

NETWORK POSITION AND FIRM PERFORMANCE IN WARSAW STOCK EXCHANGE-LISTED COMPANIES

Competitive paper

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Abstract

The fundamental question of management research is to explore the determinants of differences in company performance. These determinants are both exogenous and endogenous. Network literature highlights the importance of external resources available to a firm through its network (Håkansson and Johanson, 1992; Gulati et al., 2000). Networks can be considered in a variety of contexts, including a structural, cognitive, institutional or cultural context (Zukin and DiMaggio, 1990). The main emphasis of our research is on the structural context that either constrains or facilitates the results achieved by firms.

The main objective of the presented research is primarily to test the relationship between the performance of companies and their position within a network. The structural variables that were used to explain the relationship between network effects and organizational-level outcomes were operationalized by positional and structural network measures (Burt, 1992, Freeman, 1977, 1979; Provan, Fish and Sydow, 2007; Zaheer and Bell, 2005). The empirical field of this research were companies listed on the Warsaw Stock Exchange. This dataset consists of nearly 400 companies. The concern in this research was to analyse the corporate networks consisting of boards and ownership ties using the technique of social network analysis (Borgatti and Halgin, 2011). Data were retrieved through the IPG GOLD database and the companies' financial reports.

The approach presented in this research project is largely innovative. A comparatively small number of papers have applied network analysis to the governance and control of organizations (e.g. Conyon and Muldoon, 2008). Existing studies usually concern some aspects of the corporate network, including networks resulting from ownership links (Vitali, Glattfelder and Battiston, 2011; Rotundo and D'Arcangelis, 2010), networks of interlocking directorships (Kogut, Walker 2001), networks of joint projects (Dimitrios, 2010), etc. A combination of different approaches and the analysis of different relationships were applied in this research.

Additionally, this study developed an important strategic variable - the company's position in the network that is created by the relational resources of the specific network members. The optimization of the company's position in the network refers not only to the company's directly observed part of the network but also to its broader context. Johanson and Mattsson (1992) described network position as an actor's interpretation of position as it relates to network identity construction. The results of our research underline the importance of ownerships links and firm's positions in corporate networks in the context of firms' performance and strategic risk.

Keywords: business network, network position, corporate network, social network analysis

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INTRODUCTION

In the era of the network paradigm in management science, there is growing pressure for the application of a network perspective into strategic analysis and business practice. The idea of a network in management has been considered by many authors separately. The concept of the network has been recognized as a new organizational structure, replacing the hierarchical form of a company (Miles and Snow, 1992; Powell, 1990) or as a social phenomenon in itself, which has emerged as a result of the ongoing business activities of independent entities (Möller, Rajala and Svahn, 2005; Borgatti and Foster, 2003). The first approach involves network organizations that are created for specific purposes, with borders and coordinated by a leader. An example of this are extended enterprises (e.g. Dyer, 2000), clusters (e.g., Lin et al., 2012), supply chains (see e.g. Lambert and Cooper, 2000; Giannakis, Doran and Chen, 2012; Green, Whitten and Inman, 2012) and value networks (Möller and Halinen, 1999). The second approach to networks refers to business networks that emerged as a result of the wide economic exchanges between entities conducting business. Economic exchanges are regarded here as embedded in social networks (Granovetter, 1985). In this line of thought, the network cannot be coordinated or managed as a whole and has no limited boundaries.

Public traded companies form complex corporate networks based on ownership links and interlocking directorates. These networks can be seen as “networks of organizations”, defined in the industrial network approach (INA) as self-organizing systems that emerge in a bottom-up fashion from local interaction entities (Möller, Rajala and Svahn, 2005). Corporate networks are considered to be a basis for the flow of information and a way to exchange experiences and management practices. These networks are a meaningful environment of companies’ embeddedness. Within these networks, firms gain access to the information and financial resources they need to survive and develop. This approach to the corporate network is grounded in the resource dependence theory (Pfeiffer and Salancik, 1978) as well as in the social capital theory (Coleman, 1988; Burt, 1992). Each firm occupies a specific position in the resource constellation of a corporate network. This position can be used to analyse the strategic situation of an organization (Salmi, 1996; Ramos and Ford, 2014). Although corporate networks do not concern buyer-seller networks, they do refer to firms’ relational resources. This approach is consistent with the perspective of the business network in the IMP literature.

