

**Justyna Światowiec-Szczepańska,
Michał Zdziarski**

**Position in Comparative Network,
Performance and Strategic Risks**

Problemy Zarządzania 14/4 (2), 157-176

2016

Artykuł został opracowany do udostępnienia w internecie przez Muzeum Historii Polski w ramach prac podejmowanych na rzecz zapewnienia otwartego, powszechnego i trwałego dostępu do polskiego dorobku naukowego i kulturalnego. Artykuł jest umieszczony w kolekcji cyfrowej bazhum.muzhp.pl, gromadzącej zawartość polskich czasopism humanistycznych i społecznych.

Tekst jest udostępniony do wykorzystania w ramach dozwolonego użytku.

Position in Corporate Network, Performance and Strategic Risks¹

Submitted: 19.09.16 | Accepted: 15.12.16

Justyna Świątowiec-Szczepańska*, Michał Zdziarski**

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 access to external resources available to a firm through its network. 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 empirical field of this research covered companies listed on the Warsaw Stock Exchange. We test effects of structural positions in two networks among the same set of companies linked by boards and ownership ties. Social network analysis (SNA) methods were used to determine positional characteristics of firms. The results of our research underline the importance of ownership links and firms' positions in corporate networks for firms' performance and strategic risk.

Keywords: corporate network, network position, social network analysis, performance risk.

Pozycja w sieci firm a wyniki i ryzyko strategiczne¹

Nadestany: 19.09.16 | Zaakceptowany do druku: 15.12.16

Pytanie o czynniki warunkujące wyniki firm jest kluczowe w teorii nauk o zarządzaniu. Determinanty wyników mają charakter zarówno egzogeniczny, jak i endogeniczny. Literatura nurtu sieciowego podkreśla znaczenie dostępu do zewnętrznych zasobów dostępnych dla firm poprzez ich uczestnictwo w sieci. Głównym celem prezentowanych badań jest testowanie zależności między pozycją firm w sieci a wynikami. Badanie zostało przeprowadzone na populacji firm, których akcje są notowane na Giełdzie Papierów Wartościowych w Warszawie. Autorzy testowali zależności między pozycją strukturalną a wynikami w dwóch sieciach, w których uczestniczy ten sam zestaw firm: sieci współwłasności i sieci relacji w radach nadzorczych. W celu określenia pozycji strukturalnej firm w sieciach wykorzystano metody analizy sieci społecznych (SNA). Rezultaty wskazują na znaczenie sieci współwłasności i pozycji, jakie zajmują w nich firmy, dla wyników i ryzyka.

Słowa kluczowe: sieci firm, pozycja sieciowa, analiza sieci społecznych, wyniki, ryzyko.

JEL: L14

* **Justyna Świątowiec-Szczepańska** – Ph.D., UEP (Poznan University of Economics and Business) Professor; ORCID: <http://orcid.org/0000-0002-4112-7695>.

** **Michał Zdziarski** – Ph.D., University of Warsaw, Faculty of Management; ORCID: <http://orcid.org/0000-0002-5911-0090>.

Correspondence address: Poznań University of Economics and Business, al. Niepodległości 10, 61-875 Poznań; e-mail: justyna.swiatowiec-szczepanska@ue.poznan.pl; University of Warsaw, Faculty of Management, ul. Szturmowa 1/3, 02-567 Warszawa; e-mail: m.zdziarski@uw.edu.pl.



1. Introduction

We observe increasing applications of a network perspective in organizational science, strategic analysis and managerial practice (Batorski and Zdziarski, 2009; Niemczyk, Stańczyk-Hugiet, and Jasiński, 2012; Kawa, 2014). Networks are enduring social structures in which economic entities and processes are embedded (Granovetter, 1985). The network perspective breaks with the atomistic tradition that dominated management theory and research in past decades (Czakon, 2012). The central argument of the network perspective in organizational science is that relationships matter for results achieved at different levels of analysis: that of individual firms embedded in a network, dyads of firms such as alliances, groups of firms and the overall ecosystems. In this paper, we take the firm level of analysis into account and inquire into the relationship between network positions and results.

