happened in the aerospace industry (Rossetti and Choi, 2005). Buyer-supplier NPD partnerships therefore must be seen for OEMs as a double-edged sword, which Gadde and Snehota (2000, p.315) described as follows: "High-involvement supplier relationships are at the heart of a [focal firm's] survival and the basis of its growth and development. But [they] also tie the [focal firm] into its current ways of operating and restrict its capacity to change. Supplier relationships are, for a [focal firm], both the impulse to development and the cage that imprisons it." With outsourcing, the locked-in position in regard to the OEMs dependency on the supplier's NPD resources has become one-sided and OEMs cannot make suppliers equally dependent upon their firm (Petersen et al., 2008). Therefore, we hypothesise the following:

Hypothesis 3 Supplier's development responsibility is positively related to an OEMs dependency on that supplier.

Second, the core business model of most suppliers lies in parts production and supply, but not in the preceding phase of NPD (Ganguli et al., 2016). The desire to become involved in buyer-supplier NPD partnerships in early stages is triggered by the supplier's intention to secure subsequent contracts with the OEM for producing and supplying the mutually developed parts (Oh and Rhee, 2010). Hence, suppliers' primary motivation is not in developing but in securing the production order of components (Oh and Rhee, 2010). By participating in buyer-supplier NPD activities, suppliers can 'integrate themselves into the product', making it more difficult for OEMs to switch to alternative suppliers, primarily caused by increased switching costs (Petersen et al., 2008). Additionally, the advantages of increased knowledge of the integrated supplier compared to its competing suppliers pushes buyers to pay additional information rents, due to information asymmetries between the two suppliers (Wagner and Friedl, 2007). As supplier switching decisions cause additional costs for OEMs with simultaneously entering ex-ante risks regarding the new supplier's performance, we hypothesise that dependent OEMs become reluctant to switch suppliers, further favouring the current supplier's competitive advantage:

Hypothesis 4 OEMs dependency on supplier is positively related to a supplier's competitive advantage.

2.2.3 Pie expansion and pie sharing

With regard to pie expansion and pie sharing in buyer-supplier NPD partnerships, we derive three hypotheses. The decision of firms to enter NPD partnerships and commit resources is based on the expectation of financial gain, since otherwise no partner would externalise its resources. In general, the collaboration of supply chain members increases the partnership's advantage and improves firm performance (Cao and Zhang, 2011). Focused on buyer-supplier NPD partnerships, the involvement of suppliers within NPD projects of OEMs improves new product value, primarily because of partnership-specific investments (Fang et al., 2008). In addition, the careful selection and integration of suppliers improves the performance of OEMs (Oh and Rhee, 2010; Koufteros et al., 2012). The external resources that the supplier brings to the buyer-supplier partnership can be regarded by the OEM as common resources available for their mutual interest (Liao et al., 2010). As competitive advantages of firms are positively associated with firm performance (Newbert, 2008) and buyer-supplier partnerships can increase the partners' collaborative advantage (Cao and Zhang, 2011), we expect the competitive advantages of one partner to spill over to the other partner's firm and to the mutual project in total.

Hypothesis 5 Supplier's competitive advantage is positively related to

- a PI
- b product quality (PQ)
- c production cost optimisation (PCO).

In buyer-supplier NPD projects, both firms face each other as partners and as competitors. Both firms aim to expand the partnership's total pie, however, due to each firm's natural interest maximising its own profits, partners simultaneously compete over the lion's share of the pie (Fang et al., 2008). Despite the theoretical understanding of the benefits of interorganisational collaboration, buyer-supplier partnerships are characterised by competition over the pie (Cheung et al., 2011). When a pie is divided unfairly, the dominant partner – usually the buyer – is the one to benefit (Wagner and Lindemann, 2008). This has been confirmed by Corsten and Kumar (2005), in which suppliers complained that they had received less than they deserved in buyer-supplier partnerships. Furthermore, Sahin and Robinson (2005) found that savings are not equitable allocated among supply chain members. However, empowered with an increased competitive advantage related to insourced NPD responsibilities from the OEMs firm, the bargaining power of the supplier increases (Narasimhan et al., 2009; Fang et al., 2008). We therefore hypothesise that the historical imbalance of power between OEM and supplier eventually balances out, resulting in a fairer division of the pie:

Hypothesis 6 Supplier's competitive advantage is positively related to outcome fairness in pie sharing.

Finally, fairness in pie sharing is acknowledged to increase the performance of buyer-supplier partnerships (Poppo and Zhou, 2014). Conversely, if the jointly generated pie is divided unfairly between partners, hostility is likely to harm the supply chain's competitiveness (Robson et al., 2008). As unfairness exacerbates other negative effects like opportunism and conflicts while simultaneously undermining the benefits of the partnership, unfairness is shown to be poisonous for interfirm collaboration (Samaha et al., 2011). Furthermore, both partners contribute to the NPD project's success only in

relation to the amount of capital received from the partnership (Ghosh and John, 1999). When there is an unfair or insufficient reflux of capital, partners are not willing to continue investing in the NPD project's success and the mutual exchange will end (Narasimhan et al., 2009). We therefore hypothesise the following:

Hypothesis 7 Outcome fairness pie sharing is positively related to

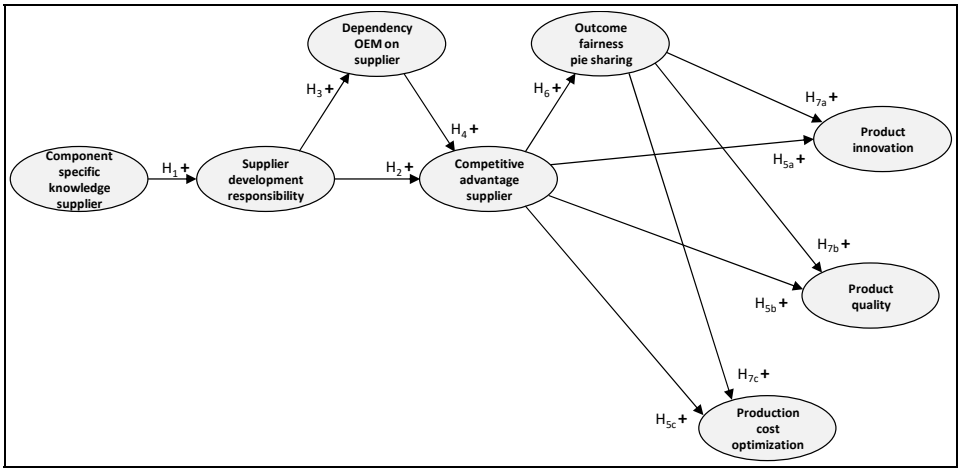
a PI

b PQ

c PCO.

Figure 2 depicts the hypothesised model.

