The Effects of Relational Embeddedness on the Manufacturer's Rent. The Study of Triadic Supply Chains with the Structural Hole

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Abstract

The goal of the study is to investigate whether manufacturer relational embeddedness contributes to the higher increase of network rent. In order to address this aim, we define manufacturer embeddedness as the effects of the quality of relationships in two dyads (supplier-manufacturer and manufacturer-customer) on the economic performance of actors. We employ the concept of network rent, to be depicted as the outcome of interplay between relational performance generated by two dyads. In general, the study shows that strong manufacturer relational embeddedness contributes to the increase of network rent for the manufacturer sitting on the structural hole.

Keywords: triad, supply chain, structural hole

Introduction

The concept of triads has risen to prominence in the literature over the last few years, offering a powerful tool for investigating the increasing complexity of contemporary supply chains (Vachon and Klassen, 2002; Swafford et al., 2006). To date, the prevailing number of previous studies on triads have been focusing on the upstream part of supply chains, and mostly investigating buyer-supplier-supplier relationships (Choi and Wu, 2009a; Wu et al., 2010; Li et al., 2010). Our study moves the research interest to the central part of a supply chain, established by the manufacturer, its supplier and its customer. In other words, we refer to the triad, formed by three subsequent actors – supplier, manufacturer, customer, that represent a manufacturing setting (Li and Choi, 2009). In such a linear structure, the manufacturer establishes direct relationships with its supplier and its customer in a triad, while the supplier and the customer do not have a direct relationship with each other (Choi and Wu, 2009b). To put it more precisely, the manufacturer, positioned centrally between the supplier and customer, fills the structural hole in the triadic arrangement. As such, the structural hole represents a non-redundant relationship established between the supplier and the customer. The manufacturer sitting on top of the structural hole acts as a buffer, like an insulator in an electric circuit (Burt, 1992). In other words, it acts as the gateway between two other actors, and thus is capable of yielding additional rents (Simmel, 1950). These rents take the form of non-redundant network benefits provided in the structural hole arrangement by both the supplier and the customer (Burt, 1992).

The goal of the study is to investigate whether the rent generated by the manufacturer sitting on the structural hole is dependent upon relational embeddedness within the triadic supply chains. In our study, we argue that, apart from maximizing its own benefits, the manufacturer may also use the structural hole in favor of its supplier and its customer. However, we believe that this strategy may not only be beneficial for the supplier and the customer, but it may also bring substantially higher profits for the manufacturer itself. To yield these benefits, the manufacturer needs to bring its supplier and its customer together. In order to investigate this issue, we refer to the concept of manufacturer relational embeddedness, composed of relational embeddedness of two dyads: supplier-manufacturer and manufacturer-customer. In general, relational embeddedness pertains to the quality of relationships established between two actors in a dyad (Moran, 2005). As indicated by Capaldo (2014), relational embeddedness captures the effects of quality, history and developmental process of relationships in a dyad on the economic performance of actors. Building upon the study of Kim (2014), manufacturer relational embeddedness can be defined as the extent to which the manufacturer relies and operates under the influence of its supplier and its customer. In other words, it refers to the influences of the content of direct, dyadic relationships. Consequently, the study investigates how much the manufacturer is embedded in two dyadic relationships – one formed with its supplier and the other one established with its customer, and how much manufacturer relational embeddedness affects the value of network rent, yielded by the manufacturer.

The paper is structured as follows. In the next section of the study, we discuss the literature, describe the conceptual framework and introduce the research hypotheses. Afterward, we describe the methodology and present our findings. Next, we conclude by discussing the implications of the results.

Conceptual model and literature review

In the triad within a manufacturing setting, the manufacturer is embedded in the network of relationships established with its supplier and its customer (Mena et al., 2013). In fact, the major driver for the companies to increase the strength of relational embeddedness is the ability to reap substantial benefits (Nair et al., 2009). Our study investigates the relationship between manufacturer relational embeddedness and the network rent – Figure 1. As depicted in the model, we specifically consider manufacturer relational embeddedness to affect the manufacturer's network rent in the structural hole arrangement.