This paper assumes that a firm’s embeddedness and network position are significant determinants its business results. Corporate networks influence firms’ strategic positions and should be incorporated into strategic management research. While organizational networks have become a well-established subject of strategy research, the study of emergent networks has been underrepresented. Nor does network analysis comprise an integral part of the strategic analysis of firms. A corporate network can be regarded as a mezzo environment of a company and an intermediate level of strategic analysis in relation to macro- and microenvironmental perspectives. This paper proposes an approach to the strategic analysis of corporate networks with using an INA perspective and the technique of social network

analysis (SNA). The main aim of this paper is to explain the relations between the positions of firms in a corporate network and their performance.

In the first part of the paper, the term of a corporate network is introduced in view of the interdisciplinary research literature. The possibility of including the analysis of corporate networks into strategic analysis is discussed. Next, the characteristics of the corporate network built upon the companies listed on the Warsaw Stock Exchange are presented. Most of the studies on interlocking directorates concern the context of developing countries (e.g. Kogut and Walker, 2001; Conyon and Muldoon, 2008). This paper reports the results of a study of interlocking ownerships and interlocking boards of directors in a post-communist country such as Poland. The modern history of the Polish capital market is not very long: it has functioned for barely twenty five years.

In the next section, the possibility of applying the SNA technique in order to identify and analyze a company's position in the corporate network is presented. The section introduces measures developed in the SNA literature, which could be used for this purpose. Then a research hypotheses is proposed that refers to the impact of a company's network position on the performance and variation of financial performance that reflect a company's strategic risk. Regression models with SNA variables were developed that enabled testing the research hypotheses. The results of the study allowed final research conclusions to be drawn.

LITERATURE REVIEW

Corporate networks are a form of social and economic institutions, the structure of which is a source of resources and constraints for the participants in the network (Davis, 1991; Kogut, 2012). They are created, often unconsciously, by investors and boards of directors through business decisions (Ferraro et al., 2012). The structure of corporate networks is determined by the ownership links and relationships of board members in the interfirm environment (Kogut and Walker, 2001). Thus, corporate links can be created either at the level of the owners (interlocking ownership) or at the level of the directors (interlocking directorships). An interlocking directorate refers to the situation in which the same person shares positions on the boards of more than one firm. The board of directors is the prime decision maker today in corporate enterprise and has an important role in the governance of any corporation. Corporate interlocking has brought about a complex web of interconnected firms and directors with important socio-political and economic consequences (Sankar, Asokan and Kumar, 2015).

The architecture of corporate networks is an indicator of the national economy (Kogut and Walker, 2001). It reflects the structure for the regulation of competition and coordinates market exchange (e.g., competitive or cooperative capitalism) (Windolf, 2014). Corporate networks are intrinsically dynamic. Their structure is changing under the influence of such phenomena as liberalization, the globalization of capital, privatization, mergers and acquisitions, crises, etc.

Empirical research on corporate interlocks has a long history in sociology and management. The primary research objective in this paper was to identify the causes of interlock ties. In recent scholarship, the focus has been shifted toward an informational perspective that sees interlocks as a means by which firms reduce uncertainties and share information about effective corporate practices (Borgatti and Foster, 2003).

There are different interpretations of the phenomenon of interlocking. They are formulated within the framework of management and the political and social sciences. Most often three approaches are mentioned. The first refers to the theory of resource dependency, where personal connections are to reduce the uncertainty of access to valuable resources. Uncertainty has been increasing, caused by the deepening of company dependence on external resources (Pfeffer and Salancik, 1978). This approach is related to the management sciences where the phenomenon of interlocking is regarded as a legal instrument for the control of companies. The second perspective, which has its roots in political science, refers to the theory of class hegemony, indicating that personal connections are the result of specific social relations within the elite class (Koening and Gogel, 1981). According to this approach, on the one hand, influential directorates ensure an increase in the company's reputation and good will among stakeholders, on the other hand, the corporate elite seizes considerable power throughout the system. The third interpretation of the concept of corporate networks is derived from the social sciences and refers to the study of social relationships with application of the SNA technique. Irrespective of the research perspective, corporate interlocking has become a characteristic feature of the global economy in recent decades (Kentor and Jang, 2004).