Figure 2 Structural model of buyer-supplier NPD partnership



3 Methodology

3.1 Questionnaire design and sample

To test our hypotheses, we developed a survey questionnaire, accompanied by a letter of introduction and an explanation of the survey. Participants were asked to base their answers on only one single and relevant buyer-supplier NPD project, which has to fulfil following selection criterion: The project should have been characterised by development activities in which the supplier took a major NPD role and the project should have been awarded to the supplier by an OEM within the last five years. The unit of analysis is the examination of interrelated causal effects of pie expansion, pie sharing, RBV and RDT in the context of bilateral buyer-supplier NPD partnerships, from the perspective of automotive suppliers. To ensure readability, unambiguity, and completeness, the questionnaire was validated and pretested with four independent OEM purchasing executives and by an academic university board. Minor revisions were made based on these pre-tests. The original English questionnaire was also translated into German. To ensure content-wise equivalence, double- and reverse-translation procedures were conducted by one native speaker of each language (Brislin, 1970).

Table 1 Sample demographics

	N	*%*		*N*	*%*
Number of employees			Respondent job title		
<100	8	5.4%	CxO/general manager	15	10.2%
100–499	36	24.5%	Director/head of department	76	51.7%
500–999	26	17.7%	Manager	31	21.1%
1.000–4.999	37	25.2%	Team leader	13	8.8%
5.000–15.000	23	15.6%	Other	12	8.2%
>15.000	17	11.6%	Respondent function		
Sales [Mio. EUR]			General management/administration	24	16.3%
<20	16	10.9%	Product-development	20	13.6%
20–49	16	10.9%	Sales	87	59.2%
50–100	23	15.6%	Production	3	2.0%
100–499	36	24.5%	Other	13	8.8%
500–999	17	11.6%	Work experience		
>1.000	39	26.5%	<10 years	8	5.4%
Headquarters			10–14 years	15	10.2%
Germany	122	83.0%	15–19 years	19	12.9%
USA	9	6.1%	20–25 years	55	37.4%
Austria	5	3.4%	>25 years	50	34.0%
Japan	4	2.7%	Experience in current firm		
Rest of world	7	4.8%	<2 years	9	6.1%
Supplier automotive industry			2–4 years	23	15.6%
Exterior and body	42	28.6%	5–9 years	25	17.0%
Powertrain	39	26.5%	10–15 years	40	27.2%
Interior	27	18.4%	>15 years	50	34.0%
Electric/electronics	20	13.6%	Experience in job position		
Chassis and steering	19	12.9%	<2 years	21	14.3%
Business relationship OEM/supplier			2–4 years	46	31.3%
≤5 years	13	8.8%	5–9 years	34	23.1%
6–10 years	20	13.6%	10–15 years	30	20.4%
11–15 years	24	16.3%	>15 years	16	10.9%
16–20 years	31	21.1%			
21–30 years	37	25.2%			
>30 years	22	15.0%			

Note: $n = 147$.

Hypotheses were tested using a sample of 527 automotive suppliers from a database held by the German Association of the Automotive Industry (VDA), which consisted mostly of automotive suppliers headquartered in Germany. Firms were initially contacted via telephone, to identify and recruit prospective informants in managerial positions. Four

hundred and fifty-three firms expressed an interest to the study. Questionnaires were sent to them via postal mail between January and June 2016. Most of these firms´ addressees were in executive sales positions. To increase the response rate, we conducted follow up telephone calls three weeks after mailing the questionnaires. A total of 152 replies were received, 5 of which were excluded due to inconsistency of data. This yielded an effective response rate of 32.5% (147/453).

The demographic of the effective response sample is described in Table 1. On average, firms had 10,531 employees and have had sales of EUR 1.996 million EUR (USD 2.228 million) in 2015.[1] The average respondent is a sales director, has a work experience of 22.8 years, has been employed at his/her current firm for 12.7 years and has held his/her current position for 7.4 years. Hence, the respondents' demographic underpins that most knowledgeable informants in regard to the research topic were surveyed.

Non-response bias was assessed by comparing early responses (received within the first 10 days; *N*: 45) against late responses (received after 28 days; *N*: 43). We conducted Levene's test and t-test on firm demographic (number of employees and sales) and on all items to verify equality of variances and equality of means between the two groups. Both tests indicated no differences in variances and means between early and late responses are given ($p \geq 0.05$). To ensure applicability of the maximum likelihood estimation method for our subsequent structural equation modelling, we examined the univariate distributions of all items of our measurement model for skewness and kurtosis (i.e., absolute values of skewness below 2.0 and of kurtosis below 7.0), but no issues were detected.

3.2 Measures

All measures of this research are based on scales which have been validated in previous studies. Minor modifications were made to individualise items to the research context. Items were measured using a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). Details of the items, descriptive statistics and their original sources are provided in Table 2.

Table 2 Measures

Constructs and items		*Source*	*Mean*	*SD*
Component-specific knowledge supplier (CSK)		Takeishi (2001)		
How would you describe the component specific knowledge and experience of your firm, compared to the OEMs?				
CSK1	Core technology of the component		3.90	0.83
CSK2	Functional and structural design of the component		3.61	0.75
CSK3	Design for manufacturing of the component		3.79	0.94
CSK4	Durability design of the component		3.50	0.90
Supplier development responsibility (SDR)		Wynstra et al. (2012)		
SDR1	Our firm was in charge of numerous development tasks, essential to complete the OEMs component		3.65	1.13

Notes: Item mean is calculated as arithmetic mean. SD refers to standard deviation.

Table 2 Measures (continued)

Constructs and items		*Source*	*Mean*	*SD*
Supplier development responsibility (SDR)		Wynstra et al. (2012)		
SDR2	The OEM significantly relied on our firm to complete development tasks, which have been delegated to us		3.69	1.03
SDR3	Our firm received responsibility to develop engineering solutions, which met functional specifications of the OEM		3.97	0.92
SDR4	Our firm developed the new component for the OEM		3.54	1.19
Dependency OEM on supplier (DOS)		Petersen et al. (2008) and Wagner et al. (2011)		
Please evaluate the OEMs dependency on your firm, after your firm took over product development activities for the OEM.				
DOS1	The OEM would have suffered difficulties in developing the product, if they had lost our firm's engineering support		3.48	1.10
DOS2	Much of the product development success can be attributed to our firm		3.52	0.99
DOS3	The OEM would have suffered difficulties achieving their development goals, if they had discontinued our partnership		3.49	1.09
DOS4	The OEM was quite dependent on our firm		3.10	1.02
Competitive advantage supplier (CAS)		Kearns and Lederer (2003)		
Taking charge of the product development of the OEM has helped our firm to…				
CAS1	Keep competitive suppliers at distance		3.58	0.97
CAS2	Create entry barriers against competitive suppliers		3.54	0.95
CAS3	Leverage our unique firm capabilities		3.78	0.86
Outcome fairness pie sharing (OF)		Jap (2001) and Poppo and Zhou (2014)		
Our firm has received a fair share of the financial earnings relative to…				
OF1	The responsibilities assigned to us by the OEM		2.86	0.90
OF2	The effort and investments we have made to support the OEMs development project		2.95	0.99
OF3	The knowledge contributions that we have made		2.96	0.93
OF4	What we make in similar development projects with other OEMs		3.07	0.94
Relationship induced financial performance supplier (FPS)		Benton and Maloni (2005) and Lawson et al. (2009)		
The OEM-supplier development collaboration has helped our firm to…				
FPS1	Improve our financial performance		3.35	1.02
FPS2	Increase our profit		3.14	0.97
FPS3	Increase our profitability		3.20	0.93
FPS4	Without the OEM, our financial performance would not be as good		3.33	0.92

Notes: Item mean is calculated as arithmetic mean. SD refers to standard deviation.