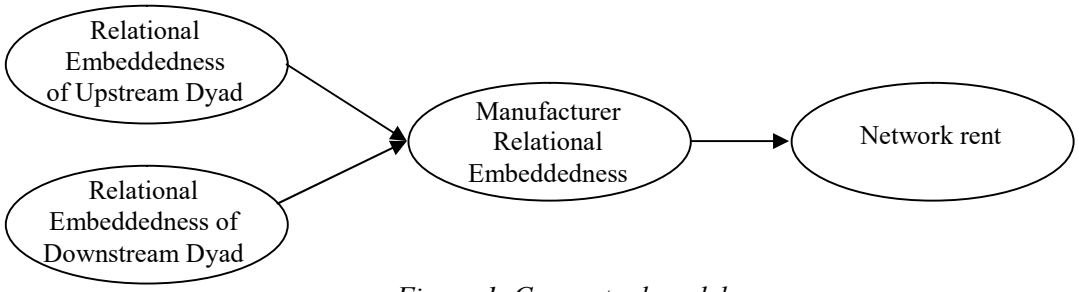

Figure 1. Conceptual model

In order to investigate network benefits reaped by the manufacturer from the structural hole, we focused on the mutual influence of both dyads in a triad (i.e. supplier – manufacturer and manufacturer – customer) as a specific unit of a supply chain (Dubois, 2009). In other words, we captured how a link in one dyad affects another link

in another dyad (Choi and Wu, 2009b). The outcome of this interplay enables to yield a rent. Drawing upon the work of Burt (1992), we argue that the supplier and the customer positioned on two sides of the structural hole provide network benefits that are, to some extent, additive rather than overlapping. Accordingly, the sum of relational performance: value(a) and value(b) generated in two dyads ('a' and 'b') together with the added value of network rent: value (a, b) defines the manufacturer's performance. The network rent simultaneously captures if the outcome of one dyad, established between the manufacturer and its supplier, affects the outcome of the other dyad, formed by the manufacturer and its customer. This will provide an understanding of the interplay and relational dynamics of supplier–manufacturer–customer relationships in the structural hole arrangement (Wu and Choi, 2005). In line with the proposed model, we argue that the value of network rent is, to some extent, dependent upon manufacturer relational embeddedness. Furthermore, as depicted in Figure 1, in the structural hole arrangement, manufacturer relational embeddedness is composed of upstream and downstream relational embeddedness. Both of them can be then characterized as either strong or weak. They are strong when the relationships established by the manufacturer and its supplier or the manufacturer and its customer are of high quality, meaning that actors of a dyad consider one another's needs and goals to be important (Kuan and Bock, 2005). In other words, strong relational embeddedness denotes that both actors in a dyad sacrifice their time, engage emotionally, deepen mutual confiding, and extend reciprocal services offered to each other (Granovetter, 1973). However, at times, companies are not willing to deepen the link between each other; on the contrary, they want to exit the current relationship (Nair et al., 2009). In this case, relational embeddedness is weak, as both actors in a dyad act opportunistically and antagonistically (Choi and Wu, 2009b). The juxtaposition of upstream and downstream relational embeddedness with their extreme values yields three types of manufacturer relational embeddedness in the structural hole arrangement.