Corporate networks can be considered as business networks. They are not coordinated from the inside and have no boundaries in contrast to the strategic network. Interlocking directorship and ownership can be perceived as a result of the accidental overlapping of business activities. However, it cannot be excluded that corporate links reflect also conscious and intentional activities to establish specific ties between enterprises. This intentional network refers to a network horizon defined as a part of a network perceived by a single firm (Johanson and Mattsson, 1994). Although the firms constitute a corporate network, any single company cannot perceive all connections at the same time. Each firm acts within a certain context of relevant connections that is delimited by its network horizon. Thus, a corporate network cannot be managed or coordinated by any single firm. These network attributes indicate the possibility of linking corporate networks with the business network approach developed in the IMP tradition. However, it is important to accept business networks as not limited to industrial business (such as suppliers, OEMs or distributors), but also considered as a wider phenomenon involving links between different types of actors.

Organizational ties due to board interlocks function as communication channels, enabling the sharing of information between directorates who have access to confidential information. Therefore, these links can be considered as an instrument for the diffusion of information within the network. In particular, the strategic information and cross-organizational knowledge flow allow powerful and influential companies to exercise control

over other companies (Seidel and Westphal, 2004; Haunchild and Beckman, 1998). On the other hand, personal connections and communication can promote coordination between two or more companies to achieve specific common goals. It can also lead to the development of mutual trust and commitment in the competitive corporate world.

POLISH CORPORATE NETWORKS

The context for our research is the publicly traded firms in the Polish economy. The Warsaw Stock Exchange (WSE) was created in 1991 after the overthrow of Poland's former communist regime in 1989. Its first trading session was held with just five listed companies, all of which were formerly State-owned companies that had been privatized. In 1999, Poland reformed its pension system, which contributed to an increase in domestic institutional investment, and in 2004 it joined the EU. These developments helped to boost trading volume in subsequent years. The WSE created the NewConnect exchange-regulated market for small and medium-size enterprises in 2007, and launched the Catalyst bond market, creating a platform for trading corporate, mortgage-backed, treasury and municipal bonds in 2009. The WSE has become one of Europe's most dynamic IPO markets with 387 companies, including 46 foreign companies, listed on its Main Market, and 418 companies listed on NewConnect as at April 14, 2016 (<https://www.gpw.pl>).

Polish corporate governance represents continental European governance arrangements in which dual boards (executive and supervisory boards) and concentrated block holders are more common¹. Additionally, in Poland there is no legal restriction regarding the number of interlocking directorships (Pawlak, 2008).

CORPORATE NETWORK AND SNA

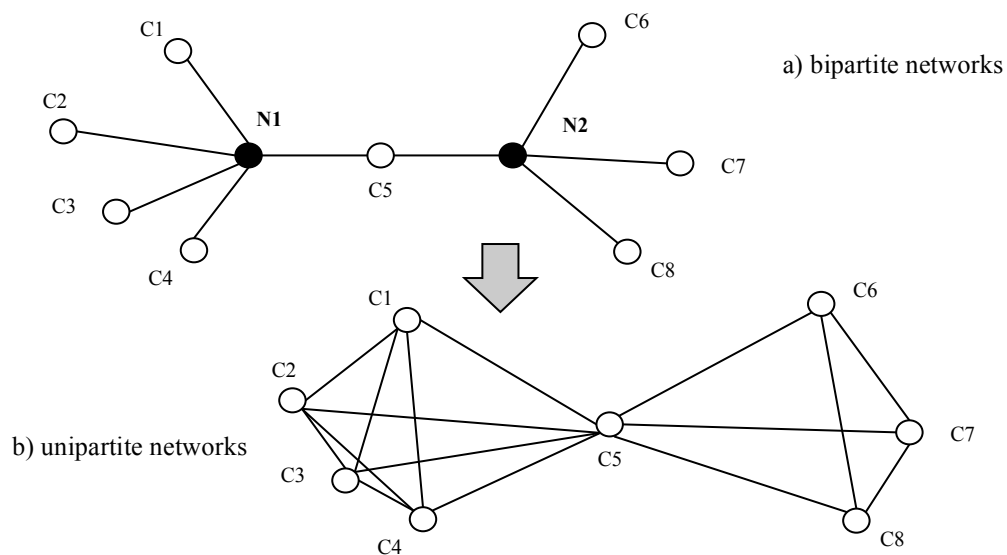
The main components of any social network are actors (or nodes) and relations. Their combination constitutes a social network. The actors represent entities at various levels of collectivity, such as individuals, firms, countries, and so on. The ties among actors can be of many different types (e.g., friendship, competition) and can be characterized along multiple dimensions, such as duration, frequency and the like (Borgatti and Li, 2009). Through ties of shared ownerships and interlocking directorates, corporations are tied together in a fabric of social network. Corporate ties can be studied by using databases to apply the tools and techniques of structural analysis. The data are collected in the form of bipartite networks with two types of nodes: public traded companies and directorates or public trade companies and their shareholders respectively. These networks, called also affiliation networks, assign members of the supervisory and executive boards or ownerships to the companies. The inter-organizational networks can be constructed by converting the bipartite networks into the unipartite networks that directly represent links among companies due to common board members or shareholders (Fig. 1). This transformation is useful in analyzing hidden links