Networks facilitate the flow of information, access to resources and adoption of new management practices. They constitute a meaningful environment of companies' strategic actions which is not anonymous and external, but related to and built of identifiable entities. Strategic importance of networks 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 business network which constrains its access. This position can be used to analyze the strategic situation of an organization versus other partners that are present in a network (Salmi, 1996; Ramos and Ford, 2014).

The concept of a network organization has been proposed as a new organizational form, increasingly replacing the hierarchical coordination within companies as well as market transactions (Powell, 1990; Wiatrak, 2003). Among examples of network organizations that were studied in the management field are extended enterprises (e.g., Dyer, 2000), clusters (e.g., Lin et al., 2012), supply chains (Green, Whitten, and Inman, 2012) and value networks (Möller and Halinen, 1999). These network organizations are created for specific purposes, with clear-cut borders and identifiable, central leaders that coordinate activities within the organizational form. In business reality, many networks have neither clear boundaries nor strict leadership that is accountable for purposeful creation of a network. We further refer to these emerging structures as business or corporate networks. They are an emergent social phenomenon resulting from the ongoing business activities and exchanges among relatively independent entities, rather than purposeful human creations of new organizational forms (Möller, Rajala, and Svahn, 2005). These business networks emerge as a result of economic, information and resource exchanges among entities embedded in a social structure that both creates strategic opportunities and constrains its members (Granovetter, 1985). Among interesting examples of business

networks are those created by ownership and interlocking-directorate links among firms. 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 (Möller, Rajala, and Svahn, 2005).

Several researchers aimed to verify the relationship between interlocking-directorate and ownership networks and financial performance. Theoretical motivation to expect such a relationship include: reduced cost of information exchange, access to key resources, boundary spanning, optimization of control processes, possibility of joint lobbying, increased legitimacy and faster diffusion of innovations (Zdziarski and Czarniawska, 2016). Surprisingly, research on relationships among network positions and results brought mixed findings, with only some studies confirming this intuitive relationship (Mizruchi, 1996). That research was conducted mostly in developed countries, with the majority of research conducted in the American and Canadian context with one-tier boards. We decided to verify the relationships among the position in ownership and interlocking-directorate networks and results in a new context. We selected a sample of Polish firms which were listed on the Warsaw Stock Exchange. The modern history of the Polish capital market comprises barely twenty-five years. This paper reports the results of a study of interlocking ownerships and interlocking directorates in the empirical context of a post-communist country with a short institutional history of the capital market and a so-called continental corporate governance system based on a two-tier board structure.

The paper is organized as follows: 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 in strategic analysis is discussed. Next, the characteristics of corporate networks among companies listed on the Warsaw Stock Exchange are presented. 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, research hypotheses are proposed that refer to the impact of a company’s network position on the performance and variation of financial performance that reflects a company’s strategic risk. Regression models with SNA positional variables were developed that enabled testing the research hypotheses. Finally, we present conclusions based on results of the study.

2. 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 (Mizruchi, 1996). The board of directors is the prime decision maker in a corporate enterprise and has an important role in the governance and strategy 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, globalization of capital, privatization, mergers and acquisitions, crises, regulatory changes, individual actions of directors, etc.

There are different interpretations of the phenomenon of interlocking. They are formulated within the fields of management, political and social sciences. Most often two approaches are mentioned. The first is grounded in the resource dependence theory, where personal connections serve as a means to reduce the uncertainty of access to valuable resources under control of the environment of an organization. Uncertainty increases with company dependence on external resources, and therefore managers act to reduce the dependence on external forces (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 (Koenig and Gogel, 1981). According to this approach, on the one hand, influential directors 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. Irrespective of the research perspective, corporate interlocking is present across different political and market systems in the global economy (Kentor and Jang, 2004; Heemskerck and Takes, 2016).