Strong relational embeddedness of both dyads (*s*-*s* situation) is typical for strong manufacturer relational embeddedness, as it is characterized by a high level of commitment, deeper trust, intense information sharing, relational-based conflict resolution and adherence to relational norms. The literature provides numerous examples of the triadic supply chains with strong manufacturer relational embeddedness (Christopher, 2016; Drayer, 1999; Bovet and Martha, 2000). On the other hand, weak manufacturer relational embeddedness is characterized by weak relational embeddedness of both dyads (*w*-*w* situation), demonstrating a low degree of commitment and mutual distrust, reluctance to share information among companies, contract-based conflict resolution and lesser adherence to the relational norms. However, only few prior studies deliver examples of weak manufacturer relational embeddedness (Williamson, 1996). Finally, balanced manufacturer relational embeddedness represents a hybrid type of the structural hole arrangement, in which one dyad is characterized by strong relational embeddedness, while the other one is described by weak relational embeddedness (*w*-*s* or *s*-*w* situation). A number of previous studies offered examples of weak manufacturer relational embeddedness (Mena et al. 2013; Rugman and D'Cruz, 2011; Morris, 2002; Lambert and Cooper, 2000; Storey et al., 2006). Several prior studies indicated that in terms of the quality of relationships in two dyads forming a triad, the actor sitting on top of the structural hole is capable of yielding different network benefits (Sukresna et al., 2016; Huo et al., 2014; Hernández-Espallardo et al., 2010). Building upon the previous studies, we propose the following hypothesis:

The stronger manufacturer relational embeddedness, represented as a higher order factor, the higher increase of network rent derived by the manufacturer.

Methodology

Research sample characteristics

In order to collect data from all three links forming a triadic structure of supplier-manufacturer-customer, the methodology recommended by Wu et al. (2010) was employed. The target company - manufacturer, acting as the focal node in its triad, provided detailed contact information on its first-tier supplier and first-tier customer. The major business partners of the focal company were selected on the basis of two criteria: (1) supply components are parts that go into the end item, received by a customer (Wu et al., 2010), and (2) the end item concerns the highest value product line for the focal company (Tan et al., 1998). In addition, the sample was checked for redundancy by cohesion, in order to make sure that the manufacturer is actually positioned on the structural hole in the examined triads (Burt, 1992), and both the supplier and the customer, although they may know about each other, do not establish a strong tie. A few iterations were needed to gather necessary data and obtain a sample of a reasonable size, embracing 29 manufacturers that establish simultaneous relationships both with its supplier and its customer. The latter two actors bring non-redundant benefits (redundancy by cohesion), as in most of the cases they do not know each other. Additionally, suppliers and customers do not establish strong relationships with each other in any of the investigated triads. The subsample including triadic relationships has been employed in this study for further analysis.

The majority of the surveyed triadic supply chains operated in the machinery industry (34.5%), followed by transportation (27.6%) and electronics industry (20.7%). All investigated triads operated in Europe. Specifically, the prevailing number of triads are established by the companies from Poland (27.6% of the manufacturers, 34.5% of the suppliers and 38% of the customers), Germany (20.7% of the manufacturers, 38% of the suppliers and 17.2% of the customers) and Czech Republic (13.8% of the manufacturers, 20.7% of the suppliers and 10.3% of the customers). Other European countries (i.e. the Netherlands, Italy, Hungary and Slovakia) are also represented in the sample, but with a lower share. Regarding the number of employees, a group of 75.9% of the manufacturers employed from 101 to 300 people, while almost all investigated suppliers (89.6%) and 93.1% of the customers employed below 300 workers.

Data collection

The process of data gathering spanned over 5 months in 2017, and covered several stages. In order to conduct the study, a quantitative survey was developed as a method of data collection. The questionnaire used for this study contained a number of variables examining operational performance of the manufacturer, as well as both the relational performance and relational embeddedness of two dyads: supplier-manufacturer and manufacturer-customer. The structure of the survey questionnaire was adjusted to certain groups of respondents, serving different functions in a triad. Depending on the role served in a triad, each responding company answered a specific set of questions. Accordingly, the manufacturer answered the questions concerning relational embeddedness separately for both dyads – one formed with its supplier and the other one established with its customer. Then, due to its middle location, the manufacturer also answered the questions concerning the relational performance of both dyads: upstream and downstream, and finally rated its operational performance. The suppliers and the customers answered the questions concerning both relational embeddedness and the relational performance of a dyad formed with the manufacturer.

Measures

Our study considers two groups of constructs – measures for performance and measures for relational embeddedness. The first group of constructs were used to calculate the network rent, while the second group provided us with necessary information to test the research hypothesis of the study.