¹ Continental European corporate governance differs from the Anglo-Saxon model where ownership is diffuse with each shareholder typically owning a small fraction of the firm's common equity (Conyon and Muldon 2008).

among actors of the same type, which would otherwise be undetectable in the complexity of the network.

The corporate network research in recent decades has turned increasingly to the SNA technique. There have been quite a number of studies on corporate networks. There are generally two approaches to corporate networks in management. The first refers to the processes that determine network structure and characteristics of the network as a whole. In this stream, there are studies on small world phenomenon in ownership and control interfirm networks (e.g. Kogut and Walker, 2001; Davis et al., 2003; Sankowska and Siudak, 2016). Small world corporate networks facilitate rapid information diffusion given the short average path length, and this property also operates in sparse networks (Ferraro et al., 2012). Moreover, despite the pressure of globalization, which can change ownership cross-holdings among companies, corporate networks retain their small-world properties (Kogut and Walker, 2001; Uzzi et al., 2007). Many researchers demonstrate the small-world properties of national or regional corporate networks (e.g., Sankar, Asokan and Kumar, 2015; Windof, 2014).

However, small world measures are not sufficient to explain microbehavior at the company level. Therefore, another stream of research has been developed recently. This approach refers to the mechanism and process that interact with network structures to yield certain outcomes for individual companies. It is about the consequences of network variables. In this research stream, the effects of interlocking on a firm's position and innovativeness (e.g. Zaheer and Bell, 2005; Haunschild and Beckman, 1998; Gulati and Westphal, 1999;) have been studied.



$C_1, \dots, C_N$ – companies

N_1, N_2 – directors or shareholders

Figure 1. Transformation of a bipartite network into direct interorganizational links within a corporate network

In this paper, the latter approach is used in which the consequences of network structure regarding the firms' level of analysis are explored. This perspective resembles the concept of analysis of the company position in the industry (Porter, 1990), but it differs substantially in terms of both methods of analysis and its purpose. The aim of the analysis of the company position in the corporate network is to determine the degree of separation from a privileged position in the enterprise networks, which facilitate access to more diversity and faster information resources in relation to other companies.

RESEARCH HYPOTHESES

Network position and performance

Each actor occupies a specific position in the activity pattern, web of actors, and resource constellation of a network, depending on the portfolio of relationship help by each actor (Håkansson and Johanson, 1992). Network position is a concept increasingly studied in the literature (e.g., Purchase et al., 2015; van Rijnsoever et al., 2015; Schepis, Purchase and Ellis, 2014). In the management literature, social networks are used particularly to explain the innovative performance of firms (e.g. Ahuja, 2000). These studies highlight that strategic network positions of actors induce new combinations of knowledge or resources that lead to new innovation (Ozman, 2009). Position can therefore be used to analyze the strategic situation of an organization as well as eventual opportunities or constraints for future strategic activities (Ramos and Ford, 2014).

Network literature highlights the importance of external resources available to the firm through its network (Gulati, Nohira, and Zaheer, 2000). Diverse knowledge is the most valuable resources acquired through networks of interfirm ties. A firm's competitive position is increasingly based on the existence of networks where exchange of codified and tacit knowledge occurs. Access to such resources influences firm performance. Social capital theory offers a theoretical approach to explain how individuals, groups, and organizations manage relationships and access knowledge resources. The structural dimension of social capital has stimulated debate regarding the optimal network configuration to achieve innovation (Filieri et al., 2014). Thus, the embeddedness of firms in networks of external ties with other entities (persons or institutions) has significant implications for firm performance (Zaheer, and Bell, 2005; Gulati, Nohria and Zaheer, 2000). Firms with superior network positions may be better able to exploit their internal capabilities to enhance their performance.