Interlocking directorship and ownership can be perceived as a result of mixture in the accidental overlapping of business activities and purposeful strategic behaviour of owners and individual directors. Organizational ties due to board interlocks function as communication channels, enabling the sharing of information between directorates that have access to confidential

information. Therefore, these links can be considered as an instrument for the diffusion of information within the network. In particular, strategic information and cross-organizational knowledge flows 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.

3. 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 the trading volume in subsequent years. The WSE created the New-Connect 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. In July 2010, the WSE entered into the Master Agreement with NYSE Euronext to establish a framework for their strategic cooperation. In recent years, the WSE has become one of Europe's most dynamic IPO markets with 471 companies, including 51 foreign companies, listed on its Main Market, and 431 companies listed on NewConnect as at December 31, 2014 (Polish Market Online, 2012). Polish corporate governance represents continental European governance arrangements in which dual boards (executive and supervisory boards) and concentrated block holders are more common². Additionally, in Poland there is no legal restriction regarding the number of interlocking directorships (Pawlak, 2008).

4. Corporate Network and SNA

The main components of any social network are a set of actors (or nodes) linked by a set of relations. 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 ownership and interlocking directorates, corporations are tied together in social networks. 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: publicly traded companies and directorates or publicly traded companies and their shareholders, respectively. These networks, also called affiliation networks, assign members of the supervisory and executive boards or owners to companies. Inter-organizational networks can be constructed by converting bipartite networks into unipartite networks that directly represent links among companies due to common board members or shareholders and links of board members who serve on the board of the same company (Fig. 1).

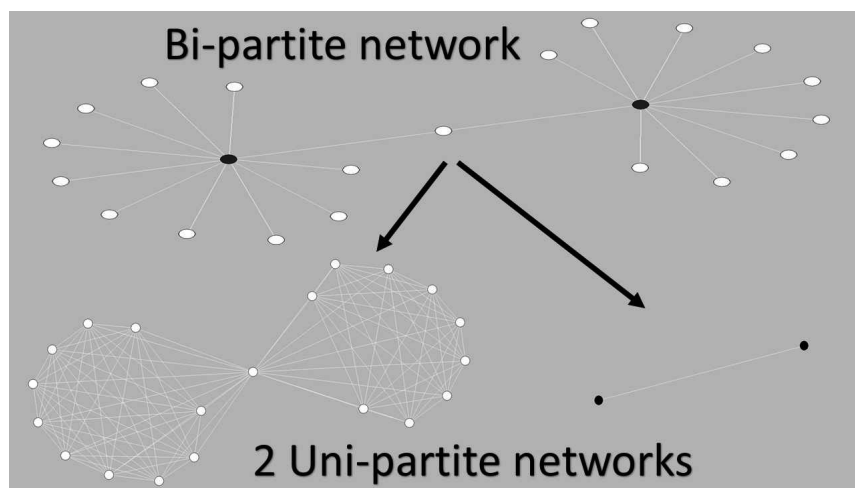


Fig. 1. Transformation of a bipartite network into two uni-partite networks. Black nodes: companies. White nodes: directors. Source: the authors' own work.

The corporate network research in recent decades has increasingly applied techniques of social network analysis (SNA) developed in sociology, physics, and computational science (Wasserman and Faust, 1994). 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 the 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 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 looked at processes and consequences of interlocking-directorate and ownership networks (e.g., Davis, 1996; Mizruchi, 1996; Zaheer and Bell, 2005; Haunschild and Beckman, 1998; Gulati and Westphal, 1999). We follow this stream of research in our paper, 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 a corporate network is to determine the degree of separation from a privileged position in enterprise networks; such a position facilitates faster access to more diversified information resources, compared to other companies. Earlier research on interlocking-directorate networks in Poland (Zdziarski, 2012a; Zdziarski, 2012b; Sankowska and Siudak, 2016) and ownership networks in Poland (Trzaska, 2015) looked at structural properties of networks, but not at their effects.