The group of performance constructs covered the manufacturer's performance and relational performance of a dyad. Extant studies demonstrated that companies willing to make relation-specific investments and combining resources in the spirit of networking can achieve superior benefits (Asanuma 1989; Dyer 1996). Accordingly, performance is generally conceptualized in the literature as the financial performance (Flynn et al., 2010), market performance (Swink et al., 2007), operational performance and customer-focused performance (Mackelprang et al., 2014). Among these four, the operational performance is the most significant for investigating the network rent yielded by the manufacturer. This group includes a wide range of productivity characteristics, such as cost of purchased items, physical product quality, new product development capability (cost, time, uniqueness) and transportation cost (Allred et al., 2011). Therefore, in our study we employed the following group of metrics to investigate the operational performance yielded by the manufacturer: product quality, product conformance to customer specification, manufacturing volume/variety flexibility, manufacturing efficiency, product development cycle time and response to changes in manufacturing (Duclos et al., 2003; Lummus et al., 2005; Li et al., 2008; Li et al., 2009; Reichhart and Holweg, 2007).

The measures for relational performance of a dyad were used to assess the extent to which both parties generated reciprocal effects. In the opinion of Whipple et al. (2015), the relational performance between partners ought to lead to improved benefits for all involved actors. We used the following five indicators to be inquired from respondents separately for two dyads, namely: two companies are more profitable or more competitive together than they would have been alone, the benefits derived from the combination must be greater than the capabilities of each individual, working with a partner has allowed to overcome certain problems, and thus derive substantial benefits for a dyad, sharing opinion and discussion between firms often leads to increased benefits for both actors in a dyad, the ongoing costs of coordination of a dyadic relationship are balanced by its benefits. Based on the responses obtained from both actors (supplier-manufacturer and manufacturer-customer), the average scores for a certain dyad, forming a triad, were calculated. As a result, two constructs were formed – one for the upstream dyad established between the manufacturer and its supplier, and the other one for the downstream dyad formed by the manufacturer and its customer (Cheung et al., 2011; Weber et al., 2016; Kim and Choi, 2015).

Relational embeddedness was operationalized as a second order factor and comprised of two dimensions (i.e. relational embeddedness of upstream dyad, and relational embeddedness of downstream dyad). To operationalize both dimensions of relational embeddedness, we used by 5 indicators developed by Rowley et al. (2000), Tsai and Ghoshal (1998), and Larson (1992) that measured frequency of contacts in a dyad (RE 1), level of trust that reduces opportunistic behavior (RE 2), trustworthiness of the partner in a dyad (RE 3), ability to perceive a dyadic partner as an important 'team member' (RE 4), dyadic commitment primarily based on sharing similar values (RE 5).

All constructs were operationalized on 1 to 5 Likert scale where 1=Strongly disagree, 3=Neutral, and 5=Strongly agree.

Research findings

Assessing the network rent

In order to assess the network rent, we developed the multiple regression model with interaction effects to demonstrate additional benefits generated as the combination of the relational performance of two dyads (Peng et al., 2016). If such benefits exist, we posit that the network rent is present in the triadic supply chain. As recommended by Aiken and West (1991), the factor scores (obtained as a result of Exploratory Factor Analysis proceeding the primary assessment) of three constructs - the relational performance of upstream dyad, the relational performance of downstream dyad and the manufacturer's operational performance, - were applied as main terms in the regression model. The interaction term, manifesting cross-product, demonstrated the network rent for the manufacturer. In addition, we checked the predictors for multicollinearity using variance inflation factors (*VIFs*). The variance inflation indices for all predictors were below 10, which indicated no multicollinearity in the model (Belsley et al., 1980). We also performed the Durbin-Watson test to make sure that the independence of residuals was not violated. Regarding correlation, the Durbin–Watson test is approximately 2, which means that autocorrelation is not an issue in the model (Field, 2009).