However, the concept of a privileged position in the network is not clear. It arises from the competing theoretical bases to explain the most favourable locations of the entity in the network. Two alternative ideas find their source in the theories of social capital: the theory of strong ties (Coleman, 1988) and the strength of weak ties theory (Granovetter, 1973, 1985). According to the first theory, the advantaged position of the entity in the network is due to a number of strong ties, ensuring trust, lower transaction costs and increasing willingness of partners in such ties to make specific investments in relationships. According to this approach, having more ties implies having more information. This also

leads to the conclusion that actors that are connected to well-connected actors will have even more information than entities that are connected to an equal number of less connected others (Li and Borgatti, 2009). Strong corporate relationships enable companies to improve their performance in many cases. In particular, the profits earned by a company show a direct and positive correlation with the number of links (Haunschild and Beckman, 1998). In a business environment with greater uncertainty, companies with a larger number of links show better results measured by sales growth and return on equity (ROE) (Nicholson et al., 2004).

The second theory suggests the danger of closing of the entity in the networks of strong ties by restricting access to new unique information resources. According to this approach, the success of an individual is determined by maintaining loose distant ties and a relatively moderate number of strong ties. The advantage is to a great degree decided by access to unique and rare knowledge resources in relation to the knowledge acquired by other entities in the network (Granovetter 1973, 1985). This theory is strengthened by the concept of structural holes (Burt, 1992), according to which the advantaged position in a network is taken by the individual, who acts as an intermediary between unrelated parties. The entity that bridges the structural hole uses this situation in two ways: it has access to rare information (because it is inaccessible to all) and has the ability to control the flow of such information within the web. The concept of structural vulnerability and the importance of loose ties stress the importance of not redundancy relations (Burt, 1992). Increasing the number of connections without increasing their diversity cannot provide access to important information resources. Keeping numerous but counterproductive contacts limits access to unique knowledge resources and also incurs excessive costs of maintaining these relationships. Empirical studies provide considerable justification for the theory of the strength of weak ties (Zaheer and Bell, 2005; McEvily, and Zaheer, 1999).

Considering both research streams within social capital theory we define the advantaged network position as a firm's placement within an interfirm network that provides it with rapid access to non-redundant information. Consistent with this definition, the following two appropriate hypothesizes can be formulated:

Hypothesis 1. Firms with a position providing rapid access to information achieve better performance.

Hypothesis 2. Firms with a position providing access to non-redundant information achieve better performance.

Network position and strategic risk

A more advantaged position of a firm in the network provides greater access to information resources of the network and thus allows reduction of environmental uncertainty (Pfeiffer and Salancik, 1978). Uncertainty is defined as a lack of knowledge of future conditions in an organization's environment that results from the complexity and rapidity of change (Buschko, 1994, p. 410) Uncertainty plays a crucial role in the implementation of strategic initiatives. Strategic uncertainty and strategic risk have been considered by most scholars in strategic management research as the instability of company's performance

(Miller, and Bromiley, 1990). Therefore, it would seem that the better a company's position in the network and accessibility of information the less volatility of returns a company will experience. Based on this argument the two following hypotheses can be formulated:

Hypothesis 3. Firms with positions providing rapid access to information have lower strategic risk measured by variability of performance.

Hypothesis 4. Firms with positions providing access to non-redundant information have lower strategic risk measured by variability of performance.

Firm performance and strategic risk

The relationship between profit and risk has been a subject of interest in many disciplines for many years. The financial approach usually presents a positive relationship between both variables. However, in the 1980s, seminal research by Bowman (1980) undermined a positive risk–return relationship and indicated a negative correlation between the results achieved by companies and the strategic risk taken by them. These findings opened a heated discussion around the so-called Bowman paradox. Today, there are many interpretations of this phenomenon, but still scholars are divided as to the actual relationship between firm performance and risk. Explanation of this phenomenon has been sought primarily in behavioral theories, such as prospect theory (Kahneman, and Tversky, 1979) and behavioral theory of a firm (Cyert and March, 1963) where strategic risk is interlinked with managerial risk.

This study is in line with the Bowman paradox and assumes negative correlation risk–return relationships. Thus, the hypothesis is put forward that higher strategic risk in a firm is associated with the firm's lower average performance.

Hypothesis 5. Firms with higher strategic risk achieve lower performance.