5. Research Hypotheses

5.1. 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 relationships held 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 to explain 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 innovation (Ozman, 2009). Position can therefore be used to analyze the strategic situation of an organization as well as potential 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 resource 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. The 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 the 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 competing theoretical bases to explain the most favorable 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, an 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 the entity in 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 an 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 not accessible 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 non-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 the social capital theory, we define an advantaged network position as a firm's placement within an interfirm network that provides it with rapid and privileged access to non-redundant information that can be located in the network treated as a reservoir of information. Consistent with this definition, the following two hypotheses were 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.*

5.2. 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). Organizations constantly seek ways and mechanism to reduce uncertainty. 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 performance (Miller and Bromiley, 1990). This approach to risk measurement through instability has been used in a reach stream of research on Bowman's Risk-Return Paradox (e.g., Bowman, 1980; Fiegenbaum and Thomas, 1986; Miller and Chen, 2004). The level of risk faced by an organization is partially the product of managerial decisions (Palmer and Wiseman, 1999). Therefore, it would seem that the better a company's position in the network and managers' accessibility of information, the less volatility of returns the company will experience. Galbraith (1973) defined uncertainty as the gap between the amount of information that an organization possesses and the amount of information required for a given level of performance. Reducing this gap leads to better decisions, and subsequently to higher and more stable company performance. 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 the variability of performance.*
- Hypothesis 4. *Firms with positions providing access to non-redundant information have lower strategic risk measured by the variability of performance.*

6. Research Methods

6.1. 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 1,278, 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 held 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, 1,696 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. 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 matrices.

6.2. Measures

6.2.1. Independent variables

Performance. The primary dependent variable was firm performance. Return on equity (ROE) and return on assets (ROA) are two common accounting-based measures of performance. Both measures are highly correlated. Furthermore, both have been used to compute highly correlated accounting-based risk measures in previous strategy research (Miller and Bromiley, 1990). This study uses average ROA over the five-year period as the return measure (Miller and Leiblein, 1996; Maurer, 2008). ROA does not vary with changes in financial leverage, whereas ROE does. 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. Researchers in the area of strategic management have typically defined risk as unpredictability of business outcome variables. It has typically been operationalized as the variability of accounting or stock returns 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 (Aaker and Jacobson, 1987), and ex-ante 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 return on assets (ROA) during the previous five years. This is a standard variable in the literature examining the association between risk and return (e.g. Miller and Chen, 2004; Andersen and Bettis, 2015).

6.2.2. Dependent variables

Positions with access to fast information. The network position of companies can be assessed through several SNA measures. The primary ones are 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 retained zero for all other cases.

6.2.3. 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 a 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.

7. Results

We analyzed GLS regression on ROE and strategic risk by using SPSS. In Tab. 1, we present a correlation matrix and descriptive statistics for our variables.

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

The adjusted R^2 for both models is significant, explaining in the case of Model 1 (see Tab. 2) 17 percent of the variance of firm performance. Model 2 (see Tab. 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 a 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 Hypothesis 2, which 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.

	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

Tab. 1. Means, standard deviations and correlation. Source: the authors' own work.

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
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

Tab. 2. Multiple regression results for firm performance.

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

Tab. 3. Multiple regression results for strategic risk. Source: the authors' own work.

Hypotheses 3 and 4 argued for a negative impact of 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 directorship ties ($\beta = 0.01$; ns and $\beta = -0.06$; ns, respectively). However, the expected relationships in both hypotheses are supported in interfirm networks based on ownership ties ($\beta = 0.16$; $p < 0.05$ and $\beta = -0.22$; $p < 0.01$, respectively).

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

8. Discussion

More and more researchers have positively tested the hypotheses which predicted the strategic consequences of network position in terms of a firm's 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 with rapid access to non-redundant information, impacts 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 in strategic analysis of the company seems to be justified and necessary.