The regression analysis for the manufacturer's operational performance showed that the adjusted *R*-squared explained slightly below 25 percent of the variance. Furthermore, all three predicting variables turned out to be significant in the model. The standardized regression coefficients indicate the relative strength of each of the significant independent variables, as demonstrated by (beta, *p*) at the end of each variable. There is a positive impact of the relational performance generated by upstream dyad (.277, .000), downstream dyad (.541, .000), and the network rent (.218, .017) on the operational performance. It is also worth noting that both factors of relational performance contributed quite similarly to the manufacturer's operational performance. In other words, the higher the relational performance generated by either an upstream or a downstream dyad, the greater the overall operational performance yielded by the manufacturer. Interestingly, the network rent, interpreted as the additional effect of the reciprocal effects of relational performance generated by two dyads, is significant in the model at $p < .05$. This finding suggests that network rent actually exists in the examined triads. Therefore, based on the obtained results we argue that the interaction between relational performance of two dyads brings the network rent for the manufacturer sitting on the structural hole. The factor scores for the interaction term, used in the regression analysis to demonstrate the manufacturer's network rent, were then applied to assess the PLS Path Model. The scores formed a single item construct of the network rent (NR).

Assessing the PLS Model

The PLS Path Model consists of the inner model and the outer model. The first model covered constructs and their hypothesized relationships, while the latter one described relationships between latent (unobserved) variables and manifest (observed) items (Tenenhaus et al., 2005). There are four constructs used in the model, namely: upstream relational embeddedness, downstream relational embeddedness, manufacturer relational embeddedness as a higher order factor, and the network rent. As a rule of thumb for the PLS, the sample size should be ten times larger than the largest number of structural paths directed at a particular construct in the inner path model (Chin, 1998). The sample size used in the study is 29, whereas the largest number of structural paths directed at a particular construct in the proposed path model is 1. Therefore, the study meets this criterion of a sample size for the PLS Path Model.