RESEARCH METHODS

Sample and procedure

This paper analyses the phenomenon of interlocking directorates and common ownership in the Polish corporate sector. The relevant data for analysis consist of 3,064 directors affiliated with the boards of 387 companies listed by the WSE on the Main Market. The data was retrieved through the IPG GOLD database, companies' financial reports and the official portal of the WSE in February, 2016. Extensive manual and electronic procedures were used to ensure the quality of the data. Finally, interlocking and non-interlocking directors were separated from this cleaned data. Out of the 387 companies, 223 are interlocked. Likewise, companies with shared ownership were identified. Out of the 387 companies 238 have interlocking ownership. It should be noted that under Polish corporate law, ownership stakes exceeding 5% are reported and can be observed by the researcher. We therefore list all owners with share stakes exceeding this critical threshold. The number of reported shareholders of 378 companies was 1278, with 149 majority shareholders (an entity that owns more than 50% of a company's outstanding shares). Thus, about 39% of the

companies have majority shareholders. It should be noted that the average size of share ownership by leading shareholders is nearly 13%. This data is consistent with the continental European model in which ownership is concentrated.

Among all directors in 387 companies, 16,967 were members of supervisory boards and 1,079 represented executive boards. The average size of a supervisory board was 5.1 members and the same indicator for an executive board was 2.8 (cf. Pawlak, 2008). Only 10% of board members are nonresident foreign citizens (people who do not possess a PESEL number i.e., the Polish personal identification number).

We measured directory ties and interfirm ownership in separate matrixes.

Measures

Independent variables

Performance

The primary dependent variable was firm performance. In this study, the performance indicator was assessed by the average return on assets (ROA) of each company during the previous five years. Return on assets was computed as the income (or loss) before extraordinary items and other adjustments, divided by average total assets. Lag performance was not used, because the corporate network (members of boards and ownership structure) is relatively stable and it can be assumed that current positions support existing performance.

Strategic risk

Risk has typically been operationalized in the strategy literature as the variability of a given performance measure during a certain time period, e.g., the standard deviation of firm ROA or ROE during the previous five years (Bowman, 1980), stock price volatility, and ex-ant measures of the predictability of accounting performance (e.g., analyst forecast deviation, Bromiley, 1991).

In this study, strategic risk was computed as the standard deviation of the return on assets (ROA) during the previous five years. This is a standard variable in the literature examining the Bowman paradox.

Dependent variables

Positions with access to fast information

The network position of companies can be assessed through several SNA measures. The primary one is centrality measures used to quantify the degree of connectivity of nodes in the network (Freeman 1977, 1979). Among the various measures of centrality, *closeness centrality* was used that takes into account the distance of each node from each other in the network. Therefore, the greater the value of closeness centrality is, the shorter its total distance to all other nodes in the network is. This measure can be used to estimate the time

flow of information between a node and the others. *Closeness centrality* is strongly correlated with other centrality measures such as *degree centrality*, counting the number of direct ties that each firm possesses. We computed *closeness centrality* following Freeman's (1979) definition in the UCINET software package (Borgatti, Everett and Freeman, 1992).

Positions with access to non-redundant information

The most frequently used measure of structural holes is called constraint. It measures the extent to which a firm is both directly and indirectly invested in specific others (Borgatti and Li, 2009). According to Burt, network constraint effectively measures a firm's lack of access to structural holes (Burt, 1992). Thus, a high constraint score means low structural holes. We assessed the presence or absence of structural holes in the network of ties among companies and among directorates separately (cf. Zaheer and Bell, 2005). We applied calculation of the structural holes indicator as was done by Zahher and Bell (2005). We introduced to our models the structural holes variable as one minus the firm's constraint score (in cases where the score was not zero) and retain zero for all other cases.

Control variables

The analysis included *industry sectors*, *country of firm headquarters* and *affiliation to a big network conglomerate* as control variables. *Industry sectors* were measured by an item indicating one of twenty seven industries represented by publicly traded companies on the Main Market of the Polish stock exchange. We also controlled for the effect of *country of firm headquarters* measured by dummy variable (0 – Poland; 1 – foreign firm headquarters). In addition, dummy variables were used for *affiliation to a big network conglomerate* (0- no affiliation; 1 – affiliation). No hypothesis was developed for these incorporated control variables.

RESULTS

The GLS regression on ROE and strategic risk was analyzed by using SPSS. Table 1 present a correlation matrix and descriptive statistics for our variables.