However, predicted findings are limited to only one type of corporate network, i.e. a network based on ownership interlocking. Support for a network created by directorate ties was not found. The explanation for this may be the relatively sparse network of personal connections between publicly traded companies on the Warsaw Stock Exchange. This study focused on personal links limited only to publicly traded companies. We excluded cases in which directors of two different companies listed on the WSE sit together on the board 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 directors is planned in future research. It is expected that more ties between publicly 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.

9. Conclusions

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 all the levels of strategic analysis: the firm, the microenvironment, the network level (i.e. mezzoenvironment) and the macroenvironment. Cross-level research could open a 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 into 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 through 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.

Endnotes

- ¹ The project was financed by the National Science Center, granted by decision number DEC-2013 / 11B / HS4 / 00461.
- ² 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).

References

- Aaker, D.A. and Jacobson, R. (1987). The role of risk in explaining differences in profitability. *Academy of Management Journal*, 30, 277–296.
- Ahuja, G. (2000). Collaboration networks, structural holes, and innovation: A longitudinal study. *Administrative Science Quarterly*, 45, 425–455, <http://dx.doi.org/10.2307/2667105>.
- Andersen, T.J. and Bettis, R.A. (2015). Exploring longitudinal risk-return relationships. *Strategic Management Journal*, 36, 1135–1145, <http://dx.doi.org/10.1002/smj.2281>.
- Batorski, D. and Zdziarski, M. (2009). Analiza sieciowa i jej zastosowania w badaniach organizacji i zarządzania. *Problemy Zarządzania*, 7(4), 157–185.
- Borgatti, S., Everett, M., and Freeman, L.C. (1992). *UCINET IV, Version 1.0*. Columbia: Analytic Technologies.
- Borgatti, S.P. and Halgin, D.S. (2011). On Network Theory. *Organization Science*, 22(5), <http://dx.doi.org/10.1287/orsc.1100.0641>.
- Borgatti, S.P. and Foster, P.C. (2003). The network paradigm in organizational research: A review and typology. *Journal of Management*, 29, 991–1013, http://dx.doi.org/10.1016/S0149-2063_03_00087-4.
- Borgatti, S.P. and Li, X. (2009). On network analysis in a supply chain context. *Supply Chain Management*, 45, 5–22, <http://dx.doi.org/10.1111/j.1745-493X.2009.03166.x>.
- Bowman, E.H. (1980). A risk/return paradox for strategic management. *Sloan Management Review*, 21, 17–31.
- Bromiley, P. (1991). Testing a causal model of corporate risk taking and performance. *Academy of Management Journal*, 34(1), 37–59.
- Burt, R. (1992). *Structural Holes*. Cambridge: Harvard University Press.
- Czakon W. (2012). *Sieci w zarządzaniu strategicznym*. Warszawa: Oficyna Wolters Kluwer Business.
- Coleman, J.S. (1988). Social capital in the creation of human capital. *The American Journal of Sociology*, 94, 95–120.
- Conyon, M.J. and Muldon, M.R. (2008). Ownership and control: A small-world analysis. In: *Network Strategy, Advances in Strategic Management*, 24, 31–65.
- Cyert, R. and March, J.G. (1963). *A Behavioral Theory of the Firm*. Wiley-Blackwell.
- Davis, G.F., Yoo, M., and Baker, W. (2003). The small world of the American corporate elite: 1982–2001. *Strategic Organization*, (3), 301–326, <http://dx.doi.org/10.1177/14761270030013002>.
- Davis, G. (1991). Agents without principles? The spread of the poison pill through the intercorporate network. *Administrative Science Quarterly*, 36, 583–613.
- Dyer, J.H. (2000). *Collaborative advantage: Winning through extended enterprise supplier networks*. Oxford University Press.
- Ferraro, F., Schnyder, G., Heemskerk, E., Corrado, R., and Del Vecchio, N. (2012). Structural breaks and governance networks in Western Europe. In: B Kogut (ed.), *The Small Worlds of Corporate Governance* (pp. 151–182). Cambridge: The MIT Press.

