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The effects of balanced and asymmetric dependence on supplier satisfaction: Identifying positive effects of dependency

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ABSTRACT

Studies argue that balance in dependence is critical to supplier satisfaction in buyer-supplier relationships. We examine whether asymmetric relationships can also lead to supplier satisfaction, arguing that traditional analysis methods are unsuitable for thoroughly analyzing this issue. With polynomial regression and response surface analysis combined with dyadic data, we test the relationship between (1) balanced dependence (i.e., the buyer and supplier are equally dependent on each other) and supplier satisfaction and (2) asymmetric dependence (i.e., either the supplier or buyer is the dominant party) on supplier satisfaction. The results indicate that mutual dependence is positively related to supplier satisfaction, but surprisingly, asymmetric dependence can be related to higher levels of supplier satisfaction.

1. Introduction

In recent business practice, firms experience that supplier satisfaction has strategic value for buying firms (Baxter, 2012; Essig and Amann, 2009). Satisfied suppliers invest in buyer-supplier relationships, which creates benefits for buyers, such as gaining access to innovations and new technologies (Bemelmans et al., 2015; Pulles et al., 2016; Schiele et al., 2015; Vos et al., 2016). For buying firms, it is relevant to know what drives supplier satisfaction and what situations are conducive to supplier satisfaction in buyer-supplier relationships.

It is commonly accepted that buyer-supplier dependence is crucial for understanding buyer-supplier relationships (Blois, 2010; Caniëls and Gelderman, 2007). The dependence literature suggests that buyer-supplier relationships characterized by a balanced mutual dependence are superior to other buyer-supplier relationships (Da Villa and Panizzolo, 1996; Hausman and Johnston, 2010; Leonidou et al., 2008; Kumar, 1996). Asymmetric relationships, in which one partner dominates the exchange, are generally believed to be less effective because the dominant partner may be tempted to exploit its position (Blois, 2010; Casciaro and Piskorski, 2005; Gulati and Sytch, 2007; Ireland and Webb, 2007; Wang et al., 2016). However, in situations where a buyer dominates, suppliers may still be satisfied with the overall relationship. For instance, although large retailers may sometimes squeeze their suppliers, these suppliers can still be satisfied with the relationship due to the growth opportunities offered by a large buyer (Bloom and Perry, 2001). In addition, highly dependent partners may have a strong relational orientation, which leads to an improved relationship. This idea is supported by studies that highlight the importance of total dependence in the relationship and that show that asymmetric relationships can be as satisfactory (Caniëls and Gelderman, 2007; Caniëls and Roeleveld, 2009) and even more effective than relationships governed by ownership or formal management controls (Muthusamy and White, 2006; Steensma et al., 2000). Hence, although contemporary research suggests that dependence asymmetry leads to inefficient relationships, dependence asymmetry may actually foster relationships and supplier satisfaction and thus improve relationship outcomes.

The present study aims to increase insights into how configurations of relative dependence relate to supplier satisfaction. We distinguish between *balanced dependence*, in which the buyer and supplier have either a high mutual dependence or a low mutual dependence, and *asymmetric dependence,* in which either the buyer or the supplier is the dominant party in the relationship. We use supplier satisfaction as a dependent variable, as supplier satisfaction has been found to be crucial to understanding many aspects of buyer-supplier relationships that are relevant from a managerial perspective, such as collaborative innovation, supply allocation and supplier pricing behavior (Pulles et al., 2016).

The current study is based on data gathered from 109 buyer-supplier dyads in the manufacturing industry. We use polynomial regressions with response surface analysis – a technique that is new to the

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purchasing and supply management field – to investigate a three-dimensional view of relative dependence and supplier satisfaction. Our analyses yield three contributions. First, whereas current literature mainly argues that asymmetric relationships are less effective, we argue that dependence asymmetry can also foster supplier satisfaction. Based on the notion of relative and absolute values, we show that relationships that are characterized by mutual dependence and those characterized by buyer/supplier dominance show higher levels of supplier satisfaction. It is not so much about the direction of dependency but about the absolute size of the dependency. Second, our findings add new insights to the supplier satisfaction literature. Specifically, we advance current knowledge about the role of relative dependence in buyer-supplier relationships and its effects on supplier satisfaction. High dependency is associated with satisfied suppliers, regardless of whether it is symmetric or asymmetric. Third, we use polynomial regression analysis to analyze our data. Current methodologies on relative dependence combine buyer's and supplier's dependence into one score of relative dependence, in which the effect of each component on the outcome is lost (Kim and Hsieh, 2003; Shanock et al., 2010). Alternatively, studies use spline scores (Gulati and Sytch, 2007; Kumar et al., 1995), but these scores do not capture curvilinear effects. To the best of our knowledge, polynomial regression analysis has not yet been widely applied in buyer-supplier dependence research, yet it is specifically suitable in this context.

This paper continues with a review of the literature and then the hypotheses. Then, we discuss our methodology and results. We conclude with a discussion of our findings.

2. Literature background: supplier satisfaction and dependence in buyer-supplier relations

Supplier satisfaction is related to the supplier's perceived value of a relationship in terms of meeting or exceeding expectations (Pulles et al., 2016). If a supplier perceives a relationship to be satisfactory, the supplier will feel socially indebted to make relational investments (Blau, 1964; Emerson, 1962; Nyaga et al., 2013). Satisfied suppliers make a greater effort to gratify their customers and provide resources that go beyond what has been contracted (Bemelmans, Voordijk et al., 2015; Vos et al., 2016). It has been argued that supplier satisfaction is an important factor in obtaining preferred customer status, which notably includes benefits for buyers, such as better access to innovations and technologies, higher flexibility and access to resources in times of scarcity (Pulles et al., 2016; Schiele et al., 2015; Sieweke et al., 2012; Vos et al., 2016). In this way, supplier satisfaction is positively related to the relational performance of buyers and suppliers alike (Baxter, 2012; Essig and Amann, 2009; Ghijsen et al., 2010; Vos et al., 2016). Conversely, suppliers that become dissatisfied with their relationship with the buyer may eventually search for alternative buyers and commit to other relationships (Ellegaard and Koch, 2012). Having dissatisfied suppliers could therefore result in both decreased performance within a certain buyer-supplier relationship and decreased performance of a buying firm relative to its competitors that source from similar suppliers, thereby negatively impacting long-term competitive advantages of the buying firm. Hence, supplier satisfaction is an important construct that has strategic value for buying firms.