Table 1. Means, standard deviations and correlation

	Mean	SD	Performance	Strategic risk	Industry	Country	Affiliation	Closeness centrality (directorships)	Structural holes (directorships)	Closeness centrality (ownerships)	Structural holes (ownerships)
Performance	1.68	12.05	1.00								
Strategic risk	7.23	12.41	-0.728**	1.00							
Industry	n/a	n/a	0.07	0.03	1.00						
Country	n/a	n/a	-0.03	0.10	0.06	1.00					
Affiliation	n/a	n/a	0.04	-0.05	-0.05	0.418*	1.00				
Closeness centrality (directorships)	0.21	0.04	0.09	-0.170*	-0.05	-0.04	-0.09	1.00			
Structural holes (directorships)	0.30	0.31	0.05	-0.06	-0.05	0.06	0.605**	0.704**	1.00		
Closeness centrality (ownerships)	0.49	0.11	0.228**	-0.297**	0.03	0.04	0.09	0.201**	0.181**	1.00	
Structural holes (ownerships)	0.21	0.30	0.137*	-0.300**	-0.02	0.01	0.04	0.11	0.09	0.791**	1.00

* p < 0.05; ** p < 0.01

Table 2 and Table 3 present the results of the regression analyses testing the hypothesized relationships between network structural variables and firm performance and strategic risk.

Table 2. Multiple Regression Results for Firm Performance

Predictors	Coefficients ^a (t-value)	Hypothesis supported ?
Closeness centrality (directorships)	0.01 (0.06)	H1a: No
Structural holes (directorships)	0.03 (-0.25)	H2a: No
Closeness centrality (ownerships)	0.33 (2.74)**	H1b: Yes
Structural holes (ownerships)	0.24 (2.04)*	H2b: Yes
Strategic risk	-0.36 (-4.88)**	H5: Yes
Control variables		
Industry	0.13 (1.91)*	
Country	-0.06 (-0.55)	
Affiliation	0.20 (0.28)	
R ²	0.21	
Adjusted R ²	0.17	
F-value	5.99**	

^a standardized coefficients (•)

*.p < 0.05; **.p < 0.01

Table 3. Multiple Regression Results for Strategic Risk

Predictors	Coefficients ^a (t-value)	Hypothesis supported ?
Closeness centrality (directorships)	0.01 (0.04)	H3a: No
Structural holes (directorships)	-0.06 (0.56)	H4a: No
Closeness centrality (ownerships)	-0.16 (-1.31)*	H3b: Yes
Structural holes (ownerships)	-0.22 (1.81)**	H4b: Yes
Control variables		
Industry	0.00 (-0.01)	
Country	-0.03 (-0.37)	
Affiliation	0.11 (1.50)	
R ²	0.13	
Adjusted R ²	0.10	
F-value	3.597**	

^a standardized coefficients (•)

* p < 0.05; ** p < 0.01

The adjusted R² for both models is significant, explaining in the case of Model 1 (see Table 2) 17 percent of the variance of firm performance. Model 2 (see Table 3) explains 10 percent of the variance of strategic risk. Hypotheses 1 to 4 were tested by applying network variables computed on the basis the directorship ties and ownership links. Thus, double network variables (closeness centrality and structural hole) were incorporated in the models. These hypotheses were recognized as completely supported if both pairs of network variables were significantly related to independent variables, i.e., firm performance and strategic risk.

Partial support was found for Hypothesis 1, which examined the effects of firm network positions with rapid access to information (measured by closeness centrality) on firm performance. The standardized coefficient for closeness centrality for ownership interlocking is positive and significant ($\beta = 0.33$; $p < 0.01$). However, the closeness centrality in the case of directorship interlocking is not significant ($\beta = 0.01$; ns). Therefore, the influence of privileged network position due to the availability of fast information on firm performance exists only in the interfirm network considering common ownerships. Similar results were obtained for Hypotheses 2, that is supported by the network variable for ownership ties ($\beta = 0.24$; $p < 0.05$) but it is not supported in the case of directorship interlocking ($\beta = 0.03$; ns). Hypothesis 2 refers to the influence of network positions considering the structural hole on firm performance. The results show that this relationship exists solely in ownership networks.