- Fiegenbaum, A. and Thomas, H. (1986). Dynamic and risk measurement perspectives on Bowman's risk-return paradox for strategic management: An empirical study. *Strategic Management Journal*, 7(5), 395–408.
- Filieri, R., McNally, R.C., O'Dwyer, M., and O'Malley, L. (2014). Structural social capital evolution and knowledge transfer: Evidence from an Irish pharmaceutical network. *Industrial Marketing Management*, 43, 429–440, <http://dx.doi.org/10.1016/j.indmarman.2013.12.011>.
- Freeman, L.C. (1977). A set of measures of centrality based on betweenness. *Sociometry*, 40, 35–41.
- Freeman, L.C. (1979). Centrality in social networks conceptual clarification. *Social Networks*, 1, 215–239.
- Galbraith, J. (1973). *Designing complex organization*. Reading: Addison-Wesley.
- Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology*, 78, 1360–1380.
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, 91, 481–510.
- Green, K.W., Whitten, D., and Inman, R.A. (2012). Aligning marketing strategies throughout the supply chain to enhance performance. *Industrial Marketing Management*, 41, 1008–1018, <http://dx.doi.org/10.1016/j.indmarman.2012.02.003>.
- Gulati, R., Nohria, N., and Zaheer, A., (2000). Strategic networks. *Strategic Management Journal*, 21, 203–215.
- Gulati, R. and Westphal, J. (1999). The dark side of embeddedness: An examination of the influence of direct and indirect board interlocks and CEO/board relationships on interfirm alliances. *Administrative Science Quarterly*, 44, 473–506, <http://dx.doi.org/10.2307/2666959>.
- Håkansson, H. and Johanson, J. (1992). A model of industrial networks. In: B. Axelsson and G. Easton (eds), *Industrial Networks: A New View of Reality* (pp. 28–34). London: Routledge.
- Haunschild, P.R. and Beckman, C.M., (1998). When do interlocks matter? Alternate sources of information and interlock influence. *Administrative Science Quarterly*, 43, 815–844, <http://dx.doi.org/10.2307/2393617>.
- Heemskerck, E.M. and Takes, F.W. (2016). The corporate elite community structure of global capitalism. *New Political Economy*, 21(1), 90–118, <http://dx.doi.org/10.1080/13563467.2015.1041483>.
- Johanson, J. and Mattsson, L.-G. (1992). Network position and strategic action — An analytical framework. In: B. Axelsson and G. Easton (eds), *Industrial Networks: A New View of Reality*. London: Routledge.
- Johanson, J. and Mattsson, L.-G. (1994). The market-as-networks tradition in Sweden. In: G. Laurent, G. Lillen, and B. Prass (eds), *Research Traditions in Marketing* (pp. 321–342). Boston: Kluwer Academic Publishers.
- Kahneman, D. and Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, XLVII, 263–291.
- Kawa, A. (2014). Analiza sieciowa jako metoda badawcza w naukach o zarządzaniu. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, 356, 40–49.
- Kentor, J. and Jang, Y.S. (2004). Yes, there is a (growing) transnational business community; a study of global interlocking directorates 1983–98. *International Sociology*, 19, 355–368, <http://dx.doi.org/10.1177/0268580904045345>.
- Koenig, T. and Gogel, R. (1981). Interlocking corporate directorships as a social network. *American Journal of Sociology*, 40, 37–50.
- Kogut, B. (ed.) (2012). *The Small Worlds of Corporate Governance*. Cambridge: MIT Press.
- Kogut, B. and Walker, G. (2001). The small world of German corporate networks in the global economy. *American Sociological Review*, 66, 317–335.