The present study focusses on buyer-supplier dependence as a determinant of supplier satisfaction. The theoretical foundations of dependence research lie in the power-dependence view of Emerson (1962) and the resource-dependence view of Pfeffer and Salancik (1978). The basic idea behind these theories is that organizations are interconnected systems that need resources for survival. The need for these resources generates dependence and power-dynamics in inter-organizational relationships. Even though definitions vary considerably, a general definition of dependence is “an actor's need to continue its relationship with an exchange partner in order to achieve its desired goals” (Scheer et al., 2015, p. 700).

To study interorganizational dependence, researchers advocate adopting a two-sided view, taking both buyer and supplier dependence into account. For instance, Terpend and Krause (2015) studied mutual dependence and found that the effectiveness of cooperative relational incentives in supplier performance depends on the degree of buyer and supplier dependence. They showed that mutual dependence – with a slight emphasis on the supplier's dependence – is the key driver in the effectiveness of cooperative incentives with regard to increasing supplier performance. They acknowledged that without taking a two-sided view on dependence, they would have rejected the idea that cooperative incentives have an impact on supplier performance. Hence, a dyadic view on buyer-supplier dependence is crucial for understanding buyer-supplier relationship dynamics. Moreover, the literature has shown that different degrees of mutual and asymmetric dependence can exist. Casciaro and Piskorski (2005) distinguished between dependence asymmetry and joint dependence in analyzing the effects on the power restructuring activities of firms. They found that mutual dependence allowed weaker firms to address resistance from stronger partner firms. However, a shortcoming of their study was that they did not include the underlying causes of mutual and asymmetric dependence in their hypothesizing. Recent studies have begun to address this issue by including asymmetric and mutual dependence as interaction effects in their hypothesis building. For example, Griffith et al. (2017) analyzed the resource sharing of suppliers and found that positive and negative inequity differentially influence perceived relationship performance depending on the degree of mutual dependence. To summarize, the above studies demonstrate the importance of taking a dyadic view on buyer-supplier dependence, while explicitly considering the different effects of mutual and asymmetric buyer-supplier dependence.

Despite the growing body of research on supplier satisfaction, there is still a lack of a thorough understanding of how different (asymmetric) dependence constellations of buyer versus supplier dependence have different effects on supplier satisfaction. Below, we take a dyadic view of buyer-supplier dependence, and we hypothesize on the effects of mutual and asymmetric dependence.

3. Hypotheses

3.1. Mutual dependence and supplier satisfaction

As noted, firms always depend, to varying extents, on their trading partners (Caniëls and Gelderman, 2007; Schiele and Vos, 2015). Studies about buyer-supplier dependence usually conceptualize dyadic relationships, taking into account the dependence from the buyer's as well as the supplier's perspective (Buchanan, 1992; Geyskens et al., 1996; Kumar et al., 1995). The possession and control of critical assets by one party creates dependence in the other party: A has a dominant position over B if B depends on A more than A depends on B (Caniëls and Gelderman, 2007; Emerson, 1962).

Scholars have emphasized that balanced levels of dependence between partners enhance relationship stability (Muthusamy and White, 2006). Social exchange theory suggests that exchanges between partners occur when they are rewarding for both parties (Emerson, 1962). In this way, buyer-supplier relationships characterized by mutual dependence facilitate interactions between firms that both seek value. The dependence literature describes notions such as ‘total interdependence’, ‘total mutual dependence’ and ‘joint dependence’ (Bacharach and Lawler, 1981; Casciaro and Piskorski, 2005; Gulati and Sytch, 2007) to delineate the sum of the parties’ dependence on one another. Higher levels of mutual dependence increase the depth of economic interaction between exchange partners and in this way are related to a stronger relational orientation (Gulati and Sytch, 2007). These relationships are therefore expected to be stable and beneficial for both parties. Hence, symmetry in the dependence of two trading partners is expected to facilitate the relationship (Andaleeb, 1996).

Fig. 1 shows the relation between buyer dependence and supplier

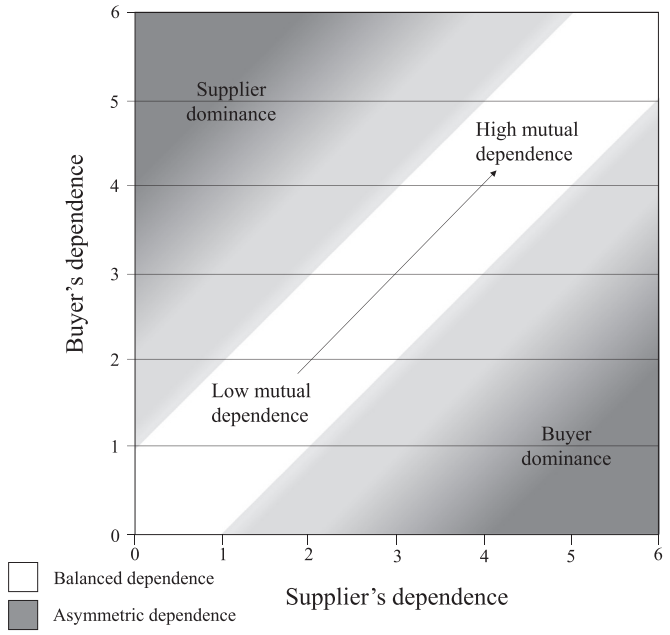

Fig. 1. Buyer-supplier dependence (inspired by Caniëls and Gelderman (2007) and Caniëls and Roeleveld (2009).