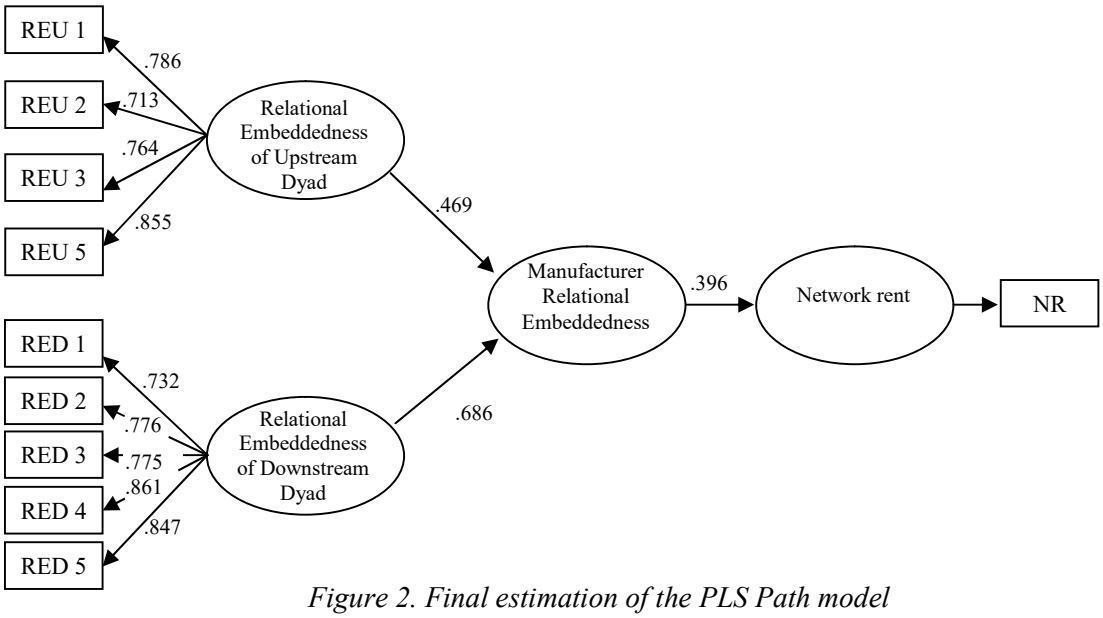

Figure 2. Final estimation of the PLS Path model

In order to assess the PLS Path model, we employed the Repeated Indicators Approach, which is the most popular procedure when estimating higher-order constructs through PLS (Lohmöller, 1989) – Figure 2. This approach is applied when all the measurement relationships are modeled as reflective. In addition, it can also be used when the formative relations from the first-order to second-order latent variables exist (Ciavolini, 2012).

Firstly, to assess the outer PLS model, unidimensionality, reliability and validity were evaluated (Hulland, 1999). The final items of three constructs (the network rent is unidimensional): upstream relational embeddedness, downstream relational embeddedness and manufacturer relational embeddedness, except for one item – ability to perceive a dyadic partner as an important 'team member' in the upstream dyad (REU 4), demonstrated significant factor loadings of above .5. The coefficients of Cronbach's alpha and Composite Reliability estimated for the underlying constructs were close or above the threshold of .7, which is considered to be a satisfactory result (Nunnally and Bernstein, 1994). In addition, the values of average variance extracted (*AVE*) for the constructs exceeded the recommended cutoff of .5, demonstrating convergent validity (Hair et al., 2010). The analysis showed that discriminant validity exists, as the *AVE* for each construct is larger than the squared correlations between this construct and any other construct considered (Fornell and Larcker, 1981). In aggregate, the obtained results suggest acceptable unidimensionality, reliability and validity.

As demonstrated in Figure 2, the inner model showed support for the research hypothesis. Specifically, the model indicated that there was a positive and significant effect of manufacturer structural embeddedness on the network rent (.396; $p < .01$). However, *R*-squared value of .212 does not provide a strong predictive capability of the model (Cohen and Cohen, 1975). It may suggest that, aside from manufacturer relational embeddedness, there are other variables that affect the network rent. Furthermore, an estimation of the inner model suggests that relational embeddedness of the upstream and downstream dyads demonstrated a strong predictive capability of .698 for manufacturer relational embeddedness in the examined triadic supply chains.

Conclusions

The findings of the study show that manufacturer relational embeddedness significantly contributes to the network rent. More specifically, stronger manufacturer embeddedness

determines the increase of network rent. In other words, if the manufacturer sitting on the structural hole uses its position to shape positive relationships in both dyads established with the supplier and the customer (*s-s situation*), then this manufacturer is capable of deriving the highest network rent. Accordingly, in the light of the research findings, weaker relational embeddedness of the manufacturer in the triadic supply chains implies decreasing the network rent.

In line with the structural hole theory, the "ego" perspective rather encourages the manufacturer to use its position to yield profits at the expense of the other two actors in the triadic supply chain (Burt, 1992, Burt, 2002, Zaheer and Bell 2005, Uzzi, 1996). As a consequence, the manufacturer tends to establish balanced (*s-w* or *w-s situations*) or weak (*w-w situation*) relational embeddedness with the supplier and the customer. The novelty of the research is that these combinations may not bring the most benefits for the manufacturer. The preliminary results of this study show that strong relational embeddedness is the most beneficial for the manufacturer. Arguably, however, not only is it advantageous for the manufacturer itself, but it is very likely that strong manufacturer embeddedness also provides substantial profits for the supplier and the customer. This, however, would require changing the research scope from "ego" to "network" perspective. As with any research, we would like to indicate some limitations of the study that need to be addressed. First, there was a self-selection of the manufacturer in choosing its supplier and its customer that participated in the following stages of the research. Though unintentionally, this might distort the findings of the study concerning the network rent. The other selection problem is related to the missing actors of the triadic supply chains who were dropped from the further analysis. They refused to respond the survey, but they might arguably indicate much lesser relational performance with the manufacturer. Finally, the survey may be deemed as too subjective to collect data that are then used for measuring performance impartially.

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