Table 2 Measures (continued)

Constructs and items		*Source*	*Mean*	*SD*
Relationship induced financial performance OEM (FPO)		Benton and Maloni (2005) and Lawson et al. (2009)		
The OEM-supplier development collaboration has helped the OEM to…				
FP01	Improve the OEMs financial performance		3.44	0.95
FP02	Improve the OEMs profit		3.42	0.96
FP03	Improve the OEMs profitability		3.26	0.90
FP04	Without our firm, the OEMs financial performance would not be as good		2.95	1.03
Product innovation (PI)				
PI	The developed product by our firm, in joint collaboration with the OEM, was highly innovative		3.56	0.94
Product quality (PQ)				
PQ	The developed product by our firm, in joint collaboration with the OEM, was of high quality		4.05	0.77
Production cost optimisation (PCO)				
PCO	The developed product by our firm, in joint collaboration with the OEM, was produced at low cost		3.12	0.92

Notes: Item mean is calculated as arithmetic mean. SD refers to standard deviation.

Component-specific knowledge supplier (CSK) was measured using a four-item construct developed by Takeishi (2001). The construct examines the degree of NPD engineering competencies and knowhow, divided into the skills necessary to develop new components for a buyer's final product. To evaluate whether suppliers possess advanced knowledge in their core technology, in comparison to the buyer, firms were asked to compare their own engineering knowledge against the OEMs.

Supplier development responsibility (SDR) is the extent and depth of engineering responsibility outsourced from the buyer and insourced by the supplier, within the supplier-buyer NDP. It measures NPDs responsibility to define the significance of the supplier's project contribution within bandwidth of either extreme: almost none to almost all NPD responsibility. The four-item construct was adapted from Wynstra et al. (2012).

Dependency OEM on supplier (DOS) measures the degree of OEM dependency attributable to the decision to outsource development activities to suppliers. Suppliers were asked to evaluate OEM dependency on their firm with regards to NPD resources provided by suppliers to the OEM. The four-item construct – derived from Wagner et al. (2011) and Petersen et al. (2008) – captures the significance of the supplier's resources to the NPD, switching difficulties of the OEM to another supplier, and NPD success which is attributable to the supplier.

Competitive advantage supplier (CAS) measures advantage suppliers were able to achieve against their competitors, by insourcing NPD activities from OEMs. Measures were modified from the research of Kearns and Lederer (2003), in which competitive advantage gains were studied based on IT employment.

Outcome fairness pie sharing (OF) was measured using a four-item construct, based on Jap (2001) and Poppo and Zhou (2014). This construct measures the perceived fairness in the distribution of financial earnings, which have been generated within the

partnership of the buyer-supplier NPD. By evaluating their own resources committed to the NDP, versus financial earnings received from the NPD in comparison to OEM, suppliers were asked to rate fairness of pie sharing between both partners.

Pie expansion within buyer-supplier NPD partnerships is measurable in numerous performance dimensions (Hart, 1993). In our study we used the most intuitive dimensions, which is pie expansion from a product point of view and pie expansion from a financial point of view. To simplify our structural equation model, we only evaluate effects on product pie expansion as part of our path analysis; data on financial pie expansion was evaluated as part of our post-hoc analysis to highlight the impact of pie sharing fairness on pie expansion.

Three characteristics of product pie expansion were evaluated, as tradeoffs in NPD performance might cause interrelations between single product attributes (Swink et al., 2006; Cho and Pucik, 2005). We used single-item measures for a separate evaluation of *PI*, *PQ*, and *PCO*, attributable to the buyer-supplier NDP partnership. Measures were based on Fang et al. (2008). The application of single-items instead of multi-item measures was confirmed to be appropriate, since these single-items adequately represent their individual construct by themselves, while being comprehensible and free of misinterpretation.

Financial pie expansion was measured using a four-item construct for each NPD partner: *relationship induced financial performance supplier (FPS)* and *relationship induced financial performance OEM (FPO)*. The constructs indicate financial achievements of each partner, attributable to the buyer-supplier NDP relationship. Measures were adopted from Benton and Maloni (2005).

4 Results

We tested our hypotheses with structural equation modelling using the maximum likelihood estimation method. We began by evaluating the measurement model for reliability and validity with a confirmatory factor analysis (CFA). We then assessed model fit and significance of causal effects with a path analysis. Finally, additional insights were generated via post-hoc analysis using the radar-chart method.

4.1 Confirmatory factor analysis

We assessed the psychometric properties of the reflective measurement scales by using covariance-based CFA. The results revealed a good fit to the data: $\chi^2(363) = 481.37$, $p < 0.001$; $\chi^2/df = 1.326$; CFI = 0.954, TLI = 0.945, SRMR = 0.0512, RMSEA = 0.047 with 90% confidence interval = [0.035, 0.058].[2] The results also indicated that the reflective items capture well the underlying latent variables and suggested an acceptable level of convergent validity and internal consistency. Without exception, each item loaded on its hypothesised factor with a large and significant loading (all loadings significant at $p < 0.001$), thus supporting convergent validity. Composite reliabilities and average variances extracted (AVE) exceeded the commonly recommended cut-offs (i.e., 0.70 and 0.50) (Fornell and Larcker, 1981; Hair et al., 2009). Discriminant validity was evaluated based on the criterion suggested by Fornell and Larcker (1981). Table 4 shows that each construct extracted variance that is larger than the highest variance it shares with other constructs, thus providing support for discriminant validity.