Hypotheses 3 and 4 argued for a negative relationship between the centrality closeness and structural holes in both networks on strategic risk measured by average variability of firm performance. These hypotheses are supported partially because of the non-significant relationships between network variables calculated on the basis of the directorship ties (respectively $\beta = 0.01$; ns and $\beta = -0.06$; ns). However the expected relationships in both hypotheses are supported in interfirm networks based on the ownership ties (respectively $\beta = 0.16$; $p < 0.05$ and $\beta = -0.22$; $p < 0.01$).

Hypothesis 5, which hypothesized a negative relationship between strategic risk and firm performance was supported ($\beta = -0.36$; $p < 0.01$). Firms with greater variability of financial performance achieve better average returns.

Examining the regression coefficients for the control variables, positive relationships are found between industry and firm performance ($\beta = 0.13$; $p < 0.05$) (see Table 2). Standardized coefficients for other control variables turned out to be non-significant.

DISCUSSION

More and more researchers have positively tested the hypotheses which predicted the strategic consequences of network position in terms of a firm innovativeness (e.g., Ouimet et al., 2004) or a firm's better performance (e.g., Powell et al., 1999; Zaheer and Bell, 2005). The overall results of this study are consistent with this research direction. The main finding in this paper is that the interfirm network position of a company, defined as a firm's placement within an interfirm network that provides it rapid access to non-redundant information, impact on firm performance and strategic risk. Both the fast access to information as well as the access to non-redundant information were associated with the firms' financial returns. The idea of including the analysis of network position to strategic analysis of the company seems to be justified and necessary.

However, the predicted findings are limited to only one type of corporate network i.e. a network based on ownership interlocking. Support for the network created by directorate ties was not found. The explanation for this may be the relatively sparse network of personal connections between public traded companies on the Warsaw Stock Exchange. This study focused on personal links limited only to public traded companies. We excluded cases in which directors of two different companies listed on the WSE sit together on the boards of directors in a third company which is not listed on the WSE. Extension of the dataset of the links of directors and of the empirical analysis to second-degree connections of directorates is planned in future research. It is expected that more ties between public traded companies will be discovered in the broadened network horizon.

It should be also recalled that the Polish corporate model corresponds to the continental European governance arrangements, in which a relatively high concentration of ownership is more common. This may indicate that the ownership links are more decisive and have more significance than connections among directors when considering information transfer. However, this question requires future study, in particular comparative research in different countries.

As was predicted, negative relationships between firm performance and strategic risk were found. The findings therefore support the Bowman paradox (1980). This is in line with the expectation that network variables such as *closeness centrality* and *structural holes* impact on performance and strategic risk in opposite directions. More advantaged network positions allow firms to experience more stability and lower risk.

LIMITATIONS AND IMPLICATIONS

This study argues that it is important to consider corporate networks as an environment of firm embeddedness. It shows that network structures matter in explaining firm performance. Firms with superior access to information resources are better able to exploit their internal capabilities to enhance their performance.

This study has some limitations that suggest a number of directions for future research. First, while the intention has been to explore direct relationships between structural variables and business performance, there are many factors, both exogenous and endogenous, which mediate these relationships. Future research could develop a broader range of independent factors significant to the analysis of network positions. Although network scholars tend to focus their attention on the value of the network structure, without considering the internal capabilities of the actors, it should be underscored that companies with poor competence and capabilities may not be able to use network benefits efficiently. Thus, network analysis should be more integrated with strategic analysis. Future research could include factors representing of all the levels of strategic analysis: the firm, the microenvironment, the network level (i.e. mezzoenvironment) and the macroenvironment. Cross-level research could open discussion about the relative role of each level in the system of determinants of firm performance.

Current research concerning the examination of company position in a network tends to the analogy of the research of firm industry position that was conducted in strategy research decades ago (Porter, 1980). Considering these historical dimensions, we suppose that network analysis in the context of strategy research is at the initial stage. Another further direction of research should lead to integration of the analysis of corporate networks to business practice as a standard part of strategic analysis.

In this study, a limited number of network variables were used. The discussion about determining network positions thorough the SNA technique in the context of corporate network and strategy research has not been concluded. A clear and relevant set of structural variables, which would be helpful in assessing network positions, should be produced in future research.

This research explored strategic risk as well. A rather traditional approach was applied to measure this factor. Thus, in future research more sophisticated tools for the measurement of strategic risk should be developed and tested (see Ruefli, Collin and Lacugna, 1999).

Future research should also consider the case of sparse corporate networks due to ownership concentration. As mentioned above, a comparison of the impact of network variables that determine the network position of companies in the context of different governance models should provide valuable findings.

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