- Maurer, F. (2008). Risk and return: new insights for theory, measurement and management. *Journal of Applied Business Research*, 24, 51–63.
- Miller, K. and Bromiley, P. (1990). Strategic risk and corporate performance: An analysis of alternative risk measures. *Academy of Management Journal*, 33, 756–779.
- Miller, K.D. and Chen, W. (2004). Variable organizational risk preferences: Tests of the March-Shapira model. *Academy of Management Journal*, 47, 105–115, <http://dx.doi.org/10.2307/20159563>.
- Miller, K.D. and Leiblein, M.J. (1996). Corporate risk-return relations: Returns variability versus downside risk. *Academy of Management Journal*, 39, 91–122, <http://dx.doi.org/10.2307/256632>.
- Mizruchi, M. (1996). What do interlocks do? An analysis, critique, and assessment of research on interlocking directorates. *Annual Sociological Review*, 22, 271–298.
- McEvily, B. and Zaheer, A. (1999). Bridging ties: A source of firm heterogeneity in competitive capabilities. *Strategic Management Journal*, 20, 1133–1156.
- Möller, K. and Halinen, A. (1999). Business relationships and networks: managerial challenge of network era. *Industrial Marketing Management*, 28(5), 413–427, [http://dx.doi.org/10.1016/S0019-8501\(99\)00086-3](http://dx.doi.org/10.1016/S0019-8501(99)00086-3).
- Möller, K., Rajala, A., and Svahn, S. (2005). Strategic business nets – their type and management. *Journal of Business Research*, 58(9), 1274–1284, <http://dx.doi.org/10.1016/j.jbusres.2003.05.002>.
- Niemczyk, J., Stańczyk-Hugiet, E., and Jasiński, B. (2012). *Sieci międzyorganizacyjne. Współczesne wyzwania dla teorii i praktyki zarządzania*. Warszawa: C.H. Beck.
- Nicholson, G.J., Alexander, M., and Kiel, G.C. (2004). Defining the social capital of the board of directors: An exploratory study. *Journal of Management & Organization*, 10(1), 54–72, <http://dx.doi.org/10.1017/S1833367200004612>.
- Ouimet, M., Landry, R., and Amara, N. (2007). Network positions and radical innovation: A social network analysis of the Quebec Optics and Photonics Cluster. *International Journal of Entrepreneurship and Innovation Management*, 7, 251–271, <http://dx.doi.org/10.1504/IJEIM.2007.012883>.
- Ozman, M. (2009). Inter-firm networks and innovation: a survey of literature. *Economic of Innovation and New Technology*, 18, 39–67, <http://dx.doi.org/10.1080/10438590701660095>.
- Palmer, T.B. and Wiseman, R.M. (1999). Decoupling risk taking from income stream uncertainty: A holistic model of risk. *Strategic Management Journal*, 20, 1037–1062.
- Pawlak, M. (2008). Interlocking directorships in polish joint stock companies. *Management*, 3, 205–220.
- Pfeffer, J. and Salancik, G.R. (1978). *The External Control of Organizations: A Resource Dependence Perspective*. Stanford University Press.
- Porter, M.E. (1980). *Competitive Strategy*. New York: Free Press.
- Powell, W.W. (1990). Neither market nor hierarchy: Network forms of organization. *Research on Organizational Behavior*, 12, 295–336.
- Powell, W.W., Koput, K.W., Smith-Doerr, L., and Owen-Smith J. (1999) Network position and firm performance: Organizational returns to collaboration in the biotechnology industry. *Research in the Sociology of Organizations*, 16, 129–159.
- Provan, K.G., Fish, A., and Sydow, J. (2007). Interorganizational networks at the network level: A review of the empirical literature on whole networks. *Journal of Management*, 33, 479–516, <http://dx.doi.org/10.1177/0149206307302554>.
- Purchase, S., Da Silva Rosa, R., and Schepis, D. (2015). Identity construction through role and network position. *Industrial Marketing Management*. <http://dx.doi.org/10.1016/j.indmarman.2015.07.004>.
- Ramos, C. and Ford, D. (2014). How do managers see it? Capturing practitioner theories via network pictures. In: A.G. Woodside and R. Baxter (eds), *Deep Knowledge of*