Table 3 Evaluation of reflective constructs

Items	*Standardised factor loading*	*IR*	*t-value*	*SE*	*Item to total correlation*	*Cronbach alpha*	*Composite reliability*	*AVE*
Component-specific knowledge supplier (CSK)						0.825	0.828	0.545
CSK01	0.722	0.521	7.682	0.113	0.644			
CSK02	0.742	0.550	7.949	0.101	0.653			
CSK03	0.742	0.550	-[1]	-[1]	0.668			
CSK04	0.748	0.560	8.252	0.118	0.647			
Supplier development responsibility (SDR)						0.868	0.872	0.629
SDR01	0.824	0.679	11.046	0.086	0.755			
SDR02	0.754	0.568	9.774	0.081	0.686			
SDR03	0.768	0.589	10.148	0.071	0.713			
SDR04	0.825	0.680	-[1]	-[1]	0.745			
Dependency OEM on supplier (DOS)						0.885	0.886	0.661
DOS01	0.788	0.620	11.211	0.084	0.726			
DOS02	0.798	0.637	11.126	0.077	0.710			
DOS03	0.850	0.723	-[1]	-[1]	0.798			
DOS04	0.815	0.665	11.817	0.076	0.764			
Competitive advantage supplier (CAS)						0.847	0.849	0.653
CAS1	0.823	0.678	10.576	0.094	0.737			
CAS2	0.843	0.711	-[1]	-[1]	0.740			
CAS3	0.755	0.571	9.447	0.087	0.674			
Outcome fairness pie sharing (OF)						0.892	0.892	0.675
OF1	0.820	0.672	11.664	.075	0.758			
OF2	0.862	0.743	-[1]	-[1]	0.798			
OF3	0.821	0.675	12.155	0.074	0.755			
OF4	0.781	0.610	11.077	0.078	0.738			
Relationship induced financial performance supplier (FPS)						0.902	0.902	0.701
FPS1	0.851	0.724	15.251	0.062	0.801			
FPS2	0.943	0.889	-[1]	-[1]	0.848			
FPS3	0.840	0.706	14.762	0.058	0.795			
FPS4	0.695	0.483	10.001	0.069	0.686			
Relationship induced financial performance OEM (FPO)						0.907	0.911	0.720
FP01	0.840	0.705	14.387	0.063	0.780			
FP02	0.914	0.836	-[1]	-[1]	0.841			
FP03	0.873	0.761	14.928	0.060	0.832			
FP04	0.759	0.577	11.322	0.079	0.722			

Notes: IR = indicator reliability (squared factor loading), t-value = critical ratio, SE = standard error and AVE = average variance extracted. All factor loadings are significant at the $p < 0.001$ level (two-tailed).
[1]factor loading was fixed at 1.0 for scaling purposes.

Table 4 Construct correlation matrix and descriptive statistics

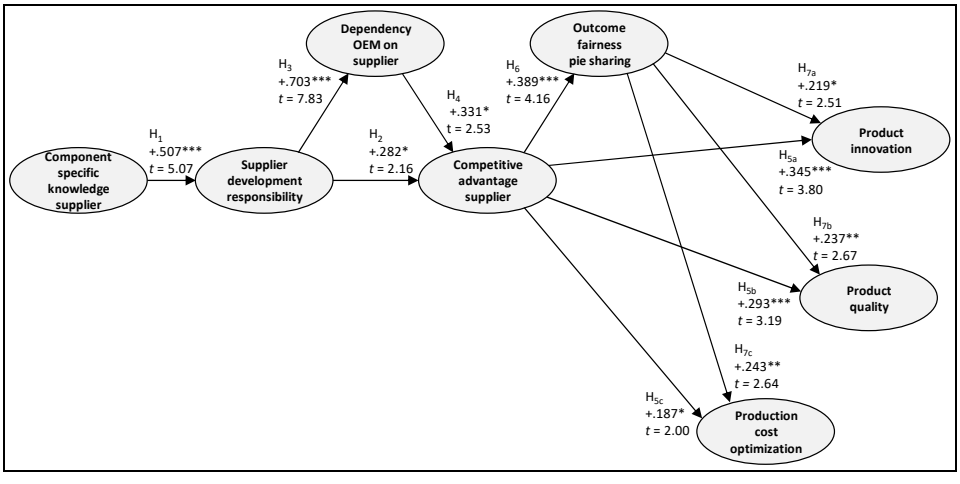
		Mean	*SD*	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
1	FPO	3.267	0.849	*0.720*	0.000	0.097	0.019	0.086	0.144	0.021	0.113	0.053	0.073
2	FPS	3.257	0.844	–0.008	*0.701*	0.031	0.262	0.067	0.046	0.018	0.020	0.003	0.031
3	CAS	3.635	0.810	0.312***	0.175	*0.653*	0.132	0.211	0.233	0.247	0.068	0.121	0.148
4	OF	2.961	0.816	0.139	0.512***	0.364***	*0.675*	0.067	0.171	0.024	0.100	0.121	0.124
5	SDR	3.714	0.907	0.293***	0.259**	0.459***	0.258**	*0.629*	0.484	0.232	0.088	0.122	0.187
6	DOS	3.398	0.904	0.379***	0.214**	0.483***	0.413***	0.696***	*0.661*	0.167	0.047	0.209	0.306
7	CSK	3.699	0.696	0.146	0.135	0.497***	0.155	0.482***	0.409***	*0.545*	0.055	0.079	0.082
8	PI	3.560	0.945	0.336***	0.143	0.260**	0.316***	0.296***	0.216**	0.235**	*1.000*	0.197	0.047
9	PQ	4.050	0.774	0.230**	0.054	0.348***	0.348***	0.349***	0.457***	0.281**	0.444***	*1.000*	0.280
10	PCO	3.120	0.918	0.270***	0.177*	0.385***	0.352***	0.432***	0.553***	0.287**	0.217**	0.529***	*1.000*

Notes: Correlation coefficients (Pearson) are below the diagonal, and squared correlation coefficients (shared variance) are above the diagonal. Average variance extracted (AVE) is highlighted bold on the diagonal. For single-item-constructs AVE = 1.*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (two-tailed) (equals $|r| > 0.162$, 0.212, and 0.269, respectively).

4.2 Path analysis

Our path analysis indicates that our hypothesised structural model fit well with the empirical data: $\chi^2(199) = 296.37$, $p < 0.001$; $\chi^2/df = 1.489$; CFI = 0.942, TLI = 0.932, SRMR = 0.0928, RMSEA = 0.058 with 90% confidence interval = [0.044, 0.071]. Figure 3 shows the results which indicate that all hypotheses were confirmed. First, all standardised path coefficients show positive (+) causal directions as hypothesised. Second, all standardised path coefficients indicate substantial causal strength in ranges between $\beta = 0.187$ (CAS $\rightarrow$ PCO) and $\beta = 0.703$ (SDR $\rightarrow$ DOS). Third, statistical significance can be confirmed with t-values ranges between 2.00 and 7.83 and p-values all lower than 0.05.

Figure 3 Results of structural equation model



Notes: Fully-standardised estimates are shown.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (two-tailed).