dependence. The white surface refers to a situation in which both partners have a similar level of dependence on each other. In cases of such balanced dependence, relationships may still differ with respect to total mutual dependence. That is, the buyer-supplier relationship can be characterized by a low or a high mutual dependence, each of which has behavioral implications for the relationship. Mutual dependence has been shown to reduce the uncertainty of transaction outcomes, increase knowledge sharing activities and improve conflict resolution (Gao et al., 2005; Kaiser et al., 2013; Kumar et al., 1995). Low levels of mutual dependence may reflect buyer-supplier relationships with respect to non-critical routine products. High levels of mutual dependence may indicate strongly co-operative relationships (Gulati and Sytch, 2007). Furthermore, when both parties are aware of each other's (high) dependence, it is unlikely that either side will abuse its position. The risk of retaliation in such situations is easily perceived as too high (Casciaro and Piskorski, 2005; Gulati and Sytch, 2007). Hence, the extent to which a buyer-supplier relationship is characterized by mutual dependence can be expected to positively influence the relational behavior due to relational risk avoidance and the value that both partners perceive in the relation. Relationships in which the buyer and supplier are mutually dependent at a high level are therefore more likely to yield high levels of supplier satisfaction.

Hypothesis 1. High levels of mutual dependence are positively related to supplier satisfaction

3.2. Asymmetric relationships and supplier satisfaction

Dependence asymmetry is usually associated with a negative influence on performance by reducing the willingness to compromise (Gundlach and Cadotte, 1994) or to undertake adaptations (Hibbard et al., 2001). In asymmetric relationships, one partner dominates the exchange (Blois, 2010; Casciaro and Piskorski, 2005; Gulati and Sytch, 2007). Current views dictate that such relationships are less effective because the dominant partner may be tempted to exploit its position (Ireland and Webb, 2007). Usually, the mere presence of asymmetric positions in relationships is associated with instability and conflict (Anderson and Weitz, 1989; Geyskens et al., 1996; Kumar et al., 1995; Rokkan and Haugland, 2002). For instance, if a dominant party forces its views onto its trading partner, knowledge sharing practices will become difficult or even impossible (Kwon and Suh, 2004). Accordingly, Ford and Thomas (1995) show that in asymmetric relationships, communication will predominantly flow from the dominating party to the dependent party, which hampers the dependent party's responses to the dominant party's initiatives.

If relationship continuity is not a priority, the dominant partner can appropriate the largest share of the relational value created (Brito and Miguel, 2017, in press). Naturally, if the supplier is the dominant party in the relationship, it is likely to gain high value from the relationship, leading to high satisfaction. For instance, Dyer et al. (2008) provide the example of Toyota. Although Toyota overall made higher relational profits than its suppliers due to asymmetric dependence, some partner suppliers made similar profits to those of Toyota. A main reason for this was that those suppliers offered more valuable and unique components than other suppliers. Consequently, the dependence of Toyota on these suppliers allowed the suppliers to gain high benefits from the relationship. The value that suppliers perceive in a relationship creates a feeling of fulfillment regarding their relationship investments and is thus linked to supplier satisfaction (Essig and Amann, 2009; Pulles et al., 2016). Hence, relationships in which the supplier has a dominant position are more likely to lead to higher levels of supplier satisfaction.

Similarly, buying firms are more likely to extract high value from supplier relationships if they hold a dominant position. However, contrary to studies that argue that buyer dominance negatively affects supplier satisfaction, we argue that buyer dominance does not necessarily result in supplier dissatisfaction.

Still, an often accepted assumption in the literature is that dependence on a dominant party has negative consequences for the dependent party. For instance, Mentzer et al. (2000, p. 553) state that "[r]egardless of whether the firm is in a position of relative power or relative dependence, increasing asymmetry in relative dependence and decreasing total interdependence generates greater conflict, lower trust, and lower commitment." Griffith et al. (2017, p. 126) argue that "a firm that is relatively less dependent on its partner is less motivated to cooperate" and that (p. 127) "as a supplier's relative dependence increases, the supplier is motivated to reduce its asymmetric dependence on its buyer to reduce its vulnerability to potential exploitation." However, in business practice, many suppliers are highly dependent on large buyers, but not all of these relationships generate conflicts, and the suppliers do not always seek to reduce vulnerability in these relationships. Additionally, buying firms do not necessarily exploit the dependence of suppliers, which would limit the negative consequences of dependence asymmetry. Gaski (1984) distinguishes exercised and unexercised power and argues that although a dominant party may have the ability to control another party's behavior, the dominant party does not necessarily need to exercise this control. Gaski (1984) argues that exercised dominance (e.g., coercive power tactics) negatively influences supplier satisfaction. Indeed, research shows that a buyer's abuse of a dominant position may have a negative impact on the value-generating performance of the relationship (Gulati and Sytch, 2007; Nyaga et al., 2010). On the other hand, unexercised dominance is argued to positively influence satisfaction (Gaski, 1984). For example, Toyota and Ikea are large firms with many smaller and dependent suppliers, but these firms are not known to exploit their suppliers. Instead, they are known for their successful supply management and satisfied supplier base.