- B2B Relationships Within and Across Borders, Advances in Business Marketing and Purchasing*, 20 (pp.293–375), [http://dx.doi.org/10.1108/S1069-0964\(2013\)0000020008](http://dx.doi.org/10.1108/S1069-0964(2013)0000020008).
- van Rijnsoever, F.J., van den Berg, J., Koch, J. and Hekkert, M.P. (2015). Smart innovation policy: How network position and project composition affect the diversity of an emerging technology. *Research Policy*, 44, 1094–1107, <http://dx.doi.org/10.1016/j.respol.2014.12.004>.
- Ruefli, T.W., Collins, J.M., and Lacugna, J.R. (1999). Risk measures in strategic management research: Auld lang syne? *Strategic Management Journal*, 20, 167–194.
- Salmi, A. (1996). Russian Networks in Transition, Implication for Managers. *Industrial Marketing Management*, 25, 37–45, [http://dx.doi.org/10.1016/0019-8501\(95\)00039-9](http://dx.doi.org/10.1016/0019-8501(95)00039-9).
- Sankar, C.P., Asokan, K., and Kumar, K.S. (2015). Exploratory social network analysis of affiliation networks of Indian listed companies. *Social Networks*, 43, 113–120, <http://dx.doi.org/10.1016/j.socnet.2015.03.008>.
- Sankowska, A. and Siudak, D. (2016). The small world phenomenon and assortative mixing in Polish corporate board and director networks. *Physica A*, 443, 309–315, <http://dx.doi.org/10.1016/j.physa.2015.09.058>.
- Schepis, D., Purchase, S., and Ellis, N. (2014). Network position and identity: A language-based perspective on strategizing. *Industrial Marketing Management*, 43, 582–591, <http://dx.doi.org/10.1016/j.indmarman.2014.02.009>.
- Seidel, M.D.L. and Westphal, J.D. (2004). Research impact: How seemingly innocuous social cues in a CEO survey can lead to change in board of director network ties. *Strategic Organization*, 2, 227–270, <http://dx.doi.org/10.1177/1476127004045252>.
- Uzzi, B., Amaral, L., and Reed-Tsochas, F. (2007). Small-world networks and management science research: A review. *European Management Review*, 4, 77–91, <http://dx.doi.org/10.1057/palgrave.emr.1500078>.
- Trzaska, R. (2015) Koncepcja analizy strategicznej sieci na przykładzie analizy sieci relacji właścicielskich. *Marketing i Rynek*, 5 (CD), 837–855.
- Vitali, S., Glattfelder, J.B., and Battiston, S. (2010). The network of global corporate control. *PLoS ONE*, 6(10), <http://dx.doi.org/10.1371/journal.pone.0025995>.
- Wiatrak, A.P. (2003). Organizacje sieciowe – istota ich działania i zarządzania. *Współczesne Zarządzanie*, (3), 7–18.
- Windolf, P. (2014). The corporate network in Germany 1896–2010. In: G. Westerhuis and T. David (eds), *The Power of Corporate Networks: A Comparative and Historical Perspective*. London: Routledge.
- Zaheer, A. and Bell, G.G. (2005). Benefiting from network position: Firm capabilities, structural holes, and performance. *Strategic Management Journal*, 26, 809–825, <http://dx.doi.org/10.1002/smj.482>.
- Zdziarski, M. (2012a). Elita wewnętrznego kręgu i centralne firmy. Wyniki badań relacji przez rady nadzorcze w polskich spółkach giełdowych. *Organization and Management*, 15(1), 23–39.
- Zdziarski, M. (2012b). Relacje w radach nadzorczych spółek publicznych. *Współczesne Zarządzanie*, (4), 213–223.
- Zdziarski, M. and Czarniawska, D. (2016). Board homophily, board diversity and network centrality. *Problemy Zarządzania*, 14(2), 117–133, <http://dx.doi.org/10.7172/1644-9584.60.7>.
- Zukin, S. and DiMaggio, P. (1990). *Structures of Capital. The Social Organization of the Economy*. Cambridge: Cambridge University Press.