In support of H1, suppliers with specialised NPD resources can increase their responsibility in buyer-supplier NPD partnerships ($\beta = 0.507$; $p \leq 0.001$). The level of supplier NPD responsibility is positively associated with suppliers' competitive advantage ($\beta = 0.282$; $p \leq 0.05$), as hypothesised in H2. In support of H3 and H4, the more responsibility suppliers have in buyer-supplier NPD partnerships, the more dependent buyers are upon their suppliers ($\beta = 0.703$; $p \leq 0.001$), which positively mediates suppliers' competitive advantage ($\beta = 0.331$; $p \leq 0.05$). In terms of competitive advantage, we discovered a range of effects on pie expansion and on pie sharing. As hypothesised in H5, suppliers' competitive advantage is positively associated with buyer-supplier NPD outcomes regarding PI ($\beta = 0.345$; $p \leq 0.001$), PQ ($\beta = 0.293$; $p \leq 0.001$) and PCO ($\beta = 0.187$; $p \leq 0.05$). Confirming H6, the higher suppliers' competitive advantage, the higher suppliers' perceived fairness in pie sharing in buyer-supplier NPD partnerships ($\beta = 0.389$; $p \leq 0.001$). In line with H7, the level of perceived fairness in pie sharing is positively associated with buyer-supplier NPD outcomes in regards to PI ($\beta = 0.219$; $p \leq 0.05$), PQ ($\beta = 0.237$; $p \leq 0.01$) and PCO ($\beta = 0.243$; $p \leq 0.01$).

Besides the results of direct effects, we tested four indirect mediation causalities in our model, using the three most commonly applied evaluation methods. Based on the causal-steps method of Baron and Kenny (1986), partial mediation can be confirmed for all four indirect mediating causalities. Direct effects from the independent variables to the outcome variables are lower when respective mediator variables are included, in comparison to the total effects without mediator variables. Further confirmation of mediating effects is provided with the z-tests in accordance with Sobel (1982), indicating significant mediation by exceeding the cut-off thresholds of ≥1.96. Lastly, we performed the bootstrap procedure suggested by Preacher and Hayes (2004). The bootstrapped bias-corrected confidence interval provides empirical support for the indirect effects and suggest partial mediation on all four indirect mediating causalities. Results are presented in Table 5.

Table 5 Mediating effects of path model

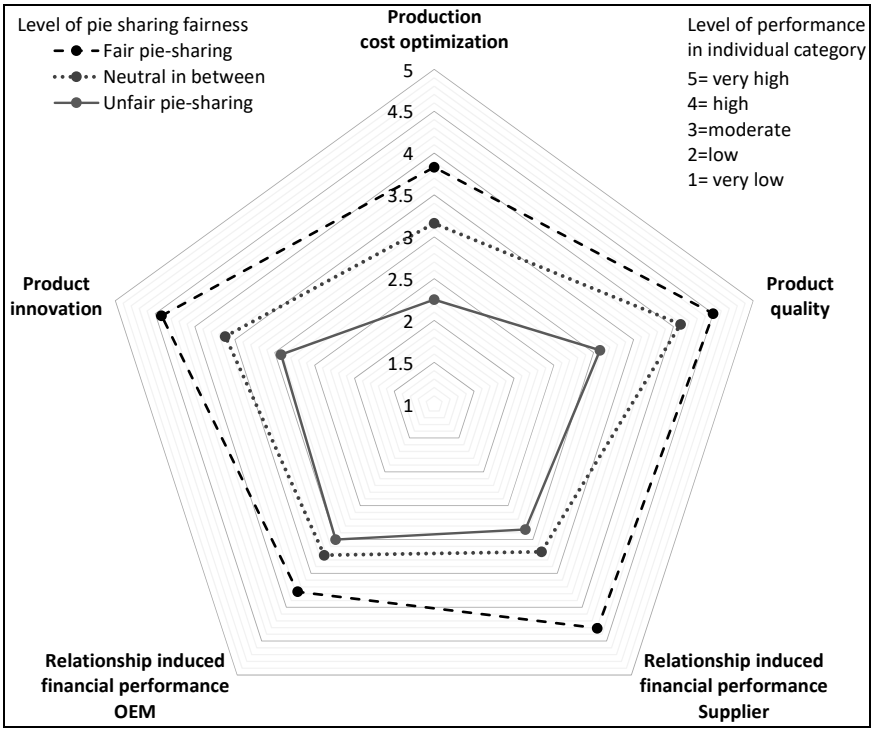
	SDR → DOS → CAS	*CAS → OF → PI*	*CAS → OF → PQ*	*CAS → OF → PCO*
	Mediator: DOS	*Mediator: OF*	*Mediator: OF*	*Mediator: OF*
Total effect (c path excl. mediator)	0.514***	0.433***	0.390***	0.285***
Direct effect (c' path incl. mediator)	0.282*	0.345***	0.293***	0.187*
Indirect effect (a–b path incl. mediator) (Preacher and Hayes, 2004)	0.233*	0.085**	0.092*	0.095**
Mediation z-score2 (Sobel, 1982)	2.41	2.15	2.26	2.23
Mediation test (Baron and Kenny, 1986)	Partial mediation	Partial mediation	Partial mediation	Partial mediation

Notes: Standardised estimates are shown. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (two-tailed).

4.3 Post hoc analysis

To highlight the impact of fairness in pie sharing to the partnership's performance, an additional post-hoc analysis with variables of product pie expansion and financial pie expansion was conducted. We segmented the data of the construct outcome fairness pie sharing (OF) in the following three clusters of respondents. Fair pie sharing: replies of respondents on OF > 4, resulting in a cluster mean of 4.5. Unfair pie sharing: replies of respondents on OF < 2, resulting in a cluster mean of 1.5. Neutral in between: replies of respondents on OF ≥ 2 and ≤ 4, resulting in a cluster mean of 3.0. All three respondent groups with distinctive levels of fairness were displayed in a radar-chart analysis against five determinants of pie expansion: PI, PQ, PCO, financial performance OEM, and FPS. Results are attributable to the buyer-supplier NPD partnership and depicted in Figure 4.

Figure 4 Pie expansion consequences on degree of fairness in pie sharing



In line with our structural equation model, the radar-chart analysis indicates significant pie expansion consequences in regard to fairness in pie sharing. Suppliers rated pie expansion in all five categories significantly higher when they perceived that financial earnings of the buyer-supplier NPD partnership were distributed fairly between both partners, relative to the resources that each partner committed to the project. When pie sharing was thought to be unfair, pie expansion was rated accordingly lower with correspondingly negative impacts upon the NPD project. The radar-chart analysis therefore serves as additional confirmation to the results of pie sharing on pie expansion in our structural equation model.

5 Discussion and contribution for automotive management scholars

We investigated buyer-supplier NDP partnerships by examining the interrelated causal effects of pie expansion, pie sharing, RBV and RDT using structural equation modelling, which has so far been considered only in isolation. Our field research makes four overarching contributions to the automotive management's body of knowledge:

1 Juxtaposing the streams of RBV and RDT literature for a better picture to emerge on suppliers' ability to gain competitive advantage from entering NPD partnerships and on the potential of partnership value creation through interorganisational exchange of complementary NPD resources.

2 Using this juxtaposition to examine the power dynamics between firms with consequences to the equitableness of value distribution amongst both partners.

3 Broadening the perspective of NPD benefits to the dyad level by highlighting both partners advantage due to mutually beneficial value creation.

4 Extending the automotive management literature with latest empirical data surrounding NPD.

Our empirical analysis therefore makes scholarly contributions to automotive management literature in several ways.