However, even if a dominant buyer extracts a higher relative value of a relationship than a supplier, the supplier may still be satisfied due to the absolute value it perceives. That is, even though a relationship is not symmetrically interdependent, high levels of absolute value for the supplier could still result in supplier satisfaction. For instance, Wal-Mart sometimes uses its dominance to squeeze its suppliers. Still, compared to smaller retailers, Wal-Mart offer suppliers better absolute growth opportunities in terms of market shares (Bloom and Perry, 2001), which can result in supplier satisfaction, since growth is a key factor determining supplier satisfaction (Vos et al., 2016). Hence, when

comparing a symmetric relationship with a small partner with low turnover potential to an asymmetric relationship with a large partner with high turnover potential, a supplier may actually prefer to co-operate with the larger partner, opting to take the higher turnover potential while accepting the relative dependence. In these situations, suppliers are inclined to satisfy the need for large-volume orders for their survival despite the relative dominance of the buyer (Brito and Miguel, 2017). Especially at moderate levels of total mutual dependence, asymmetric dependence situations may lead to higher supplier satisfaction than symmetric ones. Hence, we argue that due to (i) the relative value the supplier retrieves from a supplier-dominant relationship and (ii) the absolute value the supplier retrieves from a buyer-dominant relationship, if the buyer does not exploit this dominance, dependence asymmetry has a positive effect on supplier satisfaction.

Hypothesis 2. At intermediate levels of total mutual dependence, both supplier and buyer dominance are positively related to supplier satisfaction

4. Method

4.1. Sample and procedure

This study's data were collected in collaboration with a large German chemical company and its suppliers. To prevent response bias, suppliers were informed that responses were collected independently of the focal company. Additionally, suppliers were guaranteed complete anonymity as long as they did not voluntarily indicate their names. Informants were invited by an email including a link to an online survey tool. Two weeks after distributing the questionnaire, all suppliers were called as a reminder. Final reminders were sent out via mail in the third week, after which the survey closed. Purchasing employees, the main contacts of the supplier, were asked by their supervisors to fill in the questionnaire. Their questionnaires were matched to the supplier responses using the same survey tool.

Of the 281 contacted dyads, suppliers and buyers returned 177 and 263 questionnaires, respectively, indicating response rates of 63% and 93%. Matching the buyer and supplier views resulted in 132 dyads. After removing 23 respondents due to missing values and self-reported insufficient knowledge of their partner, the final dataset included 109 dyads. The sample characteristics are shown in Table 1.

Table 1
Sample characteristics (N = 109).

Length of firm relationship		Tenure of respondent in company		
			S	B
< 1 years	0%	< 1 years	0%	0%
1–5 years	13%	1–5 years	10%	37%
5–10 years	17%	5–10 years	23%	10%
10–20 years	26%	10–20 years	36%	17%
> 20 years	44%	> 20 years	31%	37%
Annual turnover of suppliers (in €)		**Tenure of respondent as sales/purchase representative**		
			S	B
< 10 m €	34%	< 1 years	1%	0%
10 m–100 m €	34%	1–5 years	18%	41%
100 m–1 bn €	19%	5–10 years	28%	20%
> 1 bn	13%	10–20 years	34%	30%
		> 20 years	19%	8%

Notes: S = Supplier; B = Buyer.

4.2. Measures

The measures in this research are derived from previous research (see Appendix A). The dependence construct included five items, which comprised statements such as “In this contractual relationship, our company is very dependent on this client/supplier” (Frazier, 1983; Hibbard et al., 2001; Kaiser et al., 2013; Kumar et al., 1998). The supplier satisfaction construct entailed five items, such as “On the whole, our firm is completely happy with this customer” and “If we had to do it all over again, we would still choose to use this customer” (Cannon and Perreault, 1999; Hüttinger et al., 2014; Vos et al., 2016). All items were measured on 6-point Likert scales. The anchors for these scales were 1 = strongly agree to 6 = strongly disagree.

We controlled for the length of the relationship in the analyses because contemporary research has shown its influence on the satisfaction in a buyer-supplier relationship (Nagati and Rebolledo, 2013).

4.3. Data quality criteria

To test the reliability, discriminant and convergent validity or our data, we first conducted a principal component analysis to examine whether the items load on the hypothesized components (Petter et al., 2007). We applied varimax (orthogonal) and oblique (non-orthogonal, delta = 0) rotations. Factors were identified based on eigenvalues > 1. Four components were extracted from the principal component analysis, covering variances of 23.1%, 22.7%, 21.5% and 7.0%, respectively. Apart from one item measuring dependence, all factor loadings were above the suggested minimum cut-off of .55 (Tabachnick and Fidell, 2007), and no relevant cross-loadings on non-hypothesized components were found. The varimax and oblique rotations yielded similar results. We excluded the weak dependence item from further analysis (see Appendix A).

Then, we tested the data on linearity, independence of residuals, heteroscedasticity and outliers. When regressing the independent variables on supplier satisfaction (using OLS regression), the residuals appeared independent (Durbin Watson tests, DW = 1.67 > 1), but the distribution of residuals departed from normality (Shapiro Wilk Test, W (109) = .965; p < .01) (Field, 2009). The Koenker (Koenker, 1981) heteroscedasticity analyses revealed possible heteroscedasticity ($\chi 2$(df = 1) = 10.85, p < .001), meaning that the model shows signs of asymmetric relationships (Woodside, 2013). To mitigate bias stemming from heteroscedasticity and non-normality, we bootstrapped our data in the regression analyses with 5000 bootstrap samples, which is a common procedure under these circumstances (Efron and Tibshirani, 1993; Field, 2009; Vos et al., 2016). Concerning outliers, the Cook's distances appeared to range between .09 and .01, which indicates that no separate cases have a strong influence on the regression results (Bollen and Jackman, 1990). Finally, the Cronbach's alphas are all above the threshold of .70 and the variance inflation factor values are below 4, indicating good reliability and low multicollinearity (Diamantopoulos and Siguaw, 2006; Field, 2009).