Most of the literature so far has analysed buyer-supplier NPD partnerships almost exclusively in regard to pie expansion, influenced by factors such as supplier capability (Oh and Rhee, 2010; Cousins et al., 2011), supplier NPD responsibility (Koufteros et al., 2007), or quality and strength of the buyer-supplier relationship (Autry and Golicic, 2010). Following the call by Wagner et al. (2011) and Fang et al. (2008), this study provides a better understanding of the interplay of fairness in pie sharing and its effects on pie expansion in buyer-supplier NPD partnerships. Our results suggest that fairness in pie sharing significantly influences the partnership's ability to expand the pie. In line with prior studies (Cheung et al., 2011; Samaha et al., 2011; Jap, 2001), the results emphasise the importance of pie sharing on pie expansion. Fairness in sharing the pie was found to be a crucial determinant in buyer-supplier NPD partnerships, enabling the distinct objective of both firms to engage in the mutual partnership in the first place. Unfairness, however, shrinks the partnership's pie and firms jeopardise their mutual target of pie expansion, caused by diminished incentives to contribute to the partnership. One perspective, therefore, should not be considered without the other, to prevent unfair pie sharing from endangering the partnership's goal of pie expansion.

Hitt et al. (2016) suggested that the combination of the internal focus of the RBV with the external focus of the RDT would expand the theoretical application of both. Our study extends the few studies (e.g., Oh and Rhee, 2010; Sjoerdsma and van Weele, 2015), which analysed buyer-supplier NPD partnerships from an RBV perspective, by incorporating the perspective of interfirm dependency. By linking the two perspectives of RBV and RDT and applying them to buyer-supplier NPD partnerships, we were able to empirically find significant sources of competitive advantages for suppliers. When engaging in interorganisational NPD resource networks, both partners can gain advantages from such voluntary cooperation. Mediating effects of interfirm dependency, however, must not be neglected, because these effects empower suppliers. Buyer-supplier NPD partnerships enable suppliers to make OEMs dependent on their NPD resources, which mediates and reinforces the effects of the RBV, resulting in advanced competitive advantage for suppliers.

The objective of this research was to improve the understanding of NPD partnership advantages for both OEMs and suppliers respectively, because most studies in this space (e.g., Thomas, 2013; Cousins et al., 2011) focused exclusively on buyers and neglected consequential impacts on suppliers. We thus respond to Wynstra et al. (2010) who called for investigation of factors contributing to the financial performance of buyers and suppliers, and for extending the focus of the literature to both partners. Suppliers gain competitive advantage and simultaneously make OEMs depended on their firm by engaging in interfirm NPD partnerships. The supplier's baseline of increased competitive advantage, however, is not beneficial solely to the supplier, but also increases supply

chain competitiveness. Effects of increased supplier competitiveness improve the financial performance of both supplier and OEM, and improves NPD characteristics, in forms of PI, PQ, and PCO. Hence, increased supplier competitiveness also passes over the OEMs competitiveness, which is mutually beneficial and results in a collaborative advantage (Cao and Zhang, 2011). The locked-in position in regard to the OEMs dependency on the supplier's NPD resources, therefore, must not be interpreted as a negative effect for the OEM, but is also linked to positive effects.

Overall and as a main difference of our research to prior studies, we synthesised major theoretical streams of literature and applied them empirically to buyer-supplier NPD partnerships in an automotive industry setting. We extended prior research models, which have concentrated on the direct paths to pie expansion, by considering indirect paths of pie sharing and interfirm dependency. We showed that the bridging of major theories resulted in the discovery of significant mediating effects, providing the baseline of a more holistic model on buyer-supplier NPD partnerships for further research.

6 Managerial implications and conclusions

Automotive managerial practice can benefit from our findings about buyer-supplier NPD partnerships in numerous ways. Pie sharing, pie expansion and its interplay must be embraced and anchored by the top management of both partners. Problems in managerial practice arise, when problems induced by unfair pie sharing cannibalise the partnership's ability to expand the pie. Most often, rivalry between OEMs and suppliers is induced by win-lose differentials in sharing the partnership's pie, whereas there is agreement about the partnership's goal of pie expansion. To optimise and fully exploit pie expansion within buyer-supplier NPD partnerships, firms must first create a solid baseline of fairness in pie sharing.

Sustainable and successful partnerships exist only when all three of the following conditions are fulfilled:

1 The prerequisite of partnerships is its ability to generate pie expansion through interorganisational resource combination.

2 Each partner's share of the expanded pie must be greater than its individual costs of resources committed to the partnership.

3 By balancing the resource input committed by each partner and comparing it to the relative amount of outcome received, both partners should evaluate pie sharing as fair.

From a managerial perspective, pie expansion and pie sharing are two dependent concepts and monitoring them in buyer-supplier partnerships is consequential to achieving a competitive advantage, as it influences both the product and financial outcomes. Without understanding its interplay, one partner might be able to increase its own share of the pie at the cost of the other, but does not recognise, that the total pie is shrinking as a result. Hence, fairness in pie sharing is recommended as a crucial determinant for managerial practice to achieve competitive advantage for the whole supply chain.

Suppliers should extend their business model to increase involvement in NPD partnerships with OEMs. Suppliers benefit from specialising NPD resources by assuming responsibility for buyer-supplier NPD activities, which helps them to gain advantage over competition while increasing OEM dependency on their firm. The OEMs dependency thereby reflects the supplier's power (Narasimhan et al., 2009). Empowered and rewarded by gains in competitive advantage, suppliers increase their fair share of the partnership pie, which also is beneficial to the OEM, caused by the effect of enhanced mutual pie expansion. Furthermore, insourcing NPD activities also is likely to strengthen supplier's success in core business of parts supply. By reinforcing the partnership baseline in preceding NPD activities and thereby developing competitive advantages and dependencies, suppliers are more likely to secure subsequent contracts of parts supply from the OEM, with whom they already have developed the desired parts. Hence, insourcing NPD activities from OEMs becomes a prerequisite of suppliers' competitive survival.

Overall, the result of this research therefore recommends that firms should only claim their fair share of the partnership's pie, as unfairness negatively mediates the ability to generate mutual pie expansion, undermining the partnership's objective to combine resources in the first place.

References

Adams, J.S. (1963) 'Toward an understanding of inequity', *Journal of Abnormal and Social Psychology*, Vol. 67, No. 5, pp.422–436.

Autry, C.W. and Golicic, S.L. (2010) 'Evaluating buyer-supplier relationship-performance spirals: a longitudinal study', *Journal of Operations Management*, Vol. 28, No. 2, pp.87–100.

Baron, R.M. and Kenny, D.A. (1986) 'The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations', *Journal of Personality and Social Psychology*, Vol. 51, No. 6, pp.1173–1182.

Benton, W.C. and Maloni, M.J. (2005) "The influence of power driven buyer/seller relationships on supply chain satisfaction', *Journal of Operations Management*, Vol. 23, No. 1, pp.1–22.

Blau, P.M. (1964) *Exchange and Power in Social Life*, Transaction Publishers, New Brunswick.

Brislin, R.W. (1970) 'Back translation for cross-cultural research', *Journal of Cross-Cultural Psychology*, Vol. 1, No. 3, pp.185–216.

Cao, M. and Zhang, Q. (2011) 'Supply chain collaboration: impact on collaborative advantage and firm performance', *Journal of Operations Management*, Vol. 29, No. 3, pp.163–180.

Cheung, M.S., Myers, M.B. and Mentzer, J.T. (2011) 'The value of relational learning in global buyer-supplier exchanges: a dyadic perspective and test of the pie-sharing premise', *Strategic Management Journal*, Vol. 32, No. 10, pp.1061–1082.

Cho, H.J. and Pucik, V. (2005) 'Relationship between innovativeness, quality, growth, profitability, and market value', *Strategic Management Journal*, Vol. 26, No. 6, pp.555–575.

Ciravegna, L. and Maielli, G. (2011) 'Outsourcing of new product development and the opening of innovation in mature industries: a longitudinal study of fiat during crisis and recovery', *International Journal of Innovation Management*, Vol. 15, No. 1, pp.69–93.

Corsten, D. and Kumar, N. (2005) 'Do suppliers benefit from collaborative relationships with large retailers? An empirical investigation of efficient consumer response adoption', *Journal of Marketing*, Vol. 69, No. 3, pp.80–94.

Cousins, P.D., Lawson, B., Petersen, K.J. and Handfield, R.B. (2011) 'Breakthrough scanning, supplier knowledge exchange, and new product development performance', *Journal of Product Innovation Management*, Vol. 28, No. 6, pp.930–942.

Cremer, A. (2016) *VW, Suppliers Settle Dispute After Marathon Talks*, Reuters, 23 August [online] http://www.reuters.com/article/us-volkswagen-suppliers-idUSKCN10Y05I (accessed 22 July 2017).

Das, T.K. and Teng, B.S. (2000) 'A resource-based theory of strategic alliances', *Journal of Management*, Vol. 26, No. 1, pp.31–61.

Eisenhardt, K.M. and Schoonhoven, C.B. (1996) 'Resource-based view of strategic alliance formation: strategic and social effects in entrepreneurial firms', *Organization Science*, Vol. 7, No. 2, pp.136–150.

Fang, E., Palmatier, R.W. and Evans, K.R. (2008) 'Influence of customer participation on creating and sharing of new product value', *Journal of the Academy of Marketing Science*, Vol. 36, No. 3, pp.322–336.

Fornell, C. and Larcker, D.F. (1981) 'Evaluating structural equation models with unobservable variables and measurement error', *Journal of Marketing Research*, Vol. 18, No. 1, pp.39–50.

Friedl, G. and Wagner, S.M. (2012) 'Supplier development or supplier switching?', *International Journal of Production Research*, Vol. 50, No. 11, pp.3066–3079.

Gadde, L.E. and Snehota, I. (2000) 'Making the most of supplier relationships', *Industrial Marketing Management*, Vol. 29, No. 4, pp.305–316.

Ganguli, N., Burns, C. and Goldsberry, R. (2016) *Supplying the Future of Mobility. Automotive Suppliers in the Evolving Transportation Ecosystem*, October, pp.1–2, Deloitte University Press, Fort Worth, Texas.

Ghosh, M. and John, G. (1999) 'Governance value analysis and marketing strategy', *Journal of Marketing*, Vol. 63, No. 4, pp.131–145.

Hair, J.F. Jr., Black, W.C., Babin, B.J. and Anderson, R.E. (2009) *Multivariate Data Analysis*, 7th ed., Prentice Hall, Upper Saddle River, NJ.

Hart, S. (1993) 'Dimensions of success in new product development: an exploratory investigation', *Journal of Marketing Management*, Vol. 9, No. 1, pp.23–41.

Hitt, M.A., Xu, K. and Carnes, C.M. (2016) 'Resource based theory in operations management research', *Journal of Operations Management*, Vol. 41, No. 1, pp.77–94.

Jap, S.D. (1999) 'Pie-expansion efforts: collaboration processes in buyer-supplier relationships', *Journal of Marketing Research*, Vol. 36, No. 4, pp.461–475.

Jap, S.D. (2001) ''Pie sharing' in complex collaboration contexts', *Journal of Marketing Research*, Vol. 38, No. 1, pp.86–99.

Kearns, G.S. and Lederer, A.L. (2003) 'A resource-based view of strategic it alignment: how knowledge sharing creates competitive advantage', *Decision Sciences*, Vol. 34, No. 1, pp.1–29.

Kelleher, J.B. (2014) *GM Ranked Worst Automaker by U.S. Suppliers: Survey*, Reuters, 11 May [online] http://www.reuters.com/article/us-gm-suppliers-survey-idUSBREA4B01I20140512 (accessed 22 July 2017).

Koufteros, X.A., Cheng, E.T.C. and Lai, K.H. (2007) ''Black-box' and 'gray-box' supplier integration in product development: antecedents, consequences and the moderating role of firm size', *Journal of Operations Management*, Vol. 25, No. 4, pp.847–870.

Koufteros, X.A., Vickery, S.K. and Dröge, C. (2012) 'The effects of strategic supplier selection on buyer competitive performance in matched domains: does supplier integration mediate the relationships?', *Journal of Supply Chain Management*, Vol. 48, No. 2, pp.93–115.

Koufteros, X.A., Vonderembse, M.A. and Jayaram, J. (2005) 'Internal and external integration for product development: the contingency effects of uncertainty, equivocality, and platform strategy', *Decision Sciences*, Vol. 36, No. 1, pp.97–133.

Kumar, N., Scheer, L.K. and Steenkamp, J.B.E. (1995) 'The effects of supplier fairness on vulnerable resellers', *Journal of Marketing Research*, Vol. 32, No. 1, pp.54–65.

Lambe, C.J., Spekman, R.E. and Hunt, S.D. (2002) 'Alliance competence, resources, and alliance success: conceptualization, measurement, and initial test', *Journal of the Academy of Marketing Science*, Vol. 30, No. 2, pp.141–158.

Lavie, D. (2006) 'The competitive advantage of interconnected firms: an extension of the resource-based view', *Academy of Management Review*, Vol. 31, No. 3, pp.638–658.

Lawson, B., Petersen, K.J., Cousins, P.D. and Handfield, R.B. (2009) 'Knowledge sharing in interorganizational product development teams: the effect of formal and informal socialization mechanisms', *Journal of Product Innovation Management*, Vol. 26, No. 2, pp.156–172.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S. and Rao, S.S. (2006) 'The impact of supply chain management practices on competitive advantage and organizational performance', *Omega*, Vol. 34, No. 2, pp.107–124.