Table 2 presents the construct means, standard deviations, correlations and quality criteria.

Table 2
Construct correlations and quality measures of constructs.

Construct	Mean	SD	CA	VIF	1	2	3	4
1. Buyer dependence	2.74	1.11	.90	1.85	–			
2. Supplier dependence	3.44	1.20	.87	1.45	.04	–		
3. Supplier satisfaction	5.44	.59	.90	–	.16	.43**	–	
4. Relationship length	21.51	14.92	–	1.12	.10	.19*	.04	–

Notes: SD = Standard deviation; CA = Cronbach's alpha; VIF = Variance inflation factor.

4.4. Analytical strategy

We used polynomial regression with response surface analysis (Edwards, 1994; Shanock et al., 2010) to test the effects of dependence on supplier satisfaction. Although relatively unknown in the purchasing and supply management literature, this analysis technique is growing in popularity in a variety of fields, such as marketing (Kim and Hsieh, 2003), innovation (Lee et al., 2017), organizational behavior (Caniëls and Veld, 2016; Hecht and Allen, 2005), information systems (Venkatesh and Goyal, 2010) and personnel psychology research (Shaw and Gupta, 2004).

Traditional approaches to measuring the dependence between parties calculate the algebraic difference between dependencies (Joshi, 1998; Yilmaz and Kabadayi, 2006), the average or the sum of these measures (Gundlach and Cadotte, 1994) or use spline scores (Gulati and Sytch, 2007; Kumar et al., 1995). For instance, for spline scores, the difference between the supplier's dependence (SD) and the buyer's dependence (BD) are calculated. Then, the supplier dominance equals SD–BD if (BD > SD) and zero otherwise. Conversely, the buyer dominance is BD-SD if (SD > BD) and zero otherwise. However, Edwards (1994) and Shanock et al. (2010) highlight severe methodological drawbacks of the above approaches. These approaches compute two predictor variables (i.e., buyer dependence and supplier dependence) into a single score (i.e., relative dependence), which reduces the available information. However, completely different situations may lead to similar averages. Using polynomial regressions with response surface analysis instead allows one to investigate a three-dimensional view of the relationship between combinations of buyer and supplier dependence on the one hand and supplier satisfaction on the other hand (Edwards and Parry, 1993). Additionally, polynomial regression analysis differs from interaction analysis, since it too includes two non-linear effects (X2 and Y2) rather than only an interaction term (cross product XY) in the regression equation. These non-linear terms allow for one to examine whether an apparent interaction effect is actually a curvilinear effect.

In line with the suggestions by Shanock et al. (2010), we first examined how many dyads demonstrated discrepancies between buyer dependence and supplier dependence, which would enable us to perform polynomial regressions with sufficient variance. To do so, we computed the standardized scores of buyer and supplier dependence. The standardized buyer dependence scores with half a standard deviation above and below the standardized supplier dependence scores were coded as supplier dominance and buyer dominance, respectively. The scores in between were coded as balanced dependence (see Table 3). As shown in Table 3, the cases are evenly distributed among the three dependence groups, and thus, we can conclude that indeed it makes practical sense to analyze the discrepancies between dependencies (Shanock et al., 2010).

Next, we centered buyer and supplier dependence around the midpoint of their respective scales to reduce the potential risk of multicollinearity (Cohen et al., 2013; Edwards, 1994). Finally, we conducted the polynomial regression with 5000 bootstrap samples (resampling with replacement from the original dataset) and used the Excel spreadsheet from Shanock et al. (2010) to generate a three-dimensional view of the combined relationship between buyer and supplier dependence and its effect on supplier satisfaction, including significance testing. We applied a significance level of .05 (one sided) for all subsequent analyses.

Table 3
Frequencies of dependence levels of buyer and supplier dependencies.

Groups	N	%	Buyer dependence		Supplier dependence	
			M	SD	M	SD
Buyer dominance	39	36%	2.02	.86	4.35	.87
Similar dependence	31	28%	2.74	.90	3.48	.99
Supplier dominance	39	36%	3.45	1.03	2.49	.90
Total	109	100%	2.74	1.11	3.44	1.20

Notes: N = Number of cases; M = Mean; SD = Standard Deviation; Dominance groups are based on half an SD (or more) difference between the standardized scores of the two constructs; for details, see Shanock et al. (2010).

Table 4
Polynomial regression examining the impact of buyer dependence and supplier dependence on supplier satisfaction.

Variables	Dependent: supplier satisfaction					
	Model 1		Model 2		Model 3	
	B	SE	B	SE	B	SE
Step 1						
Length of relationship	.00	.00	.00	.00	.00	.00
Step 2						
Buyer dependence (X)			.21**	.05	.05**	.36
Supplier dependence (Y)			.08*	.04	.12*	.07
Step 3						
X^2					.04	.04
Y^2					.04	.04
X * Y					−.06*	.04
Adjusted R^2	.00		.18		.20	
R^2 *change*	.00		.20**		.04	

Notes: B = unstandardized regression coefficient; SE = Standard error; N = 109; Bootstrap samples = 5000.
* = p < .05.
** = p < .01.

5. Results

Table 4 shows the results of the polynomial regression analyses. We used a hierarchical regression consisting of three steps. The first step regressed the control variable (relationship length) on supplier satisfaction (Model 1). This procedure revealed a non-significant effect. The second step added the explanatory variables (i.e., buyer and supplier dependence) to the regression (Model 2), showing a significant increase in the explained variance (R^2 change = .35). The third step in the regression analysis revealed a significant cross-product of buyer dependence with supplier dependence (Model 3). We used surface analysis to interpret the results of this model.

Fig. 2 shows the three-dimensional response surface of the

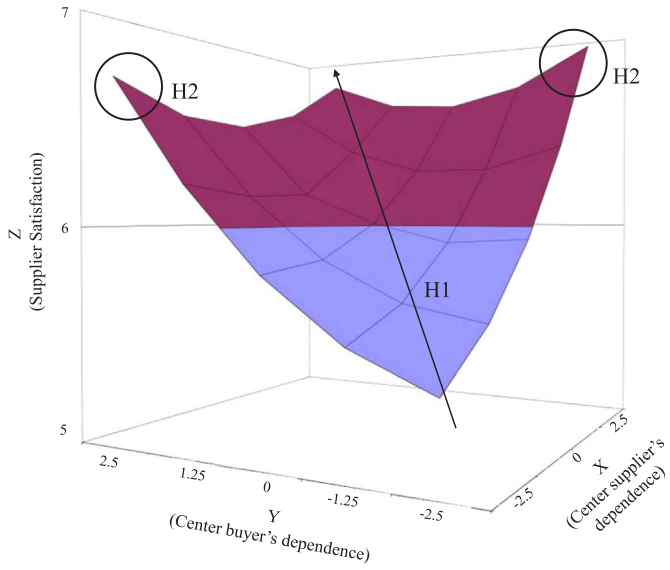

Fig. 2. Response surface model.

Table 5
Analysis of slopes and curvatures, effects as related to supplier satisfaction.

	Shape along balance line; Supplier dependence = buyer dependence (X = Y)		Shape along asymmetry line; Supplier dependence = - buyer dependence (X = -Y)	
Slope	a1 = b1 + b2	.30**	a3 = b1 – b2	.06
Curvature	a2 = b3 + b4 + b5	.02	a4 = b3 – b4 + b5	.13*

Notes: a1 and a2 represent the slope of each surface along the X = Y line, while a3 and a4 represent the slope of each surface along the X = -Y line, where b1, b2, b3, b4, and b5 are the unstandardized coefficients on X, Y, X^2, XxY, and Y^2, respectively.
* $p < .05$.
** $p < .01$.

polynomial regression. We differentiate between balanced dependence situations (H1) and asymmetric dependence situations (H2). Fig. 2 can be interpreted with the help of four surface test values for the slope and curvature along the X = Y line and the X = -Y line (Table 5). The slope of the line of balanced dependence (X = Y, buyer dependence equals supplier dependence) is given by a1 (= b1 + b2, where b1 is the β for buyer dependence and b2 is the β for supplier dependence). Curvature along the X = Y line is indicated by a2 (= b3 + b4 +b5, where b3 is the β for buyer dependence squared, b4 is the β for the cross-product of buyer dependence and supplier dependence, and b5 is the β for supplier dependence squared). We find that a1 differs significantly from zero and a2 does not; hence, there is a linear slope along the line of balanced dependence. The positive value of a1 indicates that higher levels of mutual dependence are related to higher levels of supplier satisfaction. In Fig. 2, this relationship is indicated with the upward pointing arrow. These findings support Hypothesis 1.

The impact of asymmetric dependence can be assessed by the slope and curvature along the line perpendicular to the line of perfectly balanced dependence, i.e., the X = -Y line. We find that a3 (= b1 - b2) does not significantly differ from zero, while a4 (= b3 - b4 + b5) does (Table 5). Hence, our data show a curve along the X = -Y line. The positive value for a4 indicates a convex surface along the line of perfect asymmetry, i.e., there is a U-shaped curvature along this line. Hence, we find that at intermediate levels of total dependence, extreme asymmetries have a positive impact on supplier satisfaction. In fact, the U-shape suggests that asymmetric dependence situations are associated with higher supplier satisfaction than balanced dependence situations. This finding supports Hypothesis 2.

6. Discussion and Conclusion

6.1. Discussion and implications

This study aimed to increase current knowledge on how relative dependence in buyer-supplier relationships is related to supplier satisfaction. In business practice, dependence asymmetry is often observed; therefore, research into dependence asymmetry in buyer-supplier relationships is crucial (Belaya et al., 2009; Nyaga et al., 2013). Moreover, in reality, most buyer-supplier relationships are characterized by intermediate levels of total mutual dependence, which makes analysis of these situations particularly relevant. With the help of polynomial regression analysis combined with surface response analysis, we investigated the impact of balanced dependence situations versus asymmetric situations on supplier satisfaction. It is important to distinguish between balanced and asymmetric dependence, as many studies assume a positive effect of the former and a negative effect of the latter (e.g., Griffith et al., 2017; Mentzer et al., 2000). However, several empirical works show how this assumption is not necessarily correct. For instance, Kemp and Ghauri (2001) find that dependence asymmetry does not influence conflict between partners and that other, intermediate factors play a more important role. Similarly, Geyskens et al. (1996) report that, contrary to their expectations, dependence asymmetry does not negatively influence relational commitment.

The effects of asymmetry in a relationship may be less straightforward than is often realized, because having power over a partner does not necessarily relate to (ab)using this power, especially in situations in which total dependence is at a moderate level. As noted, Gaski (1984) argued that power usage by a dominant partner generally leads to dissatisfaction of the dependent partner, while non-usage of power leads to satisfaction at the end of the dependent partner. Hence, although conventional dependence reasoning may suggest that asymmetry is directly related to the (ab)use of power, this relationship may actually be less unequivocal (Gulati and Sytch, 2007). Therefore, this study aimed to increase insights into how configurations of relative dependence relate to supplier satisfaction.

For *balanced* dependence, we find support for the hypothesis that mutual dependence has a positive impact on supplier satisfaction (slope X = Y). This finding is in line with previous studies showing that increased levels of mutual dependence are associated with supplier satisfaction (Kaiser et al., 2013; Lai et al., 2013). Supply chain management studies have shown that to the satisfaction of all involved, high mutual dependence among supply chain parties is related to high degrees of integration (Lai et al., 2013), because commitment is enhanced and supply chain management processes are streamlined (Wu et al., 2004). Similarly, Benton and Maloni (2005) found that dependence has a positive impact on various aspects of buyer-supplier relationships (e.g., trust, commitment, and conflict resolution), which in turn enhance supplier satisfaction. Our study advances previous research by confirming this relationship using dyadic data, whereas existing studies are predominantly based on single source data. Furthermore, previous research has noted that symmetry is preferable to asymmetry, whereas with our data set, it was possible to demonstrate that symmetry at a high level of total mutual dependence generates more supplier satisfaction than symmetry at a low level of total mutual dependence. The idea of high total dependence being beneficial for buyer supplier relations has been stated before (e.g., Casciaro and Piskorski, 2005; Gulati and Sytch, 2007), but until now, it has not been tested for balanced dependency situations specifically.

For *asymmetric* dependence, our data suggest that at intermediate levels of total dependence, extreme dependence asymmetries have a positive impact on supplier satisfaction (curvature X = -Y). The response surface analysis indicates that there is a U-shaped curvature along the line of perfect asymmetry. Moreover, it does not matter whether the buyer dominates the supplier or vice versa. This finding adds more clarity to the current literature on how dependence influences buyer-supplier relationships at intermediate levels of total mutual dependence. We find that suppliers are most satisfied when either (a) the buyer is highly dependent on the supplier or (b) the supplier is highly dependent on the buyer. The second finding (b) counters the often-accepted assumption in the literature that dependence on a dominant party has negative consequences for the dependent party. Why would highly dependent suppliers still be satisfied in a buyer-dominated relationship? The underlying assumption of dependence-based buyer-supplier relationship typologies is that a party that has a dominant position in the relationship will (ab)use this position and exploit the more dependent party (Tangpong et al., 2008). However, asymmetric dependence may not necessarily imply exploitation of the dependent party (Kumar et al., 1998). Dominance can also be used to benefit the value-generating capacity of the relationship. For instance, Pulles et al. (2014) found that buyer dominance most effectively generates a change in supplier behavior when it is used for rewarding rather than coercing the supplier. Additionally, a dominant buyer can provide guidance when buyer and supplier collaborate on joint tasks (Gulati and Sytch, 2007; Jap, 1999; Kaiser et al., 2013; Castellucci and Ertug, 2010). The work of Gaski (1984) suggests that the non-usage of power by a dominant partner actually leads to satisfaction of the dependent partner. In earlier work, Molm (1981) found that power usage

is often much lower than relative dependence would suggest. Additionally, Kumar (1996) notes how large manufactures instill practices that strive to prevent the supplier from perceiving inequity, despite relative dependence. Hence, the relationship between power use and dependence asymmetry is arguably less direct than suggested in classic power thinking (Gulati and Sytch, 2007).

In addition, we argue that even if a dominant buyer extracts higher *relative* value in a relationship, a supplier may still be satisfied in a relationship due to the *absolute* value it perceives. Instead of a symmetric relationship with a small partner with low turnover potential, suppliers may actually prefer to cooperate with a large partner, opting for higher turnover potential while accepting the relative dependence. Although a dominant buyer may extract the highest relative value from the relationship, a supplier would still be satisfied due to the absolute value it perceives. The apparently counter-intuitive observation of high supplier satisfaction in the presence of a supplier's dependency also becomes understandable from a closer view of the so-far identified antecedents of supplier satisfaction: growth, profitability, relationship quality and operative excellence (Vos et al., 2016). Regardless of the exact dependency configuration, suppliers may extract value from the growth opportunities offered by a certain buyer or from operative excellence on part of the buyer, such as having accurate planning systems and well-working payment systems. It is likely that these factors offset possible negative effects from being the non-dominant party. Future research may want to analyze how these factors interact with the dependency configuration in determining supplier satisfaction.

Our findings provide new insights for the literature on supplier satisfaction. Hüttinger et al. (2012) discussed drivers of supplier satisfaction and indicated that more research is needed. We advance insights in this field by showing the complex interplay between buyer and supplier dependence in relation to supplier satisfaction. We show that asymmetric dependence situations can still be satisfactory to suppliers (even more so than balanced dependence situations). A few studies found evidence that point in this direction (Kaiser et al., 2013), however, no prior study has investigated the relationship between dependence asymmetry and supplier satisfaction.

Finally, the polynomial regression approach used here is helpful for understanding the complexities of the relationship between buyer and supplier dependence with respect to supplier satisfaction. Although the potential of the technique has already been elucidated by Kim and Hsieh (2003), Caniëls and Veld (2016) and Venkatesh and Goyal (2010), studies into buyer-supplier relationships have left it unnoticed. Because this technique allows us to use buyer dependence and supplier dependence as two distinct constructs with separate measures, we do not reduce the available information, which is a drawback of current studies that collapse buyer and supplier dependence into a single score. The possibility of finding a significant curvature makes it possible to distinguish between asymmetric and symmetric dependence situations at the same level of total mutual dependence. This analysis has not been conducted before, and it is not possible with other techniques.

6.2. Managerial implications

From a managerial perspective, dependency from a business partner is typically perceived as a negative situation that should be avoided. This study casts new light on this assumption: concerning supplier satisfaction, it is not so much dependency asymmetry that matters but the degree of dependency. The more dependent both parties are on each other, typically, the more satisfied the supplier is. Hence, the general rule to avoid dependency – as postulated, for instance, by resource dependency theory – may not necessarily be the best recommendation in all cases. To benefit from satisfied suppliers and the associated advantages – notably, supplier innovation and fair pricing behavior (Schiele et al., 2011) – dependency is both acceptable and, under many circumstances, necessary. In fact, synergetic high (mutual) dependence is desirable from a satisfaction point of view, while a lack of dependency is associated with low supplier satisfaction. This finding calls for a re-evaluation of the “routine” quadrant in the Kraljic matrix, which is exactly characterized by mutual independence.

The finding that high mutual dependence is found to generate benefits is an argument for single source tactics. This argument is further underscored by the observation that asymmetric dependence of a supplier on a buyer is also a condition that, in our data, led to supplier satisfaction, on average. Furthermore, counter-intuitively, the buyer may accept situations of dependency from the supplier (Schiele and Vos, 2015). Our study shows that such situations are associated with high increases in supplier satisfaction, and hence, the supplier has no incentive to commit moral hazard and abuse the situation of its client's dependency. The typical recommendation for the situation of dependency from suppliers (the bottleneck quadrant in the Kraljic logic) is to avoid such cases. Here, our findings are a call to revisit this case by challenging the assumption that dependency automatically has detrimental effects.

In today's business environment, typical buyer-supplier relationships are characterized by intermediate levels of mutual dependency. Suppliers deliver to several buyers, and buyers source from various suppliers. Our study shows that at intermediate levels of total dependency, asymmetric dependence situations are preferable over symmetric dependence situations in terms of generating supplier satisfaction. A dominant position can be used to provide guidance and direction in joint projects. Managers of dominant forms are advised to use the dominant position of their firm in a non-coercive, rewarding way. This behavior will lead to supplier satisfaction, which in itself is related to various positive outcomes for buyers and suppliers alike.

Finally, another important, though challenging, managerial implication is that it is not the relative dependency matters, but the absolute value. It is challenging because of the difficulty of measuring dependencies in an objective and multi-scaled way. It is one thing to measure dependency in an anonymous scientific survey; it is another thing for firms to objectively assess their business relation. Here, future research could work on refining measurements applicable in a single-sided way, either by a supplier trying to rate its dependency from a buyer or a buyer trying to assess its dependency from a supplier.

6.3. Limitations and future research

The results of this study should be viewed in light of some limitations. First, the most serious shortcoming of our study stems from our data set, which has one company at its origin. It cannot be fully excluded that the particularities of this firm may influence the results. Our sample consists of suppliers that had lengthy satisfying relationships with their buyer. With regard to our data set, the suppliers of the focal company on average indicated a very high commitment towards the focal company in the questionnaire, since the mean relationship length was 21 years. This may limit the generalizability of our findings. More research is needed that employs more-diverse datasets and different contextual situations.

Second, similar to other studies on buyer-supplier relationships, we adopted a cross-sectional research design, which prevents us from investigating the direction of causality. Although we have theoretical reasons for expecting that dependence leads to satisfaction, our statistical method cannot rule out a reversed causal relationship. Future research may adopt a time-lagged research design.

Third, it would be worthwhile to further investigate how relative dependence interacts with power usage by the buyer. In this paper, we referred to the important work of Gaski (1984), who differentiated between power usage and non-usage and who suggested that power non-usage is important for partner satisfaction. In a similar vein, a study by Hausman and Johnston (2010) indicated that coercive power strategies are counterproductive, while non-coercive power strategies can generate commitment and positive outcomes in buyer-supplier relationships. However, more research is needed that explores interaction

effects between dependence and power usage. Chen et al. (2016) made a first step in showing an interaction between dependence and information sharing. Similarly, Crook et al. (2017) discuss how the use of dependence advantages could be constrained by ineffective capabilities internal to the buying firm's organization. These works suggest that power use is not a straightforward outcome of dependence advantages but is contingent on organizational factors. Recent calls for research into these and similar dependence questions (e.g., Reimann and Ketchen, 2017) demonstrate that dependence remains one of the most salient research topics within the supply management literature.

Finally, a further exploration of the links between dependence, satisfaction and supplier performance may be a fruitful avenue for future research. A major question in this context is whether supplier performance is directly related to supplier satisfaction or whether the shape of the graph shown in Fig. 1 is different for the effects of dependence on supplier performance. Are dependence asymmetries and mutual dependence beneficial to supplier performance to the same degree as they appear to be to supplier satisfaction? There may be a dark side to dependence asymmetries on certain dimensions of supplier performance, such as price or quality performance. Future research is necessary to assess the relationships between dyadic dependence, supplier satisfaction and performance.

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Appendix A. Constructs and Items

Supplier's dependence (Frazier, 1983; Hibbard et al., 2001; Kaiser et al., 2013; Kumar et al., 1998)	
1	In this contractual relationship, our company is very dependent on this client.
2	To achieve our business goals, our company has to maintain this relationship to the client.
3	A cancellation of this contractual relationship with the client could be very easily compensated by our company.(Reversed)*
4	If the relationship were to end earlier than contracted, our business goals would be negatively affected.
5	Our company would face great challenges if the client did not continue the contractual relationship.
Buyer's dependence (Frazier, 1983; Hibbard et al., 2001; Kaiser et al., 2013; Kumar et al., 1998)	
1	In this contractual relationship, our company is very dependent on this supplier.
2	To achieve our business goals, our company has to maintain this relationship to the supplier.
3	A cancellation of this contractual relationship with the supplier could be very easily compensated by our company.(Reversed)*
4	If the relationship were to end earlier than contracted, our business goals would be negatively affected.
5	Our company would face great challenges if the supplier did not continue the contractual relationship.
Supplier satisfaction (Cannon and Perreault, 1999; Hüttinger et al., 2014)	
1	Our firm is very satisfied with the overall relationship to this customer.*
2	On the whole, our firm is completely happy with this customer.
3	Generally, our firm is very pleased to have this customer as our business partner.
4	If we had to do it all over again, we would still choose to use this customer.
5	Our firm does not regret the decision to do business with this customer.

Note: * = the item has been excluded, due to low factor loadings on the intended construct.

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