Liao, Y., Hong, P. and Rao, S.S. (2010) 'Supply management, supply flexibility and performance outcomes: an empirical investigation of manufacturing firms', *Journal of Supply Chain Management*, Vol. 46, No. 4, pp.6–22.

Narasimhan, R., Nair, A., Griffith, D.A., Arlbjørn, J.S. and Bendoly, E. (2009) 'Lock-in situations in supply chains: a social exchange theoretic study of sourcing arrangements in buyer-supplier relationships', *Journal of Operations Management*, Vol. 27, No. 5, pp.374–389.

Newbert, S.L. (2008) 'Value, rareness, competitive advantage, and performance: a conceptual-level empirical investigation of the resource-based view of the firm', *Strategic Management Journal*, Vol. 29, No. 7, pp.745–768.

Nyaga, G.N., Whipple, J.M. and Lynch, D.F. (2010) 'Examining supply chain relationships: do buyer and supplier perspectives on collaborative relationships differ?', *Journal of Operations Management*, Vol. 28, No. 2, pp.101–114.

Oh, J. and Rhee, S.K. (2010) 'Influences of supplier capabilities and collaboration in new car development on competitive advantage of carmakers', *Management Decision*, Vol. 48, No. 5, pp.756–774.

Peteraf, M.A. (1993) 'The cornerstones of competitive advantage: a resource-based view', *Strategic Management Journal*, Vol. 14, No. 3, pp.179–191.

Petersen, K.J., Handfield, R.B., Lawson, B. and Cousins, P.D. (2008) 'Buyer dependency and relational capital formation: the mediating effects of socialization processes and supplier integration', *Journal of Supply Chain Management*, Vol. 44, No. 4, pp.53–65.

Pfeffer, J. and Salancik, G.R. (1978) *The External Control of Organizations: A Resource Dependence Perspective*, Harper and Row, New York, NY.

Poppo, L. and Zhou, K.Z. (2014) 'Managing contracts for fairness in buyer-supplier exchanges', *Strategic Management Journal*, Vol. 35, No. 10, pp.1508–1527.

Preacher, K.J. and Hayes, A.F. (2004) 'SPSS and SAS procedures for estimating indirect effects in simple mediation models', *Behavior Research Methods, Instruments, & Computers*, Vol. 36, No. 4, pp.717–731.

Rauwald, C. (2016) *VW Said to Pay Compensation to Supplier to End Standoff*, Bloomberg, 23 August [online] https://www.bloomberg.com/news/articles/2016-08-23/vw-said-to-pay-compensation-to-supplier-to-end-six-day-standoff (accessed 22 July 2017).

Reimann, F. and Ketchen, D.J. (2017) 'Power in supply chain management', *Journal of Supply Chain Management*, Vol. 53, No. 2, pp.3–9.

Robson, M.J., Katsikeas, C.S. and Bello, D.C. (2008) 'Drivers and performance outcomes of trust in international strategic alliances: the role of organizational complexity', *Organization Science*, Vol. 19, No. 4, pp.647–665.

Rossetti, C.L. and Choi, T.Y. (2005) 'On the dark side of strategic sourcing: experiences from the aerospace industry', *Academy of Management Executive*, Vol. 19, No. 1, pp.46–60.

Sahin, F. and Robinson, E.P. (2005) 'Information sharing and coordination in make-to-order supply chains', *Journal of Operations Management*, Vol. 23, No. 6, pp.579–598.

Samaha, S.A., Palmatier, W. and Dant, R.P. (2011) 'Poisoning relationships: perceived unfairness in channels of distribution', *Journal of Marketing*, Vol. 75, No. 3, pp.99–117.

Sjoerdsma, M. and van Weele, A.J. (2015) 'Managing supplier relationships in a new product development context', *Journal of Purchasing and Supply Management*, Vol. 21, No. 3, pp.192–203.

Sobel, M.E. (1982) 'Asymptotic confidence intervals for indirect effects in structural equation models', *Sociological Methodology*, Vol. 13, No. 1, pp.290–312.

Swink, M., Talluri, S. and Pandejpong, T. (2006) 'Faster, better, cheaper: a study of NPD project efficiency and performance tradeoffs', *Journal of Operations Management*, Vol. 24, No. 5, pp.542–562.

Takeishi, A. (2001) 'Bridging inter- and intra-firm boundaries: management of supplier involvement in automobile product development', *Strategic Management Journal*, Vol. 22, No. 5, pp.403–433.

Thomas, E. (2013) 'Supplier integration in new product development: computer mediated communication, knowledge exchange and buyer performance', *Industrial Marketing Management*, Vol. 42, No. 6, pp.890–899.

Wagner, S.M. and Friedl, G. (2007) 'Supplier switching decisions', *European Journal of Operational Research*, Vol. 183, No. 2, pp.700–717.

Wagner, S.M. and Lindemann, E. (2008) 'Determinants of value sharing in channel relationships', *Journal of Business & Industrial Marketing*, Vol. 23, No. 8, pp.544–553.

Wagner, S.M., Coley, L.S. and Lindemann, E. (2011) 'Effects of suppliers reputation on the future of buyer-supplier relationships: the mediating roles of outcome fairness and trust', *Journal of Supply Chain Management*, Vol. 47, No. 2, pp.29–48.

Wagner, S.M., Eggert, A. and Lindemann, E. (2010) 'Creating and appropriating value in collaborative relationships', *Journal of Business Research*, Vol. 63, No. 8, pp.840–848.

Wernerfelt, B. (1984) 'A resource-based view of the firm', *Strategic Management Journal*, Vol. 5, No. 2, pp.171–180.

Winton, N. (2016) *Volkswagen Supplier Dispute Might Foreshadow Deeper Industry Problem*, Forbes [online] https://www.forbes.com/sites/neilwinton/2016/08/30/volkswagen-supplier-dispute-might-foreshadow-deeper-industry-problem (accessed 22 July 2017).

Wolde, H.T. and Schwartz, J. (2015) *VW Seeks 3 Billion Euros in Savings from Suppliers*, Reuters, 12 October [online] http://www.reuters.com/article/us-volkswagen-emissions-suppliers-idUSKCN0S61UF20151012 (accessed 22 July 2017).

Wynstra, F., Anderson, J.C., Narus, J.A. and Wouters, M. (2012) 'Supplier development responsibility and NPD project outcomes: the roles of monetary quantification of differences and supporting-detail gathering', *Journal of Product Innovation Management*, Vol. 29, No. 1, pp.103–123.

Wynstra, F., Von Corswant, F. and Wetzels, M. (2010) 'In chains? An empirical study of antecedents of supplier product development activity in the automotive industry', *Journal of Product Innovation Management*, Vol. 27, No. 5, pp.625–639.

Notes

1 USD = 0.8957 EUR.

2 CFI refers to comparative fit index, TLI refers to Tucker-Lewis index (also non-normed fit index, NNFI), SRMR refers to standardized root mean residual, RMSEA refers to root mean square error of